9-12-2018

The Effect of Parent Emotion-related Talk on Infant Behavior and Emotion Regulation

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THE EFFECT OF PARENT EMOTION-RELATED TALK ON INFANT BEHAVIOR AND EMOTION REGULATION

A dissertation submitted in partial fulfillment of

the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

PSYCHOLOGY

by

Nicole E. Lorenzo

2019

To: Dean Michael R. Heithaus
College of Arts, Sciences and Education

This dissertation, written by Nicole E. Lorenzo, and entitled The Effect of Parent Emotion-Related Talk on Infant Behavior and Emotion Regulation, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Date of Defense: September 12, 2018

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Florida International University, 2019

DEDICATION

To my wonderful family and friends for all their love and truly unconditional support.

ACKNOWLEDGMENTS

First, I would like to thank my mentor, Dr. Daniel Bagner, and committee members, Drs. Lorraine Bahrick, Laura Dinehart, and Paulo Graziano. Their thoughtful questions, feedback, and guidance have been invaluable throughout this process. Special thanks to my amazing team of research assistants and fellow graduate students. Thank you for always challenging, inspiring, and encouraging me.

Last but certainly not least; I would like to thank my wonderful husband, parents, family, and friends who have supported me through every step of this process. This work would not have been possible without them.

ABSTRACT OF THE DISSERTATION

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Early parent-infant interactions play a critical role in the social, emotional, and behavioral development of children. While several aspects of parent-infant interactions have been thoroughly examined, parent emotion socialization has not been examined to the same extent. The current work aimed to examine the development of parent emotion-related talk in mothers of infants with and without behavior problems in two studies. The first study examined the developmental trajectory of parent emotion-related talk among mothers of infants with and without elevated behaviors and the effect of parent emotion-related talk on infant behavior and regulation. The study included 101 mother-infant dyads including 43 infants with and 58 infants without behavior problems. All mothers completed a measure on child behavior and videotaped behavioral observations of mother-infant interactions at three assessments. Growth analyses demonstrated different developmental changes in parent emotion-related talk in mothers of infants with and without behavior problems. For mothers of infants with elevated behavior problems, the starting point of parent emotion-related talk was very low with a significant linear increase, and no significant variability. However, for mothers of infants without elevated behavior problems, there was significant variability in the starting point of parent

emotion-related talk but no significant linear change. These findings demonstrate significantly different developmental patterns of emotion-related talk between mothers of infants with and without elevated behavior problems. Furthermore, parent emotion-related talk did not significantly predict infant emotion regulation or prosocial behavior. These preliminary results highlight the differences in parent emotion-related talk in mothers of infants with and without behavior problems and the need for future research to examine the relation between parent emotion-related talk and infant outcomes.

The goal of the second study was to examine the effect of a brief in-home parenting intervention on parent emotion-related talk. The study included 58 mother-infant dyads, with 28 mother-infant dyads assigned to the standard care group and 30 mother-infant dyads assigned to the intervention group. Mothers in the intervention group used more parent emotion-related talk at post-intervention than mothers in the standard care group. Furthermore, maternal depressive symptoms at baseline significantly moderated the effect of the intervention on parent emotion-related talk at post-intervention and follow-up. Specifically, mothers with higher depressive symptoms at baseline who received the intervention, demonstrated higher levels of parent emotion-related talk than mothers with lower scores of depressive symptoms who received the intervention. Given that depressed mothers are more likely than non-depressed mothers to display low levels of positive emotion and emotion expression during parent-child interactions, they have the most room for growth in parent emotion-related talk. These findings highlight the potential added effect of intervention on mother and child.

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The first study was entitled: Development of Parent Emotion-Related Talk in Mothers of Infants with and without Behavior Problems. This first study aimed at examining the developmental trajectory of parent emotion-related talk and differences between mothers of infants with and without elevated behavior problems. The second goal of the study was to examine how parent emotion-related talk impacted the development of infant behavior and emotion regulation.

The second study was entitled: Impact of Behavioral Parent Training in Infancy on Parent Emotion Socialization. This second study aimed to examine the effect of a brief in-home parenting intervention on parent emotion-related talk in mothers of infants with elevated behavior problems.

II. Development of Parent Emotion-Related Talk in Mothers of Infants with and without Elevated Behavior Problems

This manuscript will be submitted to Child Development, and thus adheres to its use of APA 6th Edition formatting guidelines.

Lorenzo, N.E., Bahrick, L.E., & Bagner, D.M. (in preparation). Development of parent emotion-related talk in mothers of infants with and without behavior problems.

Authors' note: This research was supported by NICHD (F31HD088084-01).

Abstract

Parent emotion socialization has been shown to impact infant social, emotional, and behavioral development mostly in preschool and school aged children. Given these findings, the goal of the present study was to examine the developmental trajectory of parent emotion-related talk, a type of emotion socialization, in mothers of infants with and without elevated levels of behavior problems and the effect on infant prosocial behavior and emotion regulation. Participants were 101 mother-infant dyads assessed over three timepoints. Mothers of infants without elevated behavior problems used significantly more parent emotion-related talk than mothers of infants with elevated behavior problems. Growth modeling demonstrated significant variability in parent emotion-related talk for mothers of infants without elevated behavior problems and no significant linear trend. For mothers of infants with elevated behavior problems, there was a significant increase in parent emotion-related talk over time with limited variability. Despite the increase in parent emotion-related talk in mothers of infants with elevated behavior problems, their levels did not reach the average level of parent emotion-related talk compared to the other group. Findings suggest parent emotion-related talk can change over time in this group but may benefit from intervention to meet the levels of mothers of infants without behavior problems. Furthermore, parent emotion-related talk did not predict infant prosocial behavior or infant emotion regulation. These preliminary results highlight the differences in parent emotion-related talk in mothers of infants with and without elevated behavior problems and the need for future research to examine the relation between parent emotion-related talk and infant outcomes.

Keywords: emotion socialization; behavior problems; emotion regulation

Development of Parent Emotion-Related Talk in Mothers of Infants with and without Elevated Behavior Problems

Research has demonstrated that increased parental socialization of emotion predicts higher levels of child emotion understanding and expression (Alegre, 2010; Denham et al., 2000). This has been associated with lower levels of behavior problems (Newland & Crnic, 2011) and higher academic competence (Izard et al., 2001), than families with lower levels of parental socialization of emotion. Emotion socialization has been defined as the method by which parents expose their children to emotions, including how they model emotional expression and how they communicate emotional understanding (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997). However, there has been little research investigating changes in emotion socialization over time, particularly during the transition from infancy to toddlerhood when infants are first learning basic emotion language (e.g., happy, sad) (Izard et al., 2011). Furthermore, limited research has examined the impact of changes in parent emotion-related talk on infant outcomes, such as prosocial behavior and emotion regulation. Therefore, it is important to examine changes in and the impact of parent emotion-related talk on infant behavior and emotion regulation, which could be targeted as a lever of change in parenting interventions.

Parental Socialization of Emotion

A common method of examining parent emotion socialization has been to evaluate the use of parent emotion-related talk. Parent emotion-related talk is defined as parent verbalizations that produce, elicit, and/or explain emotion terms (e.g., mad, scared) or desires (e.g., want, need) directed to their child (Ramsden & Hubbard, 2002). When

examining conversations about emotions (e.g., asking a child what happened after a conflict), researchers have found that parents use increased complexity and explanation of emotions as their children increased in age from 2 to 5 years, but that the overall rate of conversations about emotion remained stable (Lagattuta & Wellman, 2002). Given the rapid developmental changes in language that occur during the first two years of life (defined herein as "infancy"), it is possible that the rate of parent emotion-related talk throughout daily interaction tasks, such as play, increases throughout infancy. Moreover, research has suggested that parents scaffold their emotion-related talk by placing an emphasis on desires (e.g., want, need) and basic emotion terms (e.g., happy sad) prior to introducing more complex terms and explanations (Taumoepeau & Ruffman, 2006). Therefore, despite the findings that parent emotion-related talk during conversations about emotions is stable in quantity with children 2- to 5-years-old (Lagattuta & Wellman, 2002), research is still needed on the quantity changes in parent emotion-related talk with infants during daily interaction tasks such as play.

Parent Emotion-Related Talk and Child Behavior

In addition to possible changes in parent emotion-related talk during infancy, it may be the case that early behavior problems, which can be identified in infancy (Briggs-Gowan & Carter, 2008), are associated with parenting practices (Ramsden & Hubbard, 2002). Specifically, it is important to understand how behavior problems affect the extent to which parents use emotion-related talk in parent-infant interactions such as play. Acknowledging the literature on the relation between behavior problems and parenting practices (Baker, Heller, & Henker, 2000; Hastings, Daley, Burns, & Beck, 2006), it is important to consider the role of emotion-related parenting practices. One element of

parenting related to emotion that has been examined is the effect of critical remarks on child behavior problems. Two cross-sectional studies have demonstrated that increases in critical remarks by parents were associated with higher levels of behavior problems in preschoolers (Baker et al., 2000) and school-aged children (Hastings et al., 2006). Additionally, in longitudinal work, early parental anger and hostility have been shown to predict later child behavior problems from early to middle childhood (Denham et al., 2000). Parent positive and negative affect, as demonstrated via facial and physical expression, also have been demonstrated as predictors of child social competence and emotion regulation (Eisenberg et al., 2001). Furthermore, parents of infants with behavior problems tend to use less positive parenting practices, such as warmth, sensitivity, and praise (Dunn, 2004; Eisenberg et al., 2001). However, these studies examined emotion aspects of parenting (e.g., parent negativity, warmth, hostility) with preschoolers or older children, and none of these studies examined parent emotion-related talk with infants. While emotion affect and attachment characteristics are influential emotion components of parenting, parent emotion-related talk may impact infant behavior by emphasizing emotion language. Therefore, it is important to consider how parent emotion-related talk may differ among parents of infants with and without elevated levels of behavior problems. Given the association between parenting practices and child behavior problems, we expected parents of infants with elevated levels of behavior problems would use lower levels of parent emotion-related talk compared to parents of infants without elevated levels of behavior problems.

Parent Emotion-Related Talk and Child Prosocial Behavior

Children who display higher levels of behavior problems are also less likely to display prosocial behaviors (Zahn-Waxler, Cole, Welsh, & Fox, 1995), such as sharing and helping. In order to learn and display prosocial behaviors, children must be able to interpret the emotions of others and understand an appropriate response (Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013; Ensor & Hughes, 2005). Current findings from cross-sectional studies demonstrate a positive relation between parent positive emotion expression and emotion-related talk on child understanding of emotion (Denham & Kochanoff, 2002; Halberstadt & Eaton, 2002). In turn, increases in child emotion understanding have been positively associated with higher levels of child prosocial behavior (Drummond, Paul, Waugh, Hammond, & Brownell, 2014; Ensor & Hughes, 2005). Research has demonstrated that early prosocial behaviors are necessary to obtain and maintain positive social relationships (Belacchi & Farina, 2012). Conversely, a lack of prosocial behavior has been associated with lower levels of empathy and higher rates of peer rejection (McCabe & Altamura, 2011). Parenting behaviors, such as warmth and positive responding to emotion cues, have been demonstrated as predictors of the development of empathic concern and prosocial behavior in children (Lehman, Steier, Guidash, & Wanna, 2002).

Only a few studies have examined the relation between parent emotion-related talk and prosocial behavior in preschoolers and older children and even less research in this area has been conducted with infants. Evidence suggests that children whose parents indicate and explain their emotions are more likely to show empathic concern toward others in distress (Drummond et al., 2014). Additionally, parents who use higher rates of

emotion-related talk have been shown to have children who help and share more quickly (Brownell et al., 2013). Furthermore, to our knowledge, all studies examining the relation between parent emotion-related talk and child prosocial behavior have relied on cross-sectional designs, which limits our ability to examine how parent emotion-related talk affects changes in prosocial behavior in infancy, the period during which understanding emotions and prosocial behaviors are beginning to develop (Belacchi & Farina, 2012).

Parent Emotion-Related Talk and Child Emotion Regulation

Children who display higher rates of prosocial behaviors are more likely to have better emotion regulation skills (Beauchaine et al., 2013). Emotion regulation has been defined as the ability to manage the intensity and occurrence of the expression of emotion in response to environmental stimuli (Izard et al., 2011). Following emotion-eliciting stimuli, infants experience concurrent affective, cognitive, and physiological processes, which develop into behavioral responses that can be considered adaptive or maladaptive. Throughout the process of developing self-soothing and regulatory behaviors, infants depend on their caregivers as their main source of comfort and method for regulating their emotions (Calkins & Fox, 2002). As such, parents play a significant role in the development of their child's ability to regulate emotions.

One method by which parents can help influence emotion regulation in their child is by using emotion-related talk while interacting with their child. Specifically, a few studies suggest that higher levels of parent negative emotion expressivity are associated with poorer child emotion regulation (Eisenberg et al., 2003; Eisenberg et al., 2001; Morris, Silk, Steinberg, Myers, & Robinson, 2007). However, in these studies, parent emotion expressivity was assessed categorically as positive or negative and was not

assessed continuously, such as the frequency of emotion-related talk over time. Given the limitations of previous studies on parent expressivity and child emotion regulation, it is important to examine how parent emotion-related talk affects changes in emotion regulation in infancy, when emotion understanding is beginning to develop.

Current Study

Currently, the literature on parent emotion-related talk has included mostly parents of children preschool age and older with only a few studies including parents of infants. Furthermore, the cross-sectional nature of previous work has limited the ability to examine developmental trajectories of parent emotion-related talk. Therefore, the first goal of the present study was to examine the trajectory of parent emotion-related talk across infancy and compare the frequency of parent emotion-related talk between mothers of infants with and without elevated levels of behavior problems. The second goal of the study was to examine the effect of parent emotion-related talk on subsequent changes in infant behavior and regulation and compare differences in these effects between mothers of infants with and without elevated levels of behavior problems. We hypothesized the following: (1) the frequency of parent emotion-related talk would increase over time as the infants get older; (2) mothers of infants with elevated behavior problems would use a lower frequency of parent emotion-related talk compared to mothers of infants without elevated behavior problems; and (3) parent emotion-related talk would predict subsequent improvements in infant prosocial behavior and regulation over time.

Method

Participants

The current study is a secondary data analysis of two large studies. One study was a randomized controlled trial examining the effect of a parenting intervention, for families with an infant displaying elevated levels of behavior problems. Families were evaluated at three assessments at approximately 12, 18, and 21 months of age (study A). Sixty families were randomly assigned to receive a home-based parenting intervention (n = 31) or standard pediatric primary care (n = 29). To avoid any potential intervention effects (see Chapter III), only families that were in the standard care condition were included in the current study (and one of these families did not complete the baseline assessment and the subsequent assessments), yielding 28 families from study A. The other study was a longitudinal trajectory assessment study examining intersensory processing in typically developing infants (study B). One hundred ten parent-infant dyads in study B completed assessments at multiple time points, including 12-, 18-, and 24-month assessments, which overlap in infant ages at the assessments in study A. Primary caregivers who spoke a language other than English or Spanish during the parent-infant play task were excluded from study B (n = 4) to be consistent with the languages spoken by participants in study A. In addition, to be consistent with families in study A, caregivers other than mothers were excluded from study B (n = 12). An additional 21 families did not complete any of the three assessments. Therefore, the final sample included in this study was 101 parent-infant dyads (28 from study A and 73 from study B).

