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ORIGINAL PAPER

The Effect of Parenting Style on Social Smiling in Infants at High and Low Risk for ASD

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Abstract This study examined how parenting style at 9 months predicts growth in infant social engagement (i.e., social smiling) between 9 and 18 months during a free-play interaction in infants at high (HR-infants) and low (LR-infants) familial risk for autism spectrum disorder (ASD). Results indicated that across all infants, higher levels of maternal responsiveness were concurrently associated with higher levels of social smiling, while higher levels of maternal directiveness predicted slower growth in social smiling. When accounting for maternal directiveness, which was higher in mothers of HR-infants, HR-infants exhibited greater growth in social smiling than LR-infants. Overall, each parenting style appears to make a unique contribution to the development of social engagement in infants at high- and low-risk for ASD.

Keywords Autism · High-risk infants · Social smiling · Maternal directiveness · Maternal responsiveness · Parent–child interactions

Positive social interactions between parents and infants provide a strong foundation for infants' subsequent learning and development. Within the context of early parent–infant social exchanges, parents model, scaffold, and reinforce infants' emerging skills to promote their cognitive, social, emotional, and language development (Bornstein and Tamis-LeMonda 1989; Landry et al. 2001). Infants contribute to and reinforce these early exchanges through social smiling—smiling with eye contact directed toward a social partner—which is one of the earliest behaviors available to them for initiating and maintaining interactions with caregivers (Messinger and Fogel 2007). Social smiles typically emerge between 1 and 2 months of age (Anisfeld 1982), increasing in frequency between 2 and 6 months (Malatesta et al. 1989), and becoming more communicative as infants mature (Venezia et al. 2004).

Children with autism spectrum disorder (ASD) have been found to demonstrate lower levels of social smiling than typically developing children and children with other developmental disorders (Dawson et al. 1990; Kasari et al. 1990; Wetherby et al. 1998). Differences in social engagement and smiling have also been observed within the first 2 years of life for infant siblings of children with ASD, who are at elevated risk for receiving an ASD diagnosis by virtue of family history (HR-infants; Ozonoff et al. 2011). HR-infants have been found to exhibit lower levels of social and communicative engagement in many domains relative to infants whose older siblings have typical development (LR-infants; Landa et al. 2007; Ozonoff et al. 2010; Stone et al. 2007). Studies of social smiling have been consistent in finding differences in levels of social smiling between HR- and LR-infants, though different patterns across the groups have emerged. Ozonoff et al. (2010) found that social smiling decreased over time for HR-infants who received a later diagnosis of ASD, but increased for LR-infants, resulting in significantly lower levels of social smiling for the HR-infants by 18 months. Landa et al. (2007) found social smiling in HR-infants to decrease between 14 and 24 months of age; however, this decline occurred only for HR-infants diagnosed with ASD

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"late" (i.e., at 24 months of age), and not for HR-infants diagnosed with ASD "early" (i.e., at 14 months) or for HR-infants without ASD or LR-infants. In contrast, Nichols et al. (2014) found that HR-infants at a mean age of 15 months displayed less social smiling than LR-infants *regardless* of later ASD diagnosis, suggesting that reductions in social smiling may extend more broadly to those HR-infants who fail to meet diagnostic thresholds for ASD.

Because parents play such a large role in sustaining infants' social engagement, it has been suggested that parenting style may be one of the critical factors shaping the development of early social smiling. One type of parenting style is characterized as maternal responsiveness, which involves the use of behaviors that are sensitive, contingent, and support and follow the infant's lead with respect to social, emotional, communicative, and play behaviors (Bornstein and Tamis-LeMonda 1989; Mahoney and Nam 2011; Spiker et al. 2002). For both typically developing infants and infants with developmental challenges, maternal responsiveness has been associated concurrently with increased infant social engagement (Lowe et al. 2012; Erickson and Lowe 2008; Wan et al. 2012) and predictively with children's long-term social competence (Baker et al. 2010; Landry et al. 2001, 2003).

A different type of parenting style is referred to as maternal directiveness, and is characterized by behaviors such as prompting, instructing, and/or requesting for the purpose of focusing an infant's immediate attention or behavior (Mahoney and Perales 2003). Studies with typically developing children and children with developmental challenges suggest that maternal directiveness may have a differential influence on language and social development depending on both the age of the child and the focus of the interaction. While a mother's directive behaviors may promote skill acquisition in younger children, it may hinder the social development of older children who are beginning to exert their independence and develop new competencies (Landry et al. 2000). Furthermore, it has been suggested that directive behaviors that maintain a child's attention or capture the attention of an unengaged child may be beneficial for promoting language development, whereas directive behaviors that redirect the attention of an already engaged child may impede language development (McCathren et al. 1995).

Several studies have found that mothers of children with developmental disorders use more directive behaviors than those of typically developing children (Doussard-Roosevelt et al. 2003; Mahoney et al. 1990; Roach et al. 1998; Wan et al. 2012, 2013), with mothers of children with ASD exhibiting higher levels than other groups (Kasari et al. 1988; Lemanek et al. 1993). It has been posited that infants with developmental challenges may benefit from a more directive interaction style that provides scaffolding to elicit desired behaviors (Marfo 1992), because their more limited repertoire of social initiation and play may provide parents with fewer opportunities to follow their child's lead (Saint-Georges et al. 2011; Slonims et al. 2006; van IJzendoorn et al. 2007; Zwaigenbaum et al. 2005). However, in contrast to maternal responsiveness, the effect of maternal directiveness on the social engagement of infants and children with developmental challenges is less clear, with some studies finding a positive association (Doussard-Roosevelt et al. 2003; Green et al. 2014) and others finding no association (Wan et al. 2012, 2013) or a negative association (Landry et al. 1998). It has been suggested that typically developing children may be equipped with resources that allow them to be relatively more resilient to the effects of maternal directiveness on social development than are children with developmental challenges (Green et al. 2014).