The inclusion criteria for study A were the following: (1) the primary caregiver (which was the mother in all cases) needed to speak English or Spanish, (2) rate their infant at or above the 75th percentile on the problem scales of the *Brief Infant-Toddler Social and Emotional Assessment (BITSEA*; Briggs-Gowan, Carter, Irwin, Wachtel, & Cicchetti, 2004), a screener of infant behavior problems, and (3) obtain a standard score of 70 or higher on the two-subtest (vocabulary and matrix reasoning) version of the *Wechsler Abbreviated Scale of Intelligence* (*WASI;* Wechsler, 1999) for those speaking English, or an average standard score of 4 or higher (two standard deviations below the mean) on the two subtests (vocabulary and matrix reasoning) of the *Escala de Inteligencia Wechsler Para Adultos* (*EIWA;* Pons et al., 2008) for those speaking Spanish. The inclusion criteria for study B were the following: (1) the primary caregiver (which was the mother in all cases included in the current study) needed to report no physical or mental health impairments and (2) infants needed to have been born full term. Exclusion criteria for both study A and study B included: (1) infants with major sensory impairments (e.g., deafness, blindness) or motor problems that impair mobility (e.g., cerebral palsy); and (2) families with current child protections services involvement at time of recruitment. BITSEA scores were then used to determine group status (described below).

Infants were on average 12.62-months-old (*SD* = 1.19; see Table 1) at the first assessment. Most of the infants were female (53.5%). Based on mother report data, most infants were of Hispanic ethnicity (74%) and White race (76.2%). Throughout the play interaction (described below), mothers spoke English (43%) or Spanish (49%) with their infants, with a small portion of mothers (8%) who spoke both English and Spanish

throughout the interaction. There was a significant difference in child ethnicity, with more non-Hispanics in the group of mothers of infants without elevated behavior problems (n = 20), than mothers of infants with elevated behavior problems (n = 6, p = .017). There were no other significant differences on demographic characteristics, baseline infant prosocial behavior or emotion regulation variables between the two studies or the groups.

Procedures

The current study was a repeated measures analysis, in which mothers completed the same measures and tasks over three assessments. Infants ranged in age from 11 to 16 months at Assessment 1 and 17 to 24 months at Assessment 3. All mothers completed a demographic questionnaire at Assessment 1 and a questionnaire of infant social-emotional and behavioral functioning at all three assessments. In addition, at each assessment, the mother participated in a 9-10 minute videotaped play interaction with her infant, in which the mother was instructed to let her infant lead the play with three standardized sets of creative, constructive toys (e.g., blocks, farmhouse). This was used to code parent emotion-related talk.

To determine behavior problem group status, infants scoring at or above the 75th percentile on the Brief Infant Toddler Social Emotional Assessment (BITSEA; described below) based on their age and sex were considered to have elevated behavior problems in the current study, whereas infants scoring below the 75th percentile on the BITSEA were considered not to have elevated behavior problems. Therefore, all participants from study A were considered to have elevated behavior problems, as a BITSEA score above the 75th percentile was an inclusion criterion. Additionally, 15 (21%) participants from study B

also displayed BITSEA scores above the 75th percentile cut-off at the first assessment and therefore were included in the with elevated behavior problems group. See Table 1 for a summary of participant demographic characteristics, including by group status. Both larger studies and the current secondary data analysis were approved by the Institutional Review Boards at the affiliated university of the committee members (Chair: Daniel M. Bagner; Committee Member: Lorraine Bahrick).

Measures

Parent Emotion-Related Talk. The *Emotion Talk Coding System* (Drummond et al., 2014) was used to code parent emotion-related talk including parent verbalizations of emotions (e.g., happy, sad, angry) and desires (e.g., wants, needs) during the observations of parent-infant play interactions at each assessment. Parent emotion-related talk was coded for utterances of simple affect, desires, elaboration/explanation/inferences, empathy, and mental state talk (i.e., mental state utterances and internal state utterances). Simple affect, desires, and elaboration/explanation/inferences are comprised of production and elicitation of emotion. Production of emotion is a statement that does not require a response (e.g., you look happy), whereas elicitation of emotion requires the child to respond to the parents' inquiry surrounding the emotion (e.g., why are you sad?). See Table 2 for Parent Emotion-Related Talk codes, definitions, and examples. Total frequency counts of parent emotion-related talk were calculated by summing all individual codes. This coding scheme has been used in studies with infants to examine the use of parent emotion-related talk and has demonstrated good reliability and validity (Brownell et al., 2013; Drummond et al., 2014). An advanced graduate student (author) and undergraduate research assistants were trained to 80% agreement with a criterion

tape. For purposes of reliability coding, 20% of the baseline observations were coded a second time by an undergraduate research assistant, and inter-rater reliability was adequate and yielded an excellent overall kappa of .89 for all codes.

Infant Behavior Problems. The *Brief Infant-Toddler Social Emotion Assessment* (BITSEA; Briggs-Gowan et al., 2004) is a 42-item parent-rating scale designed to assess behavior problems and competencies in 12- to 36-month-olds. The problem scale is comprised of 31 items and has excellent test-retest reliability (Briggs-Gowan & Carter, 2007) and support for discriminative validity yielding excellent sensitivity and good specificity for those scoring above the clinical cutoff of the 75th percentile (Karabekiroglu, Briggs-Gowan, Carter, Rodopman-Arman, & Akbas, 2010). Items are rated on a scale of 0 (not true/rarely), 1 (somewhat true/sometimes), or 2 (very true/ often), and examples of items on the problem scale include "restless and can't sit still," is "destructive," and "hits, bites, or kicks." The BITSEA items were administered in order to determine which group infants belonged to (with or without elevated behavior problems).

Infant Prosocial Behavior & Emotion Regulation. The *Infant-Toddler Social and Emotional Assessment* (*ITSEA;* Carter, Briggs-Gowan, Jones, & Little, 2003) is a 166-item questionnaire on which caregivers report on infant/toddler social-emotional functioning. The first 42 items are the same items in the BITSEA. The ITSEA yields scores in four broad domains: externalizing, internalizing, dysregulation, and competence. The ITSEA has previously demonstrated good reliability with coefficient alpha values ranging from .80 to .87 across domains (Carter et al., 2003). The competence and dysregulation domains of the ITSEA were used as measures of prosocial

behavior and emotion regulation, respectively, at all three assessments. The competence domain is comprised of 6 subscales: compliance, attention, mastery motivation, imitation/play, empathy, and prosocial peer relations, with higher scores meaning more competence. The dysregulation domain is comprised of four subscales: negative emotionality, sleep, eating, and sensory sensitivity with higher scores meaning more dysregulation.

Data Analyses

Independent samples *t*-tests were used to assess mean differences in the frequency of total parent emotion-related talk and total talk between groups (with and without elevated levels of behavior problems) at each time point using SPSS 21. In order to analyze repeated- measures data and describe developmental patterns that allow for examination of change over time, we conducted longitudinal growth analyses with frequency counts of total parent emotion-related talk using Mplus 7. These growth analyses involved two steps: the first was to unconditionally model frequency counts of total parent emotion-related talk as a linear function of time, and the second was to examine the linear function by group (i.e., mothers of infants without elevated levels of behavior problems and mothers of infants with elevated levels of behavior problems).

Considering the goal of the study was to understand developmental changes throughout infancy and the variability in infant age at the assessment time points, we used time scores for the growth analyses of total parent emotion-related talk. Time scores are data for multilevel and SEM growth models in which individuals can have different time measurements (Heck & Thomas, 2015; Sterba, 2014). As the next step was to use the total level of parent emotion-related talk as a predictor of infant behavior and

regulation, we centered the data at the youngest infant participant age, which was 11 months.

In order to examine the effect of parent emotion-related talk on infant behavior and regulation we developed growth models of infant behavior and regulation using Mplus 7. These growth analyses involved two steps: the first was to unconditionally model the proposed infant outcomes as a linear function of time, and the second was to examine total parent emotion-related talk at the first assessment as a predictor of change and infant outcomes at the third assessment. To examine infant prosocial behavior, we included raw scores of the ITSEA competence domain. To examine infant emotion regulation, we included raw scores from the ITSEA dysregulation domain. Once again, we used time scores for the growth analyses. As the goal was to examine the effect of total parent emotion-related talk on subsequent infant behavior and regulation, we centered the data at the oldest age, which was 24 months.

In order to determine what model worked best for the data we examined a model with behavior problem group as predictor and compared that to a model examining each group individually (by group model). The Likelihood Ratio (LR) test and parsimony was used to determine the models that were the most appropriate for the data. The LR test examines the difference between the -2 Log Likelihood value and the degrees of freedom to develop a chi-square value and test for significance. The superior model was then used to examine predictors of growth. The fixed effects including intercepts (i.e., starting point) and slope (i.e., rate of change), as well as the random effects such as the variance (i.e., variability) of the intercept and slope were all examined in the growth models (see Curran, Obeidat, & Losardo, 2010 for more information regarding growth modeling).

Little's missing values analysis indicated missingness was consistent with a missing at random pattern. Thus, maximum likelihood estimation, which creates estimates using all available observations for participants and provides unbiased parameter estimates, was utilized for all growth analyses in Mplus.

Results

Table 3 presents means and standard deviations of the frequency of total parent talk, individual parent emotion-related talk codes, total parent emotion-related talk, rate per minute of total parent emotion-related talk, and the proportion of parent emotion-related talk for infants with and without behavior problems. For the current study, total parent emotion-related was used for all analyses, accounting for total parent talk in order to examine the data as count data to address the many observations of zero. Independent samples *t*-tests showed significant differences in total parent emotion-related talk between the mothers of infants with and without behavior problems at the first ($t = 3.32$, $p = .001$), second ($t = 3.19$, $p = .002$), and third ($t = 4.70$, $p < .001$) assessments. Specifically, mothers of infants without elevated behavior problems had more frequent total parent emotion-related talk ($M = 7.91$, $SD = 6.78$; $M = 6.62$, $SD = 5.84$; $M = 9.18$, $SD = 6.28$) than mothers of infants with elevated behavior problems ($M = 3.39$, $SD = 6.19$; $M = 2.62$, $SD = 5.43$; $M = 3.36$, $SD = 3.86$), at the first, second, and third assessment, respectively.

Parent Total Talk Growth Model

We developed a growth model for parent total talk and examined the slope to understand the changes (i.e., increases or decreases) over time and the intercept at 11 months to understand the average starting point. Furthermore, we examined the variance

in the intercept and slope to determine if there was significant variability in the changes over time and the starting point. Two models were developed to determine the model that best fit the data. To determine if the parent total talk model with group status as a covariate or the parent total talk model by group had better model fit, we conducted a LR ratio test. The parent total talk model with group status as a covariate resulted in -2 Log Likelihood value of 3,161.35 with 12 estimated parameters. The parent total talk model by group resulted in -2 Log Likelihood value of 3,143.33 with 18 estimated parameters. The parent total talk model with group status as a covariate and the parent total talk model by group were significantly different using the LR test, χ^2 (6) = 18.02, $p < .05$. Based on the significance of the LR test and numbers of parameters, the parent total talk model by group fit the data best. Therefore, we reported estimates for the parent total talk model by group.

For mothers of infants without elevated behavior problems, the parent total talk model demonstrated an average intercept of 437.315 at 11 months that was not significant ($p = .130$). The average intercept variance for parent total talk was not significant ($p = .717$). The average linear slope for parent total talk was not significant ($p = .796$), and the average slope variance for parent total talk was not significant ($p = .911$). For mothers of infants with elevated behavior problems the parent total talk model demonstrated an average intercept of 284.910 at 11 months that was not significant ($p = .369$). The average intercept variance for parent total talk was significant ($p = .004$). The average linear slope for parent total talk ($p = .846$) and the average slope variance ($p = .148$) were both not significant.

Parent Emotion-Related Talk Growth Model Controlling for Total Talk

In order to examine the developmental trajectory of parent emotion-related talk we developed a growth model. We examined the slope to understand the changes (i.e., increases or decreases) over time and the intercept at 11 months to understand the average starting point. Furthermore, we examined the variance in the intercept and slope to determine if there was significant variability in the changes over time and the starting point. Two models were developed to determine the model that best fit the data. In order to ensure that results were not due to overall differences in total talk across groups, we included the total frequency of parent words at each assessment as a covariate. Child ethnicity was included in the parent emotion-related talk model given the significant differences between groups. However, child ethnicity did not significantly predict the slope or trajectory in this model and therefore was not included in the subsequent models. Maternal education was included in the parent emotion-related talk model given the significant differences between groups. Furthermore, given the effect of maternal education on the slope, it was included in the subsequent models. The count model was used to accommodate the frequency count nature of the total parent emotion-related talk data.

The linear model with the full sample resulted in -2 Log Likelihood value of 1,025.50 with 10 estimated parameters. The Poisson linear model to account for the inflated 0 value (i.e., high rates of 0 for parent emotion-related talk) resulted in -2 Log Likelihood value of 4,628.59 with 21 estimated parameters. The linear model and Poisson linear model were significantly different using the LR test, χ^2 (11) = 3,603.09, p < .05. Based on the significance of the LR test and numbers of parameters, the Poisson

linear model fit the data best. Therefore, we reported the estimates for the total parent emotion-related talk using the Poisson linear model.

The Poisson linear model for total parent emotion-related talk did not demonstrate a significant intercept or slope. However, once group status was added to the model, group was predictive of the intercept of total parent emotion-related talk (p = .001). Therefore, with this finding and the significant mean group differences (reported above), we compared the Poisson linear model for total parent emotion-related talk by group. For mothers of infants without elevated behavior problems the Poisson linear model for total parent emotion-related talk demonstrated an average intercept of .805 at 11 months that was not significant (p = .406). The average intercept variance for total parent emotion-related talk was .394 and significant (p =.005), which suggests that there was significant variability in parent emotion-related talk at the first assessment. The average linear slope for total parent emotion-related talk was not significant (p = .721) and the average slope variance was not significant (p = .082). For mothers of infants with elevated behavior problems, the Poisson linear model for parent emotion-related talk demonstrated an average intercept of .474 at 11 months that was not significant (p = .068). The average intercept variance for total parent emotion-related talk was not significant (p =.180). The average linear slope suggests that over time (approximately 1-month intervals), the total frequency of parent emotion-related talk significantly increased an average of .164 (p = .030). The average slope variance for total parent emotion-related talk was not significant (p = .425). The trajectory of parent emotion-related talk over the three assessments is demonstrated in Figure 1 for mothers of infants with and without elevated behavior problems.

Infant Prosocial Behavior Linear Model

To examine the developmental trajectory of prosocial behavior and the impact of parent emotion-related talk on infant prosocial behavior we developed a growth model. We examined the slope to understand the changes (i.e., increases or decreases) over time and the intercept at 24 months to understand the average last score. Furthermore, we examined the variance in the intercept and slope to determine if there was significant variability in the changes over time and the starting point. Two models were developed to determine the model that best fir the data. In order to determine if the infant prosocial behavior linear model with group status as a covariate or the infant prosocial behavior linear model by group had better model fit, we conducted a LR ratio test. The infant prosocial behavior linear model with group status as a covariate resulted in -2 Log Likelihood value of 1,372.86 with 18 estimated parameters. The infant prosocial behavior linear model by group resulted in -2 Log Likelihood value of 214.52 with 19 estimated parameters. The infant prosocial behavior linear model with group status as a covariate and the infant prosocial behavior linear model by group were significantly different using the LR test, $\chi^2(7) = 86.45$, $p < .05$. On the basis of the significance of the LR test and numbers of parameters, the infant prosocial behavior linear model by group fit the data best. Therefore, we reported estimates for the infant prosocial behavior linear model by group.

For mothers of infants without elevated behavior problems, the infant prosocial behavior linear model demonstrated an average intercept of 2.640 at 24 months that was not significant ($p = .140$). The average intercept variance for infant prosocial behavior was not significant ($p = .090$). The average linear slope for infant prosocial behavior was

not significant (p = .469), and the average slope variance for infant prosocial behavior was not significant (p = .094). For mothers of infants with elevated behavior problems the infant prosocial behavior linear model demonstrated an average intercept of 1.121 at 24 months that was significant (p = .002). The average intercept variance for infant prosocial behavior was not significant (p = .867). The average linear slope for infant prosocial behavior (p = .825) and the average slope variance (p = .801) were both not significant. Furthermore, total parent emotion related-talk at the first assessment did not have a significant effect on the intercept or slope for infant prosocial behavior in either group.

Infant Dysregulation Latent Factor Model

To examine the developmental trajectory of infant dysregulation and the impact of parent emotion-related talk on infant dysregulation, we developed a growth model. We examined the slope to understand the changes (i.e., increases or decreases) over time and the intercept at 24 months to understand the average last score. Furthermore, we examined the variance in the intercept and slope to determine if there was significant variability in the changes over time and the starting point. Two models were developed to determine the model that best fit the data. In order to determine if the infant dysregulation linear model with group status as a covariate or the infant dysregulation linear model by group had better model fit, we conducted a LR ratio test. The infant dysregulation linear model with group status as a covariate resulted in -2 Log Likelihood value of 333.42 with 18 estimated parameters. The infant dysregulation linear model by group resulted in -2 Log Likelihood value of 741.04 with 23 estimated parameters. The infant dysregulation linear model with group status as a covariate and the infant dysregulation linear model by

group were significantly different using the LR test, χ^2 (5) = 407.62, $p < .05$. On the basis of the significance of the LR test and numbers of parameters, the infant dysregulation linear model by group fit the data best. Therefore, we reported estimates for the infant dysregulation linear model by group.

For mothers of infants without elevated behavior problems, the infant dysregulation linear model demonstrated an average intercept of -4.567 at 24 months that was not significant ($p = .306$). The average intercept variance for infant dysregulation was not significant ($p = .227$). The average linear slope for infant dysregulation was not significant ($p = .326$), and the average slope variance for infant dysregulation was not significant ($p = .231$). For mothers of infants with elevated behavior problems the infant dysregulation linear model demonstrated an average intercept of .205 at 24 months that was not significant ($p = .744$). The average intercept variance for infant dysregulation was not significant ($p = .827$). The average linear slope for infant dysregulation ($p = .512$) and the average slope variance ($p = .970$) were both not significant. Furthermore, frequency of total parent emotion related-talk at the first assessment did not have a significant effect on the intercept or slope for infant dysregulation in either group.

Discussion

The current study examined the developmental trajectory of parent emotion-related talk throughout infancy, and differences in the levels and trajectories of parent emotion-related talk between mothers of infants with and without elevated levels of behavior problems. Despite the influence of emotion socialization practices on early emotion development (Denham et al., 2000; Morris et al., 2007), empirical work has not examined how parents use emotion socialization skills, including parent emotion-related

talk, early in their child's life. Additionally, given the importance of early parent-child interactions, it is essential to understand if there are differences in how mothers of infants with and without elevated levels of behavior problems use parent emotion-related talk during daily activities such as play. Findings from the current study demonstrate that during interactive play, mothers used emotion-related talk at varying rates across the assessments. As hypothesized, mothers of infants without elevated behavior problems used significantly more emotion-related talk than mothers of infants with elevated behavior problems at all three assessments. Specifically, at each assessment, mothers of infants without elevated behavior problems used approximately two to three times as much emotion-related talk than mothers of infants with elevated behavior problems.

Given the significant differences in parent emotion-related talk between groups at each assessment, analyses examining the trajectory of parent emotion-related talk were also examined by group. The growth analyses demonstrated significant differences in the developmental trajectory of parent emotion-related talk between the two groups. Specifically, mothers of infants without elevated behavior problems did not display group-level changes but demonstrated a significant amount of variability, and thus individual differences, in the initial frequency of parent emotion-related talk. These findings suggesting no group level change of parent emotion-related talk in mothers of infants without elevated behavior problems are consistent with findings from previous work with mothers of 2- to 5-year-olds (Lagattuta & Wellman, 2002). The lack of significant change over time suggests that parent emotion-related talk is relatively stable across infancy for mothers of infants without elevated behavior problems.

For mothers of infants with elevated behavior problems, there was a group level change in parent emotion-related talk. Mothers of infants with elevated behavior problems did not demonstrate significant variability in the initial frequency or variability in the slope. However, they displayed significantly lower levels of parent emotion-related talk at the first assessment compared to the mothers of infants without elevated behavior problems and significantly increased their levels of parent emotion-related talk over time. Although there was a significant increase over time, mothers of infants with elevated behavior problems did not reach the same frequency of emotion-related talk as mothers of infants without elevated behavior problems. The finding that the rates of parent emotion-related talk remain significantly lower at all assessments for mothers of infants with elevated behavior problems, the significant growth over time suggests that intervention may increase use of parent emotion-related talk to the same average level as mothers of infants without elevated behavior problems.

It also important to note that there were significant differences in parent total talk between the mothers of infants with and without elevated behavior problems, with mothers of infants without behavior problems using more total talk across all assessment. However, when examining the growth models of total talk there was no significant change over time in either group. In order to be as thorough as possible, we controlled for total talk in the growth analyses but comprehend that parent total talk may have potentially influenced the trajectory of parent emotion-related talk over time. Future studies should consider examining a longer interaction or more interactions in order to fully capture the overall amount of talk, as well as parent emotion-related talk.

In addition to group differences in parent emotion-related talk, we expected that parent emotion-related talk would impact levels of infant prosocial behavior and emotion regulation. Although infant prosocial behavior did not demonstrate significant change over time (i.e., increase or decrease) in either group, there was a significant mean intercept for both groups at 24 months and as such we assessed for the impact of parent emotion-related talk. However, initial levels of parent emotion-related talk did not significantly predict the prosocial behavior at 24 months or changes over time in either group. Findings for the effect of parent emotion-related talk on infant emotion regulation were similar to those on infant prosocial behavior. One possible reason for these findings is that the measure of prosocial behavior and emotion regulation was based solely on parent report. It is possible that mothers were not exposed to some situations where the infant had the opportunity to engage in prosocial behaviors, such as childcare settings, and therefore did not notice new and different behaviors in their infant (Eisenberg et al., 1996). Additionally, emotion regulation is best captured using multi-method assessments including behavioral observations. Future studies should include other caregivers and observational assessments of prosocial behavior, such as sharing and helping tasks (Brownell et al., 2013), and emotion regulation such as frustration tasks, to further explore the effect of parent emotion-related talk on prosocial behavior and emotion regulation. It is also possible that parent emotion-related talk does not predict prosocial behavior or emotion regulation, and future studies should examine this effect with larger samples, as our samples for each group were relatively small.

While the current study extends the literature on parent emotion-related talk using longitudinal data with mothers of infants, there were some limitations that should be

noted. First, the current study only included mothers as the primary caregiver despite the documented important role of other caregivers (e.g., fathers) on infant and child outcomes (Bowie et al., 2013). Thus, future studies should include other caregivers to examine the developmental trajectory and impact of emotion-related talk on infant prosocial behavior and regulation. Second, the current study included mostly mothers and infants with Hispanic ethnicity and White race and therefore may not be generalizable to other ethnic and racial groups. Future studies should include participants from more diverse ethnic and racial backgrounds to replicate and extend the findings from the current study.

Third, it is important to note that the sample size in the current study was relatively small and may have reduced the power to detect effects, especially given the sample sizes typically recommended for growth analyses are often expected to be over 100 (Curran et al., 2010), and the sample size for each group was approximately 50. Fourth, the variability in the age of the infants at each assessment required that we use time scores which more accurately accounts for time and developmental changes in infants. However, we did not have infants assessed at each month and may not have captured some smaller changes that may have occurred, particularly given the rapid developmental changes that occur throughout infancy (Belacchi & Farina, 2012). Therefore, future studies should replicate the current study findings with a larger sample and consider including more frequent assessments to account for the rapid developmental changes throughout infancy.

Fifth, parent emotion-related talk was observed in a play situation that was not intended to elicit emotions or emotion socialization skills from the mother. While this

allowed for us to extend the literature to a more natural setting, the overall frequency of parent emotion-related talk was relatively low and may not represent the typical use of parent emotion-related talk in other mother-infant interactions. For example, one study showed that parents used emotion-related talk significantly less in joint play than in book reading (Drummond et al., 2014). Thus, future research should examine parent emotion-related talk during tasks that may elicit emotion socialization (e.g., book reading) and other daily activities (e.g., bath time, feedings).

Sixth, prosocial behavior and emotion regulation were examined using only parent report. It is important for future research to examine the impact of parent emotion-related talk on prosocial behavior and emotion regulation using parent report in combination with behavioral observations, such as helping and sharing tasks for prosocial behavior or a frustration task for emotion regulation. Lastly, while the main goal of the current study was to examine parent emotion-related talk, other components of emotion socialization may differentially affect infant behavior and regulation. Therefore, future studies should examine multiple components of emotion socialization, such as teaching and reacting to an infant's emotions, to determine how each component may impact infant prosocial behavior and emotion regulation.

Despite these limitations, our study is the first to examine the development of parent emotion-related talk in mothers of infants, and it is particularly noteworthy to observe these changes during a critical time point (i.e., transition from infancy to toddlerhood) for emotion development (Belacchi & Farina, 2012). It is especially meaningful that there were unique differences between mothers of infants with and without elevated behavior problems in their amount of parent emotion-related talk used.

Furthermore, although parent emotion-related talk was not predictive of infant prosocial behavior or emotion regulation, there is previous research supporting the relation between parent emotion socialization, and prosocial behavior and emotion regulation (Brownell et al., 2013; Morris et al., 2007), highlighting the need to conduct future research in this area. On the one hand, overall findings suggest that for mothers of infants without elevated behavior problems there is significant variability in their use of parent emotion-related talk. On the other hand, for mothers of infants with elevated behavior problems, the frequency of parent emotion-related talk on average was low, and although it increased over time, it remained lower at later time points than the frequency of parent emotion related talk among mothers of infants without elevated behavior problems. These findings offer a target for early parenting interventions for infants who are at risk for developing more severe behavior problems by focusing on early parent emotion socialization skills, including parent emotion-related talk.

Table 1. Demographic Characteristics at First Assessment

Characteristics	Without Elevated Behavior Problems (n = 58)	With Elevated Behavior Problems (n = 43)	Full Sample (n = 101)
	M (SD) or *n* (%)	*M* (SD) or *n* (%)	*M* (SD) or *n* (%)
Child Age (months)	12.03 (.21)	13.41 (1.46)	12.63 (1.19)
Child Sex (% female)	30 (51.7)	24 (55.8)	54 (53.5)
Child Ethnicity (% Hispanic)	30 (65.2)	58 (89.2)	74 (73.3)
Mother English Speaking (vs. Spanish)	28 (48.3)	15 (34.9)	43 (42.6)
Maternal Education (% Bachelor Degree or more)	36 (64.2)	12 (28.5)	48 (49)

Table 2. Parent Emotion-Related Talk Coding System

Category	Criteria	Examples
Simple Affect • Production (SAP)	Nouns, verbs, adjectives, or adverbs naming emotions, feelings, or behaviors, or states of preference, desire, or intention without	"The boy is happy" "He loves his ice cream" "Boo hoo", "grr", "hahaha"
• Elicitation (SAE)	expansion or emotion imitation	"Is he happy now?" "Is he happy or sad?" "How is he feeling?"
Desires • Production (DP)	References to wanting, needing something concrete	"He wants his ice cream back"
• Elicitation (DE)		"What does he want now?"
Elaboration/Explanation/ Inferences • Production (EP)	Phrases or statements that explain or clarify the reason or possible cause or reason for a particular emotion, or that provide background or context for the emotion to help the child understand it,	"The boy is sad because he dropped his ice cream" "The girl is scared because it is dark" "Why is he sad?" "How do you know the girl is angry?"
• Elicitation (EE)	or that elaborate or explain how one infers or knows that a given emotion is being experienced	
Empathy Statements/Sounds (EMP)	Statements or emotion-related sounds that promote empathy with a character's emotion	"Poor little boy" "Awwww" "Uh oh"
Other mental state utterances (OMS)	References to the past, or to thinking, knowing, wondering	"Remember when he dropped his ice cream" "I think she is being silly" "He knows he's gonna get some"
Other internal state utterances (OIS)	References to other internal states that are not affect- or mental state-related (e.g., physiological states)	"He is hungry" "The little girl is tired"

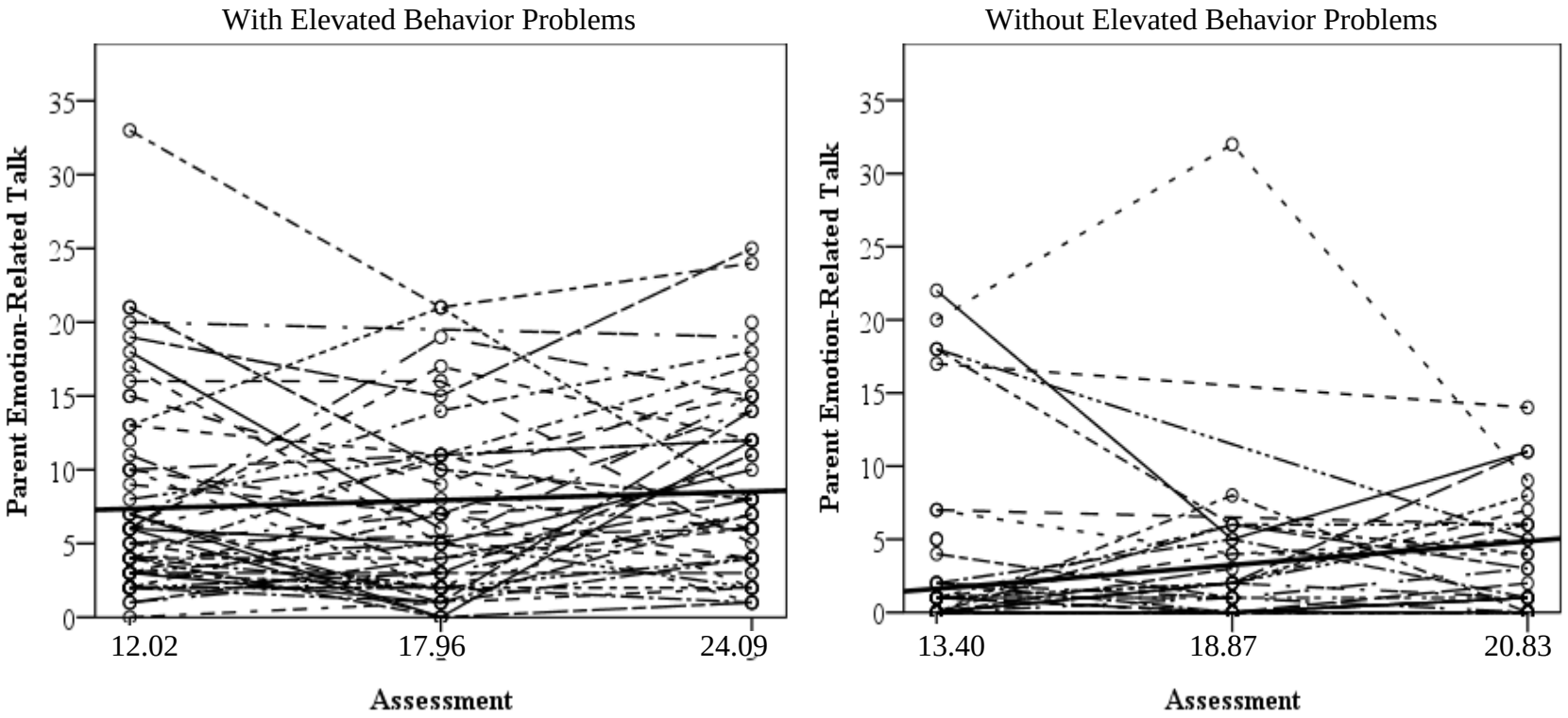
Note. Coding system developed by Drummond and Brownell (see Brownell et al., 2013; Drummond et al., 2014)