Most infant studies to date have examined the effects of responsive and directive parenting styles separately (e.g., Landry et al. 1998; Wan et al. 2012, 2013), rather than considering their combined effects on infant behavior. Yet these two styles are not mutually exclusive, and it is likely that parents can and do demonstrate elements of both parenting styles as circumstances, contexts, and infant behaviors and dispositions dictate. In the only study to examine both parenting styles in the same concurrent model, Patterson et al. (2014) found that maternal responsiveness, but not maternal directiveness, was positively associated with child-initiated joint engagement in a sample of toddlers with ASD (mean ages 30–31 months). However, it is not yet known how these parenting styles contribute to the development of social engagement during infancy, particularly during the latter half of the first year of life, which is a period of substantial social-communicative growth (Rochat and Striano 1999).

The purpose of the present study was to examine the longitudinal effects of both maternal responsiveness and directiveness on the early development of social smiling in infants who have an older sibling with ASD (HR-infants), compared with infants who have an older sibling and no family history of ASD (LR-infants). Infant smiling was measured from 9 to 18 months, as this age range captures the time when ASD-related behaviors, including reduced social smiling (Nichols et al. 2014; Ozonoff et al. 2010), may emerge. To our knowledge, this is the first study with HR-infants to: (1) include maternal responsiveness and directiveness in the same model to predict the development of infant social smiling; and (2) measure change in social smiling within the context of naturalistic free play, rather than during a semi-structured task with a parent (Rozga et al. 2011) or an examiner (Landa et al. 2007; Nichols et al. 2014; Ozonoff et al. 2010; Zwaigenbaum et al. 2005). Free-play contexts provide a more ecologically valid

measurement setting, as they more closely resemble situations encountered during everyday parent–infant interactions. Identifying the extent to which maternal responsiveness and directiveness are associated with change in social smiling in infants at high risk for ASD may lead to a better understanding of preventive intervention strategies for promoting social engagement in these children. This study seeks to answer two primary questions:

1. Are there group differences between mothers of HR-infants and LR-infants in maternal directiveness and/or responsiveness at 9 months of age?
2. To what extent do risk group and parenting styles at 9 months *separately* and *uniquely* predict individual differences in trajectories of social smiling?

Methods

Participants

Our sample comprised infants and mothers who provided informed consent and participated in an IRB-approved, longitudinal, multi-site study. All dyads completed the free-play session during their 9-month study visit. HR-infants ($n = 30$; 18 males) had an older sibling with ASD, as verified with the Autism Diagnostic Observation Schedule (Lord et al. 2000) and a DSM-IV-TR-informed clinical diagnosis (American Psychiatric Association 2000). LR-infants ($n = 18$; 12 males) had a typically developing older sibling, as verified by a score <9 on the Social Communication Questionnaire (SCQ; Berument et al. 1999), and no reported family history of ASD in first degree relatives. Exclusion criteria for both groups were: severe sensory or motor impairments; metabolic, genetic, or neurological disorders; gestational age <37 weeks; and birth weight <2500 grams. Families were primarily White and college educated. There were no significant group differences for infants' race, $X^2(2, 48) = 2.62$, $p = .27$, sex, $X^2(1, 48) = .21$, $p = .64$, gestational age $t(45) = -1.68$, $p = .10$, or birth weight, $t(45) = -.54$, $p = .59$, or for mothers' years of education, $X^2(3, 48) = 2.58$, $p = .46$ (see Table 1).

Procedure

Mothers and infants completed the Parent–Child Free Play (PCFP) procedure during laboratory visits at 9, 12, 15, and 18 months of age. The PCFP is a naturalistic paradigm that has been used in previous ASD studies to assess parent–child interactions (Baker et al. 2010; Carter et al. 2011). During the PCFP, the infant and mother were in a room with a standard set of developmentally appropriate toys, and the mother was instructed to "play with your child as you normally would at home." The duration of this procedure was 5 min, which has been found to be sufficient for identifying predictive associations between maternal and infant behaviors (Baker et al. 2010). Video recordings were used to rate parenting style at 9 months and to code infant social smiling at 9, 12, 15, and 18 months. Maternal and infant behaviors were rated/coded by different sets of coders, all of whom were blind to risk group.

Measures

Maternal Responsiveness and Directiveness

Responsive and directive parenting styles were coded using global ratings adapted from the Maternal Behavior Rating Scale-Revised (MBRS; Mahoney 2008), which has demonstrated adequate to strong interrater reliability in samples of young children with ASD (Mahoney and Perales 2003, 2005; Patterson et al. 2014). The present study employed a 9-point Likert scale with anchors of "Very Low" (1), "Moderate" (5), and "Very High" (9) to rate responsive and directive parenting styles, with behavioral descriptions and examples provided for the two extreme anchor points. *Responsiveness* was defined as the supportiveness of the mother's responses to the infant's overt (e.g., vocalizations and gestures) and subtle behaviors (e.g. changes in facial expressions; Mahoney 2008). A mother who demonstrated "Very High" responsive