Table 3. Means of parent emotion-related talk among mothers of infants with and without elevated behavior problems

	Assessment 1			Assessment 2			Assessment 3		
	Without	With	*p*	Without	With	*p*	Without	With	*p*
SAP	.70 (1.15)	.27 (.59)	.032*	.62 (.98)	.22 (.75)	.042*	.80 (1.24)	.18 (.53)	.009
SAE	1.53 (2.16)	.49 (1.45)	.009*	.82 (1.68)	.70 (1.19)	.718	1.29 (2.76)	.88 (1.83)	.461
DP	.47 (1.19)	.17 (.54)	.136	.24 (.61)	.08 (.36)	.155	.73 (1.76)	.18 (.39)	.082
DE	4.60 (4.69)	2.17 (4.36)	.012*	3.73 (3.33)	1.08 (3.10)	.001*	4.96 (4.26)	1.42 (1.97)	.001*
EP	.02 (.14)	.02 (.16)	.856	.02 (.15)	.05 (.23)	.451	.04 (.21)	.06 (.35)	.799
EE	.04 (.19)	0	.213	0	0		0	0	
EMP	.08 (.39)	.02 (.16)	.426	.02 (15)	.05 (.23)	.451	.13 (.51)	.15 (.71	.895
OMS	.45 (1.01)	.12 (.46)	.055	.91 (1.92)	.19 (.70)	.033	1.20 (1.77)	.39 (1.71)	.026
OIS	.04 (.19)	.10 (.49)	.419	.24 (.61)	.32 (1.08)	.675	.09 (.59)	.09 (.29)	.986
Total PERT	7.91 (6.78)	3.39 (6.19)	.001*	6.62 (5.84)	2.62 (5.43)	.002*	9.18 (6.28)	3.36 (3.86)	.001*
Total Talk	410.96 (144.93)	257.71 (199.72)	.001*	488.82 (182.97)	198.00 (174.67)	.001*	519.93 (170.07)	221.45 (182.77)	.001*
RPM	.977 (.834)	.409 (.789)	.001*	.797 (.719)	.309 (.691)	.003*	1.13 (.793)	.466 (.633)	.001*
Proportion	.02 (.02)	.01 (.01)	.002	.01 (.01)	.01(.01)	.065	.02 (.01)	.01 (.01)	.155

Note. * $p < .05$; Comparisons between groups at each assessment; SAP = Simple Affect Production; SAE = Simple Affect Elicitation; DP = Desires Production; DE = Desires Elicitation; EP = Elaboration/Explanation/Inferences Production; EE = Elaboration/Explanation/Inferences Elicitation; EMP = Empathy; OMS = Other Mental State; OIS = Other Internal State; PERT = Parent Emotion-Related Talk; RPM = Rate Per Minute.

Figure 1. Parent Emotion-related talk for mothers of infants with and without elevated behavior problem



III. Impact of Behavioral Parent Training in Infancy on Parent Emotion Socialization

This manuscript will be submitted to Parenting: Science and Practice, and thus adheres to its use of APA 6th Edition formatting guidelines.

Lorenzo, N. E., & Bagner, D. M. (in preparation). Impact of behavioral parent training in infancy on parent emotion socialization.

Authors' note: This research was supported by NICHD (F31 HD088084-01).

Abstract

Research has demonstrated the effect of parent emotion socialization on later child emotion development and behavior. Given these findings the goal of the present study was to examine the effect of an early parenting intervention on a component of emotion socialization: parent emotion-related talk. We also examined the indirect effect of behaviorally-based parenting skills on the relation between the intervention and parent emotion-related talk. Lastly, we examined the moderating effect of maternal depressive symptoms on the relation between the intervention and parent emotion-related talk. Participants were 58 mothers and their 12- to 15-month old infants. Families were randomly assigned to standard pediatric primary care or a brief in-home intervention targeting parenting skills to promote infant behavior. Families completed assessments at baseline, post-intervention, and a 3-month follow-up. Assessments included a 10-minute mother-infant free play task, which was coded for parent emotion-related talk. Results demonstrated a significant effect of the intervention on parent emotion-related talk. Specifically, mothers in the intervention group displayed a higher frequency of parent emotion-related talk at post-intervention. Indirect effects of behaviorally based parenting skills were not significant. However, levels of maternal depressive symptoms was a significant moderator, such that mothers who completed the intervention and had high levels of depressive symptoms used more parent emotion-related talk at post-intervention than mothers with lower levels of depressive symptoms. Findings highlight the effect of a brief, home-based behavioral parent-training program with infants on parent emotion socialization and the interacting effect of maternal depressive symptoms.

Keywords: emotion socialization; behavior problems; depression; parenting training

Impact of Behavioral Parent Training in Infancy on Parent Emotion Socialization

Emotion development in childhood is an early and complex process that encompasses emotion knowledge, emotion expression, and emotion regulation. By 5 months, infants begin to respond to emotion cues from their parents and other infants (Flom & Bahrick, 2010; Vaillant-Molina, Bahrick, & Flom, 2013; Walker-Andrews, 1997), which provides an important foundation for understanding and verbalizing simple emotions (Izard et al., 2011). By 18 months, infants begin to identify simple emotions, such as happy, sad, and angry (Belacchi & Farina, 2012; Ensor & Hughes, 2005; Nichols, Svetlova, & Brownell, 2010). Following the early onset of emotion understanding, there is a rapid increase in emotion awareness and expression within the subsequent year from 18 to 30 months (Southam-Gerow & Kendall, 2002). Furthermore, increased understanding of emotion has been associated with increases in infant prosocial behavior, such as helping others, showing concern for others when they are hurt, and sharing their personal belongings (Brownell et al., 2013). Given the early milestones of emotion development, it is important to understand the role of parents, who represent an important source of social interactions throughout infancy. Therefore, the current study examined the effect of a brief parenting intervention on parent emotion socialization during infancy.

Parent-infant interactions have been shown to play a primary role in the process of infant emotion development. Parenting behaviors, such as maternal negativity, have been shown to be related to difficulties in emotion development, such as excessive tantrums and emotion dysregulation (Leckman-Westin, Cohen, & Stueve, 2009). Additionally, depressed mothers have been shown to display reduced affect and lower social engagement during parent-infant interactions, which has been associated with

infant negative emotionality and emotion regulation difficulties (Feldman et al., 2009). Given that parent-infant interactions are one of the first contexts in which infants learn about emotions, it is also important to examine how factors, such as parenting behaviors and parental depression, may affect parent emotion socialization during parent-infant interactions.

Parental socialization of emotion is comprised of three elements: how parents express emotions to their infant, teach their infant about emotions, and react to their infant's emotions (Denham & Kochanoff, 2002; Halberstadt & Eaton, 2002). Research indicates that increased use of parental socialization of emotion predicts later child emotion understanding and expression (Izard et al., 2011), as well as other social, emotional, and behavioral outcomes. One method of assessing these three elements of parental socialization of emotion is by examining emotion-related talk between the parent and infant. Preliminary evidence suggests that the extent to which parents use emotion terms (e.g., happy, sad) and desires (e.g., wants, needs) is associated with infant empathy and prosocial behavior (Drummond et al., 2014). Parent emotion-related talk also has been shown to be associated with more positive parent-infant interactions (Dunn, 2004), which includes warmth and praise of appropriate infant behaviors (Cox & Harter, 2003; Gross, Fogg, & Tucker, 1995).

Behavioral parent training (BPT) programs have been shown to be efficacious in improving parent-child interactions by increasing positive parenting behaviors, such as praise, and reducing negative parenting behaviors, such as criticism, which we will refer to as behaviorally-based parenting skills. Some of the most established BPT programs targeting young children include Parent-Child Interaction Therapy (PCIT; Zisser &

Eyberg, 2010), The Incredible Years (Borden, Schultz, Herman, & Brooks, 2010; Webster-Stratton, Gaspar, & Seabra-Santos, 2012), Helping the Non-Compliant Child (Forehand & McMahon, 1981), and Triple P Positive Parenting Program (Sanders, 1999). However, these behaviorally-focused interventions do not target parent emotion-related talk, which can have important implications for child emotion development. Some researchers have examined adaptations of BPT programs to include an emotion coaching component, such as Luby's adaptation of PCIT for children with depression to include an Emotion Development (ED) module (PCIT-ED; Luby, Lenze, & Tillman, 2012) and Chronis-Tuscano's PCIT Emotion Coaching (PCIT-ECo; Chronis-Tuscano et al., 2014), which is an adaptation of PCIT-ED for children with ADHD and incorporates parent emotion coaching throughout all treatment phases. While studies have shown these adaptations of PCIT to lead to improvements in child emotion regulation (Chronis-Tuscano et al., 2014; Lenze, Pautsch, & Luby, 2012; Luby et al., 2012), they have not examined the effect of the added intervention components on parent emotion socialization. Given that the traditional components of BPTs target parent-child interactions, which have been associated with positive emotion socialization practices, it is possible that these traditional components impact parent emotion socialization practices.

Moreover, although infancy is a critical period for the development of parent-child emotion socialization (Izard et al., 2011), no study to our knowledge has examined the impact of BPT programs delivered in infancy on parent emotion socialization, including parent emotion-related talk. Targeting parenting practices during infancy is promising and can be brief in duration relative to interventions delivered later in

childhood (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003). Research on a home-based adaptation of PCIT for high-risk infants, the Infant Behavior Program (IBP), showed a positive impact on behaviorally-based parenting skills (Bagner et al., 2016) but did not examine the effect of the IBP on parent emotion-related talk. Overall, as summarized above, research suggests that BPT programs may impact parent emotion-related talk.

The existing body of research points to a need to examine the extent to which BPT programs delivered in infancy impact parent emotion socialization behaviors and the potential indirect effect of behaviorally-based parenting skills on subsequent changes in parent emotion socialization behaviors. Research has demonstrated the effect of BPT programs, such as PCIT, on behaviorally-based parenting skills (defined above; Thomas & Zimmer-Gembeck, 2012). Although behaviorally-based parenting skills are the direct target of BPT programs, research has demonstrated that other parenting behaviors are often impacted by changes in behaviorally-based parenting skills following BPT programs. For example, findings from one study showed the IBP had an indirect effect on parental warmth and sensitivity through changes in positive behaviorally-based parenting skills, such as praise (Blizzard, Barroso, Ramos, Graziano, & Bagner, 2017). Thus, it is possible that the impact of BPT on changes in parent emotion socialization skills is, in part, because of changes in positive behaviorally-based parenting skills.

Furthermore, it is important to account for possible factors that may moderate the impact of BPT interventions on parent emotion socialization, such as parental depression, which has been shown to affect parent-infant interactions. Specifically, depressed parents display low levels of positive emotion and emotion expression during parent-child

interactions, have difficulties with emotion regulation, and lack the skills to model appropriate emotional responses (Feng et al., 2008; Silk, Shaw, Forbes, Lane, & Kovacs, 2006). Furthermore, maternal depression has been associated with negative maternal behavior and disengagement from the child (Hoffman, Crnic, & Baker, 2006). Given the impact of parental depression on parent-infant interactions, especially around emotion development, we expected that parental depression would moderate the effect of BPT on parent emotion-related talk.

In the present study, we examined the effect of the IBP on changes in parent emotion-related talk in a randomized controlled trial (RCT) in which families were randomly assigned to receive the IBP or standard pediatric primary care. The IBP targets improvements in the parent-infant interaction, and thus is an appropriate intervention for examining the impact of a BPT program on emotion socialization-based behaviors. We hypothesized the following: (1) parents randomly assigned to receive the IBP would show significantly higher levels of emotion-related talk at a post assessment and at a 3-month follow-up assessment than parents assigned to standard care; (2) the effect of the IBP on increases in parent emotion-related talk at the post assessment and 3-month follow-up would have an indirect effect via increases in positive behaviorally-based parenting skills at the post assessment and 3-month follow-up; and (3) the effect of the IBP on increases in parent emotion-related talk at the post and 3-month follow-up assessments would be moderated by baseline levels of parental depressive symptoms, such that the effect of the intervention on parent emotion-related talk would be stronger for parents with lower levels of maternal depressive symptoms.

Method

The current study is a secondary data analysis of an RCT of the IBP. The primary outcomes of the RCT have been reported elsewhere (Bagner et al., 2016) and demonstrated that infants receiving the intervention displayed significantly lower levels of parent-reported infant behavior problems across post and follow-up compared to infants in the standard care group. In addition, mothers demonstrated significantly higher levels of positive behaviorally-based parenting skills that they were taught to use during an infant-directed play across post and follow-up compared to mothers in the standard care group. Study procedures were approved by the university and hospital Institutional Review Boards.

Participants and Recruitment

Participants were 58 mothers and their 12- to 15-month-old infants. Families were recruited by research staff during well and sick visits at a pediatric primary care clinic in a large children's hospital in the southeastern United States serving mostly low-income and ethnic minority families. The mother was the identified primary caregiver of all the families participating in the study. For study inclusion, all infant participants were required to be between 12 and 15 months of age at the time of recruitment, and mothers had to rate their infant above the 75th percentile on the Brief Infant-Toddler Social and Emotional Assessment (Briggs-Gowan et al., 2004), a screener of infant behavior problems. Mothers also had to speak either English or Spanish. If bilingual, mothers chose to complete assessments (and intervention sessions if randomized to the intervention group) in the language in which they felt most comfortable. English-speaking mothers were required to receive an estimated IQ score of 70 or higher based on

the Vocabulary and Matrix Reasoning subtests of the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999), and Spanish-speaking mothers were required to receive an average scaled score of 4 or higher on the Vocabulary and Matrix Reasoning subtests of the Escala de Inteligencia Wechsler Para Adultos- Third Edition (Pons, Matías-Carrelo, et al., 2008).

Infants were between the ages of 12 and 15 months, with an average age of 13.52 months (*SD* = 1.31) at the baseline assessment. Most of the infants were male (55%). Based on mother report, most infants were of Hispanic ethnicity (94.8%) and White race (82.8%). Mothers were on average 29.9-years-old (*SD* = 5.3) and most reported they were of Hispanic ethnicity (90%) and White race (80%). The mean *T*-scores (across Vocabulary and Matrix Reasoning subtests) for mothers was 46.35 (*SD* = 12.55), and the majority of mothers (60%) reported attending some college. Most mothers reported income below the poverty line (60%) and Spanish as their primary language (57%). Using independent samples *t*-tests, IBP and standard care groups did not differ on any demographic characteristics. Demographic characteristics of intervention and standard care groups are listed in Table 1.

Procedure

Families that met study criteria at the time of the screening were scheduled for a baseline assessment. The baseline assessment included administration of parent-rating forms and videotaped behavioral observations of mother-infant interactions. At the completion of the baseline assessment, families were randomized using a computer-generated random numbers list to receive the intervention or standard care. In the standard care group, infants received their usual care at the pediatric primary care clinic

but did not receive the IBP. A second assessment was conducted approximately two months following the baseline assessment and represented the post assessment. The 3-month follow-up assessment was conducted approximately 3 months after the post-intervention assessment. Assessments took place in the families' homes, and families were compensated $50 for completion of each assessment. The behavioral observations conducted at each assessment consisted of 10 minutes of infant-led play, in which the mother was instructed to let their child lead the play with three standardized sets of creative, constructive toys (e.g., blocks, farm house), and was used to code mother-infant interactions.

Sixty mother-infant dyads consented to participate and were randomly assigned to the intervention or standard care group. However, two families did not complete the baseline assessment (including the behavioral observation) and therefore data for the current study included the 58 families that completed the baseline assessment. Of the 58 families that completed the baseline assessment, 48 families (83%) completed the post-intervention assessment, and 46 families (79%) completed the 3-month follow-up assessment. Of the 28 families that completed the baseline assessment and were randomized to receive IBP (and had started the intervention), 20 (71%) families completed the intervention.

Intervention. The IBP is a home-based adaptation of the Child-Directed Interaction (CDI) phase of PCIT for infants with behavior problems and their families (Bagner, Rodríguez, Blake, & Rosa-Olivares, 2013). Parents who participated in the intervention were taught to follow their infant's lead in play by increasing their use of behaviorally-based parenting do skills and decreasing their use of behaviorally-based

parenting don't skills. The acronym PRIDE is used to facilitate learning of the do skills, (i.e., *P*raising the infant, *R*eflecting the infant's speech, *I*mitating the infant's play, *D*escribing the infant's behavior, and expressing *E*njoyment in the play). Therapists taught and coached parents to avoid the don't skills (i.e., questions, commands, and negative talk). Parents were also taught to ignore disruptive behaviors, such as temper tantrums and whining, and direct the PRIDE skills toward positive infant behaviors. Parent emotion socialization skills, including parent emotion-related talk, were not taught or targeted in the intervention. Consistent with standard PCIT, the first session of the intervention is a teach session during which parents learn the do and don't skills and role-play the skills with the therapist. The following sessions consist of live coaching focused on positive attention.

The intervention consisted of weekly 60- to 90-minute sessions in the parents' home. In between sessions, parents were instructed to practice skills they learned with their infant for 5 minutes each day and document practice using weekly homework logs. Families were offered a maximum of seven sessions, including the teach session. Families completed the intervention in an average of 6.1 sessions, with a range of 5 to 7 sessions. In accordance with PCIT international guidelines, advanced doctoral students were trained in PCIT by a licensed clinical psychologist and PCIT Master Trainer (second author). The advanced doctoral students participated in weekly group supervision to discuss each case. In addition, there were several practical and ethical considerations to implementing the intervention in the home that were carefully addressed for these families (e.g., therapists traveled to families' homes in pairs). All sessions were videotaped, and 37% of sessions were randomly selected and coded for integrity by an

undergraduate research assistant. Integrity, defined as the percent with which the therapist adhered to key elements of each session detailed in the IBP manual, was 97%.

Measures

Screening measures. The *Brief Infant-Toddler Social Emotion Assessment* (BITSEA; Briggs-Gowan et al., 2004) is a 42-item parent-rating scale designed to assess behavior problems and competencies in 12- to 36-month-olds. The problem scale is comprised of 31 items and has excellent test-retest reliability (r =.91 to .92; Briggs-Gowan & Carter, 2007) and support for discriminative validity yielding excellent sensitivity and good specificity for those scoring above the clinical cutoff of the 75th percentile (Karabekiroglu et al., 2010). Items are rated on a scale of 0 (not true/rarely), 1 (somewhat true/sometimes), or 2 (very true/often), and examples of items on the problem scales include "restless and can't sit still," is "destructive," and "hits, bites, or kicks." Cronbach's alpha for the problem scale in the current sample was .77. The BITSEA was administered at the screening, and infants scoring above the 75th percentile on the BITSEA problem scales based on their age and sex were included in the study.

The *Wechsler Abbreviated Scale of Intelligence* (*WASI*; Wechsler, 1999) and the *Escala de Intelligencia Wechsler Para Adultos –Third Edition* (*EIWA-III*; (Pons, Matías-Carrelo, et al., 2008) are reliable English and Spanish measures of intelligence, designed for use with individuals aged 6 to 89 years. The WASI two-subtest form consists of the Vocabulary and Matrix Reasoning subtests and yields a Full-Scale Intelligence Quotient (FSIQ-2), which has a mean score of 100 with a standard deviation of 15. An FSIQ-2 score ≥ 70 was used as a cutoff for the current study. The WASI FSIQ-2 correlated .87 with the FSIQ of the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III;

Wechsler, 1999) and had high test-retest reliability, ranging from .83 to .90 (Wechsler, 1999). The WASI also had high test-retest reliability and good concurrent validity (Wechsler, 1999). The EIWA-III is the Spanish version of the WAIS and was used as a cognitive screening measure for Spanish-speaking caregivers. The same EIWA subtests as in the WASI (Vocabulary and Matrix Reasoning) were administered, and an average scaled score ≥ 4 (i.e., two standard deviations below the mean) was used as a cutoff for the current study. Reliability coefficients ranged from .65 to .96 for subtest scores and from .95 to .97 for performance and verbal scores. The reliability coefficient associated with the full-scale score was .98 (Pons, Flores-Pabón, et al., 2008; Pons, Matías-Carrelo, et al., 2008).

Parenting Skill Measures. Observations of parent-infant interactions at each assessment were coded using the *Dyadic Parent-Child Interaction Coding System, Third Edition* (*DPICS-III*; Eyberg, Nelson, Bhuiyan, & Boggs, 2013) to evaluate parenting practices. The DPICS is a behavioral coding system that measures the quality of parent-child interactions. To examine changes in positive behaviorally-based parenting skills, we created a composite category of do skills (behavior descriptions, reflections, and praises) reflecting behaviors parents are taught to use during play. Consistent with previous work examining the IBP, we examined total frequency of do skills as positive behaviorally-based parenting skills (Blizzard et al., 2017). Advanced graduate students were trained to 80% agreement with a criterion tape and were masked to group assignment. For purposes of reliability coding, 20% of the baseline observations were coded a second time by a graduate student and yielded an excellent average kappa of .89 across all codes.

Emotion Talk Coding System (Drummond et al., 2014). Parent emotion-related talk was coded as parent verbalizations of emotions (e.g., happy, sad, angry) and desires (e.g., wants, needs) during the observations of parent-infant interactions at each assessment. Parent emotion-related talk was coded for utterances of simple affect, desires, elaboration/explanation/inferences, empathy, and mental state talk (i.e., mental state utterances and internal state utterances). Simple affect, desires, and elaboration/explanation/inferences are comprised of production and elicitation of emotion. Production of emotion is a statement that does not require a response (e.g., you look happy), while elicitation of emotion requires the child to respond to the parents' inquiry surrounding the emotion (e.g., why are you sad?). Table 2 includes Parent Emotion-Related Talk codes, definitions, and examples. Total frequency of parent emotion-related talk was calculated by summing all individual codes. This coding scheme has been used in studies with infants to examine parent emotion-related talk and has demonstrated good reliability and validity (Brownell et al., 2013; Drummond et al., 2014). An advanced graduate student (first author) and undergraduate research assistants were trained to 80% agreement with a criterion tape. For purposes of reliability coding, 20% of the baseline observations were coded a second time by an undergraduate research assistant, and inter-rater reliability was adequate and yielded an excellent average kappa of .84 across all codes.

Parental Depressive Symptoms. The *Center for Epidemiological Studies-Depression* (CES-D; Radloff, 1977) is a 20-item self-report measure to assess depressive symptoms, such as poor appetite, feeling lonely, and lack of sleep. Items are rated on a scale of 0 (Rarely or none of the time), 1 (Some or little of the time), 2 (Moderately or

much of the time), or 3 (Most or almost all of the time), with higher scores signifying higher levels of depressive symptoms and scores ranging from 0 to 60. The CES-D has also been used to identify individuals at risk for clinical depression using a cutoff score of 16 or above. The CES-D has demonstrated good sensitivity, specificity, and internal consistency (Lewinsohn, Seeley, Roberts, & Allen, 1997) and has been used with caregivers from diverse racial and ethnic groups (Thomas, Jones, Scarinci, Mehan, & Brantley, 2001). Internal consistency for the CES-D total score with the current sample was good ($\alpha = .90$). The CES-D total scores as well as the CES-D clinical cutoff at baseline were examined as a moderator of intervention effects on parent emotion-related talk.

Data Analyses

Analyses were conducted using SPSS 21. In order to examine the effect of the IBP on parent emotion-related talk, analyses of covariance (ANCOVA) was used to examine the effect of the intervention on parent emotion-related talk at post-intervention and 3-month follow up. Specifically, intervention group (0 = standard care group and 1 = IBP group) was used as the independent variable with total frequency of parent emotion-related talk at baseline as a covariate, and total frequency of parent emotion-related talk at post-intervention and follow-up as the outcomes.

Indirect effects were examined using Process 3 with intervention group predicting total frequency of behaviorally-based parenting do skills at post-intervention, and total frequency of behaviorally-based parenting do skills predicting total frequency of parent emotion-related talk at post-intervention and 3-month follow-up. Indirect effect was conducted by examining the change in the mediator (i.e., behaviorally-based parenting do

skills) from baseline to post-intervention on the change in total frequency of parent emotion-related at post-intervention and 3-month follow-up, controlling for total frequency of behaviorally-based parenting do skills and parent emotion-related talk at baseline.

Given the findings in previous work on maternal depressive symptoms and affect, we examined the moderating effect of maternal depressive symptoms on the relation between group and parent emotion-related talk at post-intervention and 3-month follow up. The moderating effect of maternal depressive symptoms at baseline on the effect of the intervention on parent emotion-related talk was examined using multiple regression analysis with product terms. The independent variable was intervention group. The dependent variable was total frequency of parent emotion-related talk at post-intervention and 3-month follow-up, and the moderator variable was maternal depressive symptoms (i.e., CES-D total score) at baseline. All predictor variables were mean centered prior to the analyses. Total frequency of parent emotion-related talk at baseline was entered as a covariate in the regression equation, so the analyses reflected the effect of the intervention on changes in parent emotion-related talk as moderated by maternal depressive symptoms. The moderating effect of maternal depressive symptoms was represented with a product term between the dummy variable for intervention group and maternal depressive symptoms. The analyses examined whether intervention effects on total frequency of parent emotion-related talk at post intervention and follow-up differed depending on the level of maternal depressive symptoms at baseline.

Prior to analysis, the data for the continuous variables were evaluated for multivariate outliers by examining leverage indices for each individual and defining an

outlier as a leverage score four times greater than the mean leverage. No outliers were identified with this procedure. The data were also examined for normality using univariate indices of skewness and kurtosis. Examination of univariate indices revealed all assumptions for normality were met.

Results

Descriptive Analyses

Table 3 presents means and standard deviations of the frequency of the individual parent emotion-related talk codes and of the total frequency of parent emotion-related talk among the intervention and standard care groups. To ensure that results were not a result of overall increases in speech, we conducted all analyses using the total frequency of all parent emotion-related talk codes and included the total frequency of parent words at each time point as a covariate. At baseline, 11 (39.3%) of mothers in the standard care group and 11 (36.7%) of mothers in the intervention group were above the clinical cutoff (i.e., raw score > 16) on the CES-D. Independent samples *t*-tests showed no significant differences between the IBP and standard care groups on the total frequency of parent emotion-related talk or CES-D scores at baseline. CES-D scores and total parent emotion-related talk were not significantly correlated at baseline ($p = .219$). Groups also did not differ on any demographic characteristics. Any demographic variable in Table 1 that significantly correlated with parent emotion-related talk or behaviorally-based parenting skills at baseline were included in analyses as a covariate. The total frequency of parent emotion-related talk was significantly correlated with child ethnicity at baseline ($r = -.44$, $p = .001$) and therefore was included as a covariate in all analyses.

Additionally, given the association between maternal education and overall speech (Henning, Striano, & Lieven, 2005), we included maternal education as a covariate in all analyses.

Effect of IBP on Parent Emotion-Related Talk

There was a significant difference in the total frequency of parent emotion-related talk at the post-intervention assessment between the IBP and standard care groups, $F(1, 39) = 5.32$, $p = .02$. Specifically, mothers in the IBP group demonstrated a higher total frequency of parent emotion-related talk at post intervention ($M = 4.35$, $SD = 4.64$) than mothers in the standard care group ($M = 1.32$, $SD = 2.03$), controlling for baseline levels of the total frequency of parent emotion-related talk. The effect size of .85 suggests a large effect size between groups. However, group did not predict the total frequency of parent emotion-related talk at the 3-month follow-up, $F(1, 33) = .31$, $p = .58$. The differences in the total frequency of parent emotion-related talk at each assessment between the intervention and standard care group are illustrated in Figure 1.

There was also a significant group difference in the total frequency of individual parent emotion-related talk codes at post-intervention. Specifically, there was a significant difference in Simple Affect Production (SAP) at the post-intervention assessment, $F(1, 39) = 9.76$, $p = .003$, between the IBP and standard care groups. Mothers in the IBP group demonstrated a higher total frequency of SAP at post intervention ($M = 1.75$, $SD = 2.94$) than mothers in the standard care group ($M = .07$, $SD = .38$). There was also a significant group difference in Elaboration/ Explanation/ Inferences Production (EP) at the post-intervention assessment, $F(1, 40) = 4.08$, $p = .05$, between the IBP and standard care group. Mothers in the IBP group demonstrated a

higher total frequency of EP at post intervention (*M* =1.05, *SD* =1.99), than mothers in the standard care group (*M* =.04, *SD* =.19). However, there were no significant between-group differences in SAP, EP, or any other individual parent emotion-related talk codes at the 3-month follow-up.

Indirect Effect of Behaviorally-Based Parenting Skills

We examined the indirect effect of behaviorally-based parenting do skills at post-intervention on the total frequency of parent emotion-related talk at post-intervention and 3-month follow-up. At post-intervention, there was a direct effect of the intervention group on behaviorally-based parenting do skills (p = < .001) and total frequency of parent emotion-related talk (p < .001). However, there was not an indirect effect of behaviorally-based parenting do skills on the total frequency of parent emotion-related talk at post-intervention, 95% CI [- .91, 5.74]. The 3-month follow-up results were similar. There was a direct effect of intervention group on the total frequency of behaviorally-based parenting do skills (p < .001) at post-intervention. The path from the total frequency of behaviorally-based parenting do skills to the total frequency of parent emotion-related talk at 3-month follow-up was also significant (p = .015) However, there was not an indirect effect of behaviorally-based parenting do skills on the total frequency of parent emotion-related talk at 3-month follow-up, 95% CI [- .45, 7.65]. Therefore, indirect effects of behaviorally-based parenting do skills were not supported.

Moderating Effect of Depressive Symptoms

Baseline maternal depressive symptoms only significantly predicted total frequency of parent emotion-related talk at post-intervention, even controlling for treatment, $F(1,47) = 2.22$, p = .046. Given significant direct effects on total frequency of

parent emotion-related talk we proceeded with examining the moderation effect. Maternal depressive symptoms at baseline significantly moderated the relation between group and total frequency of parent emotion-related talk at post-intervention, $B = .33$, $t(8, 37) = 4.68$, $p <. 001$. The unstandardized regression coefficient for the intervention variable reflects a simple main effect for intervention. This coefficient was also statistically significant ($p = .006$), indicating the mothers in the intervention group had significantly higher post-intervention parent emotion-related talk than mothers in the standard care group, holding all other variables (including CES-D) constant at their mean value. The coefficient value of 2.87 suggests that when CESD is at its mean value, the mothers in the intervention group were predicted to have post-intervention total frequency of parent emotion-related talk, on average, 2.87 points higher than mothers in the standard care group. This difference between the intervention and standard care groups is predicted to increase by .33 units with every 1 unit increase in baseline CES-D (e.g., for mothers with a CES-D score 1 unit higher than the mean, the intervention group is predicted to have post-intervention total frequency of parent emotion-related talk 3.2 units higher than the standard care group). Probing revealed a significant slope for high CES-D scores ($p = .017$) and a non-significant slope for low CES-D scores ($p = .603$). Additionally, the interaction term yielded a large effect size, $\Delta R^2 = .22$, $F(1, 37) = 21.95$, $p < .001$, after controlling for all other variables.

Similarly, at the 3-month follow-up, maternal depressive symptoms at baseline significantly moderated the relation between group and total frequency of parent emotion-related talk, $B = .21$, $t(8, 31) = 2.83$, $p =. 01$. The unstandardized regression coefficient for the intervention variable reflects a simple main effect for intervention,

indicating the mothers in the intervention group had significantly higher follow-up parent emotion-related talk than mothers in the standard care group, holding all other variables constant at their mean value. The coefficient value of 1.43 suggests that when CESD is at its mean value, the mothers in the intervention group were predicted to have post-intervention total frequency of parent emotion-related talk, on average, 1.43 points higher than mothers in the standard care group. Additionally, the interaction term yielded a medium effect size, $\Delta R^2 = .08$, $F\ (1, 31) = 8.01$, $p = .001$, after controlling for all other variables. Probing revealed a significant slope for high CES-D scores ($p < .001$) and a non-significant slope for low CES-D scores ($p = .118$). Therefore, higher levels of maternal depressive symptoms at baseline predicted a larger effect of the IBP on total frequency of parent emotion-related talk at post-intervention and follow-up. Figure 2 illustrates the moderating effect of maternal depressive symptoms on the relation between group and parent emotion-related talk at post-intervention and 3- month follow-up.

Discussion

The current study examined the effect of a randomized controlled trial of the IBP, a BPT intervention for infants, on parent emotion-related talk. Despite the influence of parenting behavior on early emotion development (Denham et al., 2000; Morris et al., 2007), empirical work has not examined the effect of BPT interventions on parent emotion socialization. Findings from the current study demonstrate that the IBP significantly predicted higher levels of parent emotion-related talk at the post-intervention assessment. These findings suggest that components of traditional BPT interventions may lead to broader effects on parent emotion-related talk, which is not directly targeted by the IBP. Our study is the first to examine the effect of a BPT

intervention on parent emotion-related talk in infancy, and it is particularly noteworthy to observe these effects during a critical time point (i.e., transition from infancy to toddlerhood) for emotion development (Belacchi & Farina, 2012).

However, the effect of the IBP on parent emotion-related talk was not maintained at the 3-month follow-up. Therefore, the intervention led to more immediate changes in parent emotion-related talk, but the frequency of parent emotion-related talk returned to baseline levels three months after the intervention ended. The findings at follow-up may suggest the need to target parent emotion-related talk as a supplement to BPT to maintain its effect on parent emotion-related talk. However, it is difficult to understand the lack of significant effects at follow-up without understanding the mechanism by which the intervention led to changes in parent emotion-related talk.

Given the direct effect of the IBP on parent emotion-related talk at post-intervention, as well as the goal of improving parent-infant interactions via parenting skills, we tested the indirect effect of positive behaviorally-based parenting skills on the relation between the IBP and parent emotion-related talk. The current findings did not support our hypothesis that levels of behaviorally-based parenting do skills at post-intervention would have an indirect effect on the relation between the IBP and parent emotion-related talk at the post-intervention or 3-month follow-up. Therefore, although the IBP had a direct effect on parent emotion-related talk at post-intervention, behaviorally-based parenting skills was not a mechanism by which the IBP led to changes in parent emotion-related talk. Instead of specific behaviorally-based parenting skills as the mechanism of change, it may be that the overall time spent with their infant in play led to increases in emotion talk. However, it is important to note the non-

significant findings at the 3-month follow-up reduced the likelihood for behaviorally-based parenting skills to be a mechanism by which the IBP led to parent emotion-related talk. Moreover, future studies should examine other possible mechanisms by which BPT may influence parent emotion-related talk, as well as replicate the current study with a larger sample and multiple follow-up time points.

In addition to indirect effects, we examined the moderating effect of maternal depressive symptoms on the relation between the IBP and parent emotion-related talk. Maternal depressive symptoms moderated the relation between the intervention and parent emotion-related talk at post intervention and at the 3-month follow-up. Additionally, mothers who scored above the clinical cutoff on the CES-D at baseline (37%) who received IBP, demonstrated higher levels of parent emotion-related talk than mothers below the clinical cutoff on the CES-D (63%) who received the IBP, as well as all mothers in the standard care group regardless of CES-D score. It is possible that the intervention, although targeting infant behavior, may have provided an outlet for emotional expression for mothers experiencing higher rates of depressive symptoms. As such, the moderation findings examining maternal depressive symptoms have significant implications for therapists aiming to increase emotion expression of mothers with their infants. Specifically, mothers who experience higher levels of depressive symptoms and mothers who meet criteria for being at risk for clinical depression may benefit from a brief BPT such as the IBP to improve emotion socialization. Future work would benefit from examining a large-scale study including mothers at varying levels of depressive symptoms to determine the impact of BPT on maternal depressive symptoms and the interplay of parent emotion-related talk.

While the current study is the first to our knowledge to examine the effect of a BPT for infants on parent emotion-related talk, there were some limitations that should be noted. First, the sample for the current study was largely homogeneous in terms of ethnicity and race. Our findings expand knowledge of the impact of a BPT program on parent emotion-related talk in a sample of infants from mostly underrepresented ethnic and racial minority backgrounds (94.8% minority status), but results may differ in a more ethnically and racially diverse sample. While our sample had limited variability in ethnicity, we did find significant correlations between ethnicity and total frequency of parent emotion-related talk. Given the scope of our study we did not further examine this relation but plan to continue examining this relation in future studies and encourage future researchers to pursue this avenue. Second, while all caregivers were invited to participate in the intervention, only mothers enrolled in the study as primary caregivers. Given the role that other caregivers, such as fathers, have been shown to have on infant emotion development (Cabrera, Shannon, & Tamis-LeMonda, 2007), future studies should examine the impact of BPT on other caregivers' parent emotion-related talk.

Third, while we measured one type of emotion socialization, we did not measure other components of parent emotion-related talk, such as teaching and reacting to an infant's emotions. These components of emotion socialization, such as emotion reaction, may differentially impact infant emotion development (Ramsden & Hubbard, 2002). Although we did not use the measures or tasks necessary to examine each component of emotion socialization in the current study, future research should examine how BPT interventions impact other components of emotion socialization. Furthermore, the parent-infant play task used was not intended to elicit parent emotion-related talk and therefore

may not have fully captured the extent to which parents may have used emotion-related talk with their infant throughout other interactions. Future studies should examine the effect of BPT on parent emotion-related talk across other interactions previously examined in emotion-related talk research, such as book reading (Drummond et al., 2014). Additionally, we utilized observational coding systems to measure behaviorally-based parenting skills and parent emotion-related talk. While observational coding systems can provide an objective assessment of parenting behavior, multi-method assessments including behavioral and self-report measures (e.g., Self Expressiveness in Family Questionnaire) provide a more comprehensive evaluation of parenting behaviors (De Los Reyes et al., 2016).

It is also important to note that the sample size in the current study was relatively small and may have reduced the power to detect effects, such as at follow-up and with the indirect effect findings. On a similar note, the IBP intervention includes only one component of PCIT and was intended to be brief. As a result, mothers received a limited number of sessions, which may have impacted their opportunity to acquire skills compared to the full-length PCIT and other BPT interventions. Therefore, future studies should examine the impact of PCIT and other BPT interventions on parent emotion-related talk. Lastly, given the non-significant findings at the follow-up assessment, future research should examine the extent to which other factors (e.g., other treatments, amount of time spent with the infant) may have impacted findings at follow-up.

Despite these limitations, the current study demonstrated an effect of a brief, home-based BPT program with infants on parent emotion socialization. It is particularly noteworthy that a brief BPT program that did not target parent emotion-socialization

skills had a significant effect on parent emotion-related talk. Overall, these preliminary findings suggest promise at improving components of parent emotion socialization during infancy. Replicating and expanding these findings could lead to targeting other parenting behaviors, including parent emotion-related talk, in future BPT interventions throughout infancy, especially for mothers experiencing depressive symptoms.

Table 1. Demographic and Baseline Characteristics

Characteristics	Full Sample (n = 58)	Standard Care Group (n = 28)	Intervention Group (n = 30)	p-value
	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	
Child Age (months)	14.45 (1.42)	14.18 (1.30)	14.71 (1.50)	.07
Child Sex (male)	31 (53.4)	14 (50)	17 (56.7)	.62
Child Ethnicity (Hispanic)	55 (94.8%)	28 (100%)	27 (90%)	.24
Mother Age	29.88 (5.28)	29.11 (5.72)	30.60 (4.80)	.50
Mother English Speaking (vs. Spanish)	24 (41.4%)	8 (28.6%)	16 (53.3%)	.06
High School graduate or less	23 (39.7%)	12 (42.9%)	11 (36.7%)	.34
CES-D Total Scores	14.41 (11.95)	15.75 (13.95)	13.17 (9.81)	.42
CES-D Clinical (16 or above)	22 (37.9%)	11 (39.3)	11 (36.7)	.84

Note. CES-D = Center for Epidemiological Studies-Depression

Table 2. Parent Emotion-Related Talk Coding System

Category	Criteria	Examples
Simple Affect • Production (SAP) • Elicitation (SAE)	Nouns, verbs, adjectives, or adverbs naming emotional feelings or behaviors, or states of preference, desire, or intention without expansion or emotion imitation	"The boy is happy" "He loves his ice cream" "Boo hoo", "grr", "hahaha" "Is he happy now?" "Is he happy or sad?" "How is he feeling?"
Desires • Production (DP) • Elicitation (DE)	References to wanting, needing something concrete	"He wants his ice cream back" "What does he want now?"
Elaboration/Explanation/ Inferences • Production (EP) • Elicitation (EE)	Phrases or statements that explain or clarify the reason or possible cause or reason for a particular emotion, or that provide background or context for the emotion to help the child understand it, or that elaborate or explain how one infers or knows that a given emotion is being experienced	"The boy is sad because he dropped his ice cream" "The girl is scared because it is dark" "Why is he sad?" "How do you know the girl is angry?"
Empathy Statements/Sounds (EMP)	Statements or emotion-related sounds that promote empathy with a character's emotion	"Poor little boy" "Awwww" "Uh oh"
Other mental state utterances (OMS)	References to the past, or to thinking, knowing, wondering	"Remember when he dropped his ice cream" "I think she is being silly" "He knows he's gonna get some"
Other internal state utterances (OIS)	References to other internal states that are not affect- or mental state-related (e.g., physiological states)	"He is hungry" "The little girl is tired"

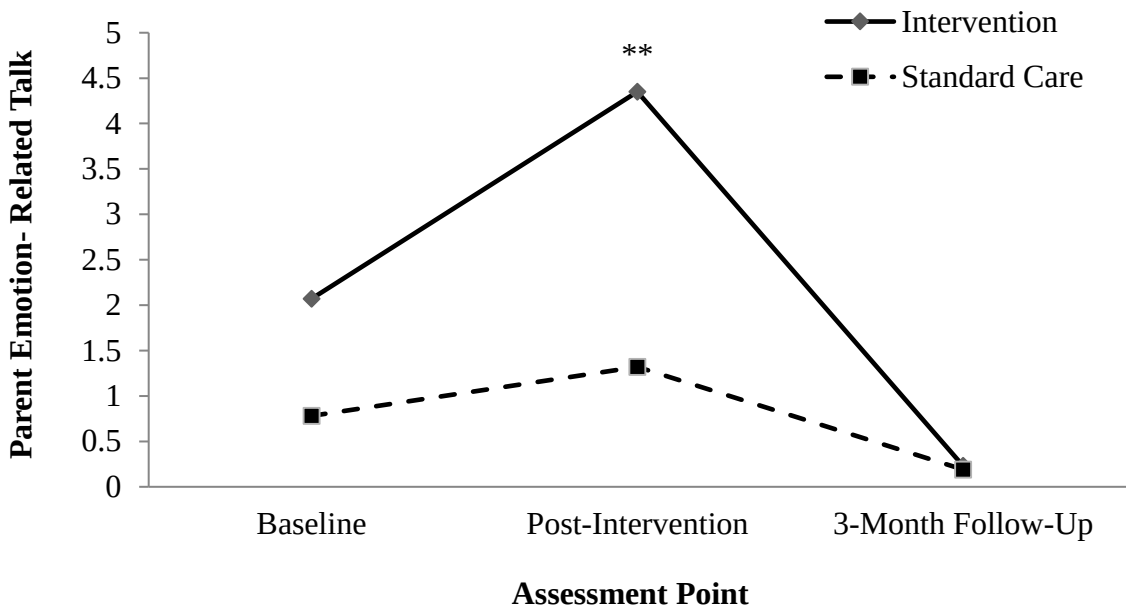
Note. Coding system developed by Drummond and Brownell (see Drummond et al., 2014)

Table 3. Means of parent emotion-related talk among intervention and standard care groups

	Baseline			Post-Intervention			3- Month Follow-Up		
	Standard Care	Intervention	*p*	Standard Care	Intervention	*p*	Standard Care	Intervention	*p*
SAP	.15 (.46)	.14 (.44)	.932	.07 (.38)	1.75 (2.94)	.004	.13 (.46)	.89 (1.45)	.021
SAE	.04 (.19)	.10 (.31)	.344	.36 (.73)	.20 (.52)	.415	.61 (1.64)	.11 (.32)	.197
DP	.07 (.36)	.31 (.66)	.111	.11 (.42)	.15 (.37)	.714	.13 (.34)	.37 (.83)	.218
DE	.44 (1.09)	1.52 (2.29)	.031	.25 (.65)	.55 (1.15)	.254	.65 (1.07)	.42 (.77)	.436
EP	0	0	--	.04 (.19)	1.05 (1.99)	.01	.09 (.42)	.89 (1.99)	.065
EE	0	.03 (.19)	.339	00	0	--	00	0	--
EMP	.04 (.19)	.21 (.77)	.272	.07 (.26)	.05 (.22)	.768	.22 (.85)	.26 (.65)	.849
OMS	00	00	--	.04 (.19)	.10 (.45)	.498	.17 (.65)	.37 (1.07)	.455
OIS	.04 (.19)	00	.304	.39 (1.23)	.55 (1.19)	.660	.13 (.34)	.42 (1.07)	.226
Total	.78 (1.55)	2.07 (2.99)	.05	1.32 (2.04)	4.35 (4.64)	.004	.23 (2.13)	.19 (3.74)	.175

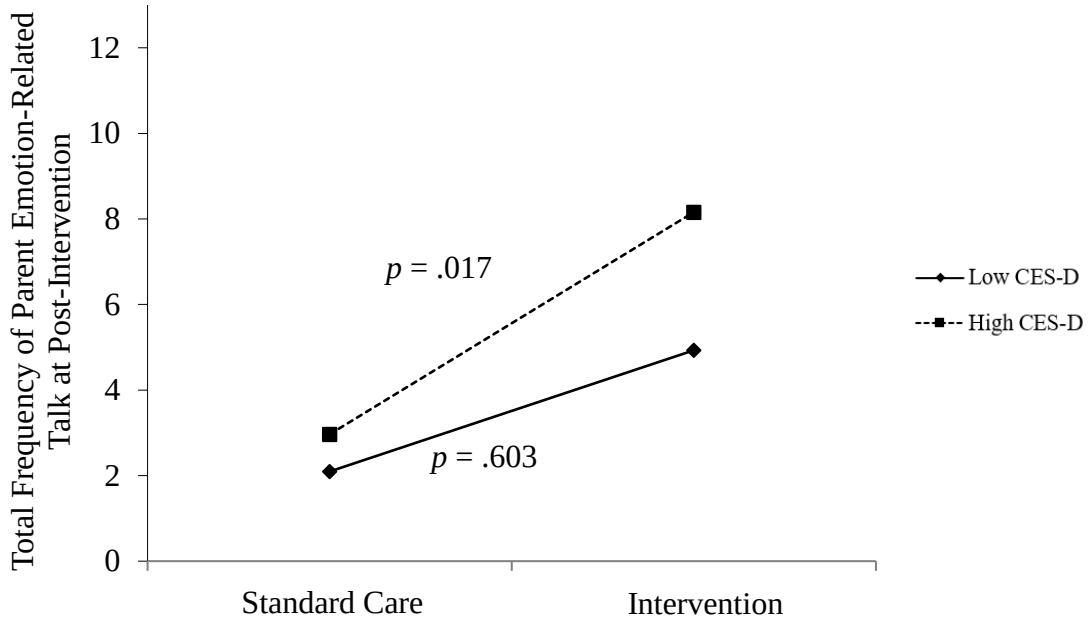
Note. SAP = Simple Affect Production; SAE = Simple Affect Elicitation; DP = Desires Production; DE = Desires Elicitation; EP = Elaboration/Explanation/Inferences Production; EE = Elaboration/Explanation/Inferences Elicitation; EMP = Empathy; OMS = Other Mental State; OIS = Other Internal State.

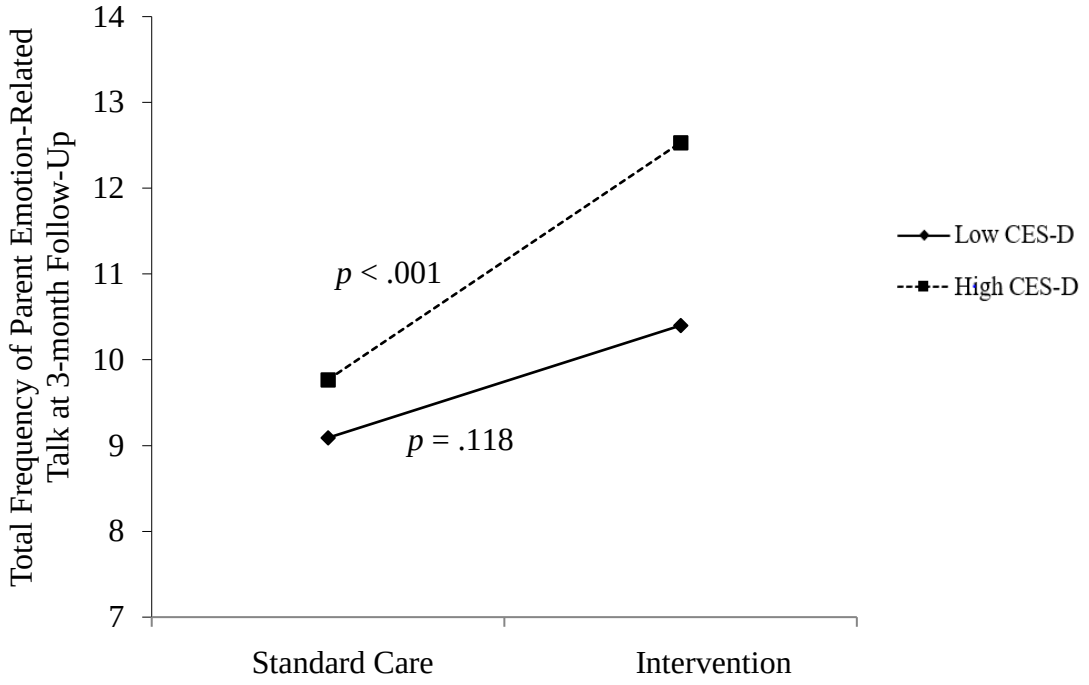
Figure 1. Differences in parent emotion-related talk between intervention and standard care groups.



Note. ** $p < .05$

Figure 2. Moderating effect of maternal depressive symptoms on the relation between group and parent emotion-related talk





Note. CES-D Total Scores at Baseline

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Appendices

Infant Behavior & Development 39 (2015) 159–165

Contents lists available at ScienceDirect

Infant Behavior and Development

The effect of preterm birth on infant negative affect and maternal postpartum depressive symptoms: A preliminary examination in an underrepresented minority sample

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article info

Article history:
Received 15 September 2014
Received in revised form 29 January 2015
Accepted 10 February 2015

Keywords:
Preterm birth
Infant negative affect
Postpartum depression
Minority

abstract

Objective: To examine the effect of preterm birth on maternal postpartum depressive symptoms and infant negative affect in an underrepresented minority sample.
Method: Participants were 102 mothers and their 3- to 10-month-old infants. Mothers completed the Edinburgh Postnatal Depression Scale and the Infant Behavior Questionnaire-Revised.
Results: Relative to normative samples, the current underrepresented minority sample of mostly Hispanics and Blacks displayed high rates of preterm birth (30%) and maternal postpartum depressive symptoms (17%). Preterm birth had a significant direct effect on postpartum depressive symptoms and infant negative affect. Additionally, there was an indirect effect of postpartum depressive symptoms on the relation between preterm birth and infant negative affect. Specifically, lower birth weight and gestational age predicted higher levels of depressive symptoms in the mother, and higher levels of depressive symptoms in the mother, in turn, predicted higher levels of infant negative affect.
Conclusion: Findings emphasize the importance of screening for postpartum depressive symptoms and infant negative affect among mothers and their preterm infants, especially among families from underrepresented minority backgrounds.

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In the United States, rates of preterm birth (i.e., <37 weeks gestational age) range from 9 to 13% (Hamilton, Martin, Ostermna, & Curtin, 2014) and have increased about 30% in the last 20 years (Raju, Higgins, Stark, & Leveno, 2006). In addition to the negative medical and health complications in infants (Moster, Lie, & Markestad, 2008), preterm birth has been associated with negative consequences in parents, such as maternal depressive symptoms (Miles, Holditch-Davis, Schwartz, & Scher, 2007), and increased risks in the child, such as a difficult infant temperament (Case-Smith, Butcher, & Reed, 1998; Hughes, Shults, McGrath, & Medoff-Cooper, 2002), as well as cognitive deficits and increased behavioral problems (Caravale, Tozzi, Albino, & Vicari, 2005). Despite evidence that prevalence rates of preterm birth are significantly higher among families from economically disadvantaged and underrepresented minority backgrounds (Smith, Draper, Manktelow, Dorling, & Field, 2007) ranging from 10% in Hispanics to 17% in Blacks (Hamilton et al., 2014), research on the relation between preterm birth and negative parent and child outcomes has largely relied on predominately white, middle class samples (McGrath, Records, & Rice, 2008). Therefore, a primary goal of this study was to explore the relation between preterm birth, postpartum depressive symptoms, and difficult infant temperament in families from underrepresented minority backgrounds.

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http://dx.doi.org/10.1016/j.infbeh.2015.02.011 0163-6383/PublishedbyElsevier Inc.

Research has demonstrated significantly higher levels of maternal depressive symptoms within the first year after childbirth among mothers of children born preterm compared to mothers of children born full-term (Voegtline & Stifter, 2010). Previous research has demonstrated higher rates of postpartum depressive symptoms among underrepresented minority mothers, ranging from 11 to 12% in Hispanics and Blacks compared to 7% in Whites (Liu & Tronick, 2013). Considering the elevated rates of postpartum depressive symptoms among mothers from underrepresented minority ethnic and racial backgrounds, research is needed to examine the relation between preterm birth and postpartum depression beyond the predominately white, middle class samples. However, in a recent review examining the association between preterm birth and maternal depressive symptoms, only one of 26 studies included an ethnically and racially diverse sample (Vigod, Villegas, Dennis, & Ross, 2010). Acknowledging the limited research examining the relation between preterm birth and postpartum depressive symptoms in mothers from underrepresented minority backgrounds, and the considerably higher rates in this population (Howell, Mora, Horowitz, & Leventhal, 2005), it is important to examine the relation between these variables among families from underrepresented minority backgrounds.

In exploring predictors of postpartum depressive symptoms among mothers with premature infants, most research has focused on other maternal variables. For example, high levels of stressful life events, as well as low levels of social support and maternal education, have been found to be associated with postpartum depressive symptoms in mothers with preterm infants (Poehlmann & Fiese, 2001). These studies, however, did not take into account child variables that are also related to levels of postpartum depressive symptoms. For example, poor infant engagement and orientation has been shown to negatively affect the way in which a mother feels about her infant (Beebe et al., 2012), and therefore may be an important variable to consider. Infants born premature are more likely than full-term infants to have a difficult temperament, including higher levels of negative arousal (Klein, Gaspardo, Martinez, Grunau, & Linhares, 2009) and negative affect (Hughes et al., 2002), and display less adaptability and more distractibility (Hughes et al., 2002). Research has largely relied on maternal report of infant temperament, and has found that in comparison to mothers of full-term infants, mothers of preterm infants reported their infant to have a more difficult temperament (Denis, Ponsin, & Callahan, 2012). However, similar to the literature on the relation between preterm birth and postpartum depressive symptoms, most studies examining the relation between preterm birth and infant negative affect (e.g., infant temperament) have been limited to predominately white, middle class samples.

In addition to the relation between preterm birth and negative affect, numerous studies have demonstrated an association between infant negative affect and maternal depressive symptoms. For example, maternal-reported and observed difficult infant temperament predicted maternal postpartum depressive symptoms (Britton, 2011). Additionally, mothers who reported a difficult temperament, specifically fussiness and irritability, in their infant were more likely to report higher levels of depressive symptoms within the first year after birth (McGrath et al., 2008). Given the significant impact of depression during the postpartum year on later child outcomes (Bagner, Pettit, Lewinsohn, & Seeley, 2010), research is needed to explore potential mechanisms by which preterm birth is associated with postpartum depressive symptoms and infant negative affect, especially with high-risk samples.

To our knowledge, only one study examined a model including premature birth, postpartum depressive symptoms, and infant negative affect. Specifically, Voegtline and Stifter (2010) found preterm birth predicted higher levels of maternal depressive and anxiety symptoms, which in turn predicted higher levels of infant negative affect. However, similar to the other studies on the relation between preterm birth and maternal depressive symptoms and difficult infant temperament, Voegtline and Stifter (2010) included a predominantly white sample. Therefore, it is important to understand whether or not these variables relate to one another in the same way among families from underrepresented minority backgrounds.

Given the reliance on predominantly white, middle class samples, the first goal of the present study was to examine the association between preterm birth and postpartum depressive symptoms and infant negative affect in an underrepresented minority and economically disadvantaged sample. Based on the previous literature, we hypothesized that preterm birth would be associated with higher levels of maternal depressive symptoms and infant negative affect. The second goal of the study was to replicate findings of the indirect effect of maternal depressive symptoms on the relation between preterm birth and infant negative affect (Voegtline & Stifter, 2010) in an underrepresented minority sample. We expected preterm birth to be associated with higher levels of maternal depressive symptoms, which in turn would predict higher levels of infant negative affect.

1. Methods

1.1. Participants and procedures

The current study is a secondary data analysis of a larger study on postpartum depression that took place at a large hospital-based pediatric primary care clinic, from 2011 to 2013, serving mostly families without private insurance. The inclusion criteria for the larger study were the following: mothers had to be at least 18 years old, not be receiving treatment for depression at the time of the screening, and have an infant 10 months old or younger. Research assistants approached 458 mothers during their infant's well or sick visit to describe the study, and 284 mothers (62%) expressed interest and provided written consent to participate. The most common reasons that mothers declined participation were that they were not interested or did not have enough time at the pediatric visit. Only one mother reported being less than 18 years old, and no mothers reported that they were receiving treatment for depression at the time of the screening. All 284 participating

Table 1
Demographic characteristics.

Characteristic	Full sample (N = 102)			Gestational age ≤ 37 weeks (n = 31)			Birth weight ≤ 2500 g (n = 16)		
	M	SD	N(%)	M	SD	N(%)	M	SD	N(%)
Infant age (months)	6.31	2.19		6.67	2.12		6.81	2.07	
Infant gestation (weeks)	37.95	2.61		34.99	2.67		34.04	3.22	

Infant birth weight (g)	3149.07	687.93		2576.08	744.70		1996.51	497.02	
Infant gender (% male)			54 (52.9)			18 (58.1)			10 (62.5)
Mother education (% only high school)			26 (44.2)			9 (29.0)			5 (31.3)
Mother age (years)	27.60	5.81		26.00	5.54		24.56	4.27	
Edinburgh Postnatal Depression Scale	7.61	5.38		10.81	5.99		10.69	4.87	

mothers completed a demographic questionnaire, which included questions about the infant's gestational age and birth weight, as well as the mother and infant's race and ethnicity. This study was approved by the Institutional Review Boards at both the children's hospital and affiliated university of the authors.

In this secondary data analysis, we excluded 119 (42%) of the 284 participating mothers who had an infant younger than 3 months, because the Infant Behavior Questionnaire-Revised (IBQ-R) has not been validated in children younger than 3 months (Gartstein & Rothbart, 2003). Due to a change in the protocol for the larger study, the IBQ-R was initially not administered at the time of the screening and as a result we excluded an additional 62 (22%) mothers with an infant between the ages of 3 and 10 months who had not completed the IBQ-R. Furthermore, we excluded one mother because she was the only participating mother in this subgroup reporting non-minority (i.e., white) status, and we wanted to examine the aforementioned hypotheses within families from underrepresented minority backgrounds. However, all results reported below were comparable when including this mother. The final sample included in this study was 102 mothers and their infant. Mothers were on average 27.60 years (SD = 5.81 years; range = 18–42 years), and their infants (52.9% male) were on average 6.31 months (SD = 2.20; range = 3–10 months). With regard to minority status, 85.3% were Hispanic, 13.7% were black, and 1% was American Indian. Close to half of the mothers (44.2%) reported only completing high school. Of those mothers reporting income, 54% were below the poverty line based on the U.S. Department of Health and Human Services guidelines for 2014 (Services, 2014). See Table 1 for a summary of participant demographic characteristics, including characteristics by gestational age and birth weight.

1.2. Measures

1.2.1. Preterm birth

Preterm birth was assessed using parent-report of gestational age and birth weight as a latent construct. Consistent with previous research, the use of both measures in analyses is recommended to increase reliability when studying preterm birth (Slaughter, Herring, & Thorp, 2009).

1.2.2. Minority status

Minority status was assessed using parent report of race and ethnicity in accordance with the race/ethnicity categories used by the U.S. Census Bureau.

1.2.3. Postpartum depressive symptoms

The Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), a 10-item self-report questionnaire designed to assess postpartum symptoms within the past 7 days, was used to assess postpartum depressive symptoms. Each of the ten items is scored on a four-point scale (0–3), and total scores range from 0 to 30. The EPDS has been analyzed as a continuous variable to assess depressive symptoms (Ludermir, Lewis, Valongueiro, de Araújo, & Araya, 2010). Convergent validity has been established via significant associations with a diagnosis of postpartum depression and with other depressive symptom scales. Internal consistency was demonstrated to be strong in the larger predominantly minority sample (α = .83; Hartley, Barroso, Rey, Pettit, & Bagner, 2014) and in the current (α = .85) sample.

1.2.4. Infant temperament

The Infant Behavior Questionnaire-Revised (IBQ-R; Gartstein & Rothbart, 2003), a parent-report questionnaire designed to assess infant temperament, with each item scored on a seven-point scale from 1 ("never") to 7 ("always"), was used to assess infant negative affect. High estimates of internal consistency have been reported for each of the 14 subscales (Gartstein & Rothbart, 2003). We included four scales (i.e., Distress to Limitations, Fear, Sadness, and Falling Reactivity/Rate of Recovery from Distress) because they displayed the highest loadings onto a latent construct of negative affectivity (Gartstein & Rothbart, 2003), which is typically used as a measure of difficult infant temperament (Rothbart, Ahadi, & Evans, 2000) and significantly associated with maternal depressive symptoms (Huot, Brennan, Stowe, Plotsky, & Walker, 2004). Internal consistency for each subscale in the current sample was acceptable (α = .85 for falling reactivity, α = .86 for sadness, α = .68 for distress, & α = .89 for fear).

1.3. Data analysis

1.3.1. Outliers

Prior to analysis, the data were evaluated for multivariate outliers. Both model-based and non-model based outlier analyses were pursued. For the former, a leverage score was calculated for each individual, and an outlier was defined as anyone having a leverage score four times the value of the mean. Model-based outliers were examined using limited information regression analyses for each of the linear equations dictated by the path models tested. Standardized dfbeta values for each individual, predictor, and intercept were examined in order to isolate unusually influential individuals in parameter estimation. An outlier was defined as having an absolute standardized dfbeta larger than 1.0. One outlier was evident using this criterion. Analyses were conducted both with and without the outlier and yielded comparable results. Therefore, all results presented included the outlier.

1.3.2. Missing data

Missing data were minimal, occurring sporadically and never exceeding more than 3% of the cases for all variables included in the models. For the few cases where missing data occurred, values were imputed using the Expectation-Maximization method in SPSS 20.0 and findings were the same with and without the imputed scores. Results presented included the imputed scores.

1.3.3. Normality

The data were examined using univariate indices of skewness and kurtosis. Examination of univariate indices revealed kurtosis values above the absolute value of 1.96 only for one variable in the models: gestational age. The kurtosis absolute value was 6.39 for the gestational age of the child, which was not surprising given most children were born between 37 and 40 weeks gestation. Given the nonnormality at the univariate level, the model was evaluated using bootstrapping with 2000 bootstrap replicates and bias corrected interval estimation as implemented in AMOS 20. As recommended by Bollen and Stine (1992), the p value for the overall fit of the tested models was calculated using the Bollen–Stine bootstrap approach in place of the traditional chi square statistic. All significance tests and confidence intervals reported are from the bootstrap analyses.

1.3.4. Covariates

Infant age in months, infant gender, maternal age, and maternal education were all included as covariates in the models given that they were significantly correlated with infant negative affect and maternal depressive symptoms in the current sample (ps < .05). When we corrected infant age for prematurity, all results remained the same. Therefore all results reported examined infant age using chronological age. Acknowledging potential differences among minority groups, race and ethnicity were examined as covariates and results remained the same. Infant gender was dummy coded, 0 for male and 1 for female. Race and ethnicity were combined into one variable, with 1 for Hispanic and 0 for non-Hispanic minority.

In both models, preterm birth was examined as a latent construct with gestational age and birth weight in grams as indicators (Slaughter et al., 2009; loadings of .85 and .74, respectively). Infant negative affect also was examined as a latent construct with four indicators: sadness, distress to limitations, falling reactivity, and fear. Factor loadings for the four temperament subscales were acceptable (.44–.81). The use of a latent variable has been shown to reduce measurement error and help account for unexplained variance (Cheung & Lau, 2008). To ease interpretation, covariates (infant age, infant gender, maternal age, and maternal education) and correlations between exogenous variables were excluded from all figures. 2. Results

2.1. Preliminary analyses

2.1.1. Descriptive analyses

Observed means and standard deviations are represented in Table 1. Thirty percent of infants were born at or less than 37 weeks gestation, and 16% weighed 2500 g or less, which is considered low birth weight (Vigod et al., 2010). Seventeen percent of mothers were above the clinical cutoff for depression on the EPDS (i.e., total score of 13 or higher), placing them at high risk for postpartum depression (Cox et al., 1987).

2.2. Analyses effects

The first model tested a direct effect of preterm birth on maternal postpartum depressive symptoms and infant negative affect. Following recommendations of (Bollen & Long, 1993), a variety of indices of model fit were evaluated and suggested a good model fit (see Table 2).

Results revealed that the latent construct of preterm birth significantly predicted postpartum depressive symptoms, such that mothers with infants born earlier and at a lower birth weight reported higher levels of depressive symptoms. For every one unit decrease in the latent variable of preterm birth, there was a .91 unit increase on the EPDS. Results also revealed that the latent construct of preterm birth significantly predicted infant negative affect, such that mothers with infants born

Table 2
Model fit indices.

Fit indices	Direct effect model	Indirect effect (Fig. 1)
Bollen–Stine[2]	p = .19	p = .66
RMSEA	.06	<.001
PCLOSE	.40	.88
CFI	.96	1.00
SRMR	.06	.05

Note. Bollen–Stine[2] = Bollen–Stine bootstrapped chi-square; RMSEA = root mean square error of approximation; PCLOSE = p value for test of close fit; CFI = comparative fit index; SRMR = standardized root mean square residual.

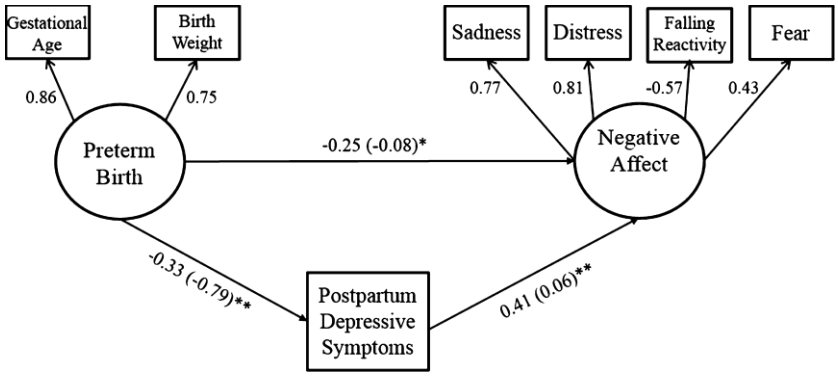

Fig. 1. Path model for effects of postpartum depressive symptoms on the relation between preterm birth and negative affect.

earlier and a lower birth weight reported higher levels of negative affect in their infant. For every one unit decrease in the latent variable of preterm birth, there was a .15 unit increase in infant negative affect.

The second model (Fig. 1) tested the indirect effect of maternal postpartum depressive symptoms on the relation between preterm birth and infant negative affect. Indices of model fit for the indirect effect of maternal postpartum depressive symptoms on the relation between preterm birth and infant negative affect demonstrated good model fit (see Table 2). In this model, there was a significant direct effect of preterm birth on infant negative affect ($p < .05$). The joint significance test paradigm was used to test the indirect effect hypothesis. The joint significance method for testing indirect effects is recommended over other methods because it offers low Type I error rates while maximizing statistical power (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). The path from preterm birth to postpartum depressive symptoms and the path from to postpartum depressive symptoms to infant negative affect in Fig. 1 were both statistically significant ($p < .01$), suggesting postpartum depressive symptoms partially accounted for the relation between preterm birth and infant negative affect (after controlling for infant age and gender, and maternal age and education). Specifically, lower birth weight and gestational age predicted higher rates of depressive symptoms in the mother ($p = .007$), and higher rates of depressive symptoms in the mother, in turn, predicted higher levels of infant negative affect ($p = .003$). In addition, when examining the bias corrected confidence intervals associated with the indirect effect mentioned above, the confidence interval did not contain zero, providing further evidence for the indirect effect.

3. Discussion

Overall, findings demonstrated that, relative to normative samples (Raju et al., 2006; Vigod et al., 2010), the current sample displayed high rates of preterm birth (30%) and high rates of maternal postpartum depressive symptoms (17%). These rates highlight the high-risk nature of the current sample and the need to assess these problems in underrepresented minority samples. Consistent with our hypothesis and previous research (Vigod et al., 2010; Voegtline & Stifter, 2010), preterm birth predicted higher levels of postpartum depressive symptoms and infant negative affect. Furthermore, this study extended previous findings on the relation between preterm birth and postpartum depressive symptoms and the relation between preterm birth and infant negative affect in a sample of families from underrepresented minority backgrounds.

In addition to the direct effects, we replicated previous research (Voegtline & Stifter, 2010) by demonstrating the indirect effect of postpartum depressive symptoms on the relation between preterm birth and infant temperament. Nevertheless, we acknowledge the inability to determine directionality with a cross-sectional design. Hence, we are not claiming mediation based on the evidence of indirect effects in the current study. Given the promising findings, however, future longitudinal research studies including multiple time points should be conducted examining a mediational model to help elucidate the directionality of effects between postpartum depressive symptoms and infant negative affect.

Considering the limited research of these constructs with underrepresented minority samples, a strength of the current study was the examination of these constructs with only underrepresented minority mothers and their infants. Additionally, the use of structural equation modeling allowed us to examine multiple indicators of latent constructs, thereby reducing measurement error (Cheung & Lau, 2008). Furthermore, the use of multiple indicators allowed us to better conceptualize preterm birth and infant negative affect according to previous research (Slaughter et al., 2009). These findings highlight the importance of further studying the relation between these constructs and developing and testing interventions for high-risk families.

The current study has several limitations that are important to consider. First, the current study was cross-sectional, which as indicated above, did not allow for a formal test of mediation. Relatedly, we were unable to examine the possible transactional relation between maternal postpartum depressive symptoms and difficult infant temperament over time. Second, data on infant negative affect was only collected from the mothers in all cases and we did not collect information from other caregivers. Future studies should examine infant data from other caregivers, such as fathers, because mothers with elevated postpartum depressive symptoms may have a biased perceptions of their infant's negative affect (Noorlander, Bergink, & Van Den Berg, 2008). Nevertheless, the extent to which postpartum depressive symptoms lead to a bias in reporting is still unclear. For example, one study found that while mothers experiencing chronic postpartum depression (i.e., >8 months) were more likely to have negative perceptions of their children's behavior, mothers experiencing brief episodes (i.e., <4 months) of postpartum depression did not have more negative perceptions of their children's behavior (Cornish et al., 2006). Therefore, the bias in maternal report of infant negative affectivity may depend on the severity or timing of the symptoms of postpartum depression. Furthermore, differences have been reported between parent ratings and observations of infant negative affect (Pauli-Pott, Mertesacker, Bade, Bauer, & Beckman, 2000), and therefore future research should investigate potential differences in the findings when including observations of infant negative affect.

Third, we only assessed postpartum depressive symptoms as a measure of parent functioning. It is possible a latent construct including other related measures such as anxiety symptoms or levels of parenting stress would have provided a more comprehensive measurement of parental distress. Similarly, we did not collect information on depressive symptoms in other caregivers (e.g., fathers), which has been shown to significantly affect child outcomes (Paulson & Bazemore, 2010). Fourth, although this was an underrepresented minority sample, a large percentage of the sample reported being Hispanic. Therefore, future research should examine these constructs in more diverse samples, as well as assess the level of acculturation for immigrants.

Fifth, preterm infants are not a homogenous group and thus infant maturity and other associated factors may influence infant negative affect. Examining variability in maturity, neonatal illness severity, and current health status in preterm infants may help clarify some differences in infant temperament and maternal postpartum depressive symptoms in future studies. Lastly, due to the relatively small sample of preterm infants (n=31) in this study, there are limits to generalizability, and results should be interpreted as preliminary. Although we examined preterm birth on a continuous scale, it should be noted that late preterm births (80% of our sample of infants born preterm) account for approximately 84% of preterm births (Blencowe et al., 2012) and have been associated with poor child outcomes (Boyle et al., 2012; Quigley et al., 2012). Nevertheless, future studies should examine the effect of preterm birth on maternal postpartum depressive symptoms and infant negative affect in a larger sample including a representation of early, moderate, and late preterm infants.

Despite these limitations, the present study provided preliminary support for the relation between preterm birth and maternal depressive symptoms and infant negative affect in an underrepresented minority sample. Given the findings that preterm birth is associated with high levels of maternal postpartum depressive symptoms and of infant negative affect, there are significant clinical implications. Specifically, screening for postpartum depression and infant negative affect among families of preterm infants, particularly those from underrepresented minority backgrounds, could help identify mothers and infants in need of and who may benefit from intervention. Continued research on these constructs and future findings could significantly impact the development of novel interventions, such as targeting depressive symptoms, among mothers of infants born preterm. Early intervention for these problems is crucial considering the long term negative outcomes of postpartum depressive symptoms and infant negative affect during the first year of the child's life (Bagner et al., 2010).

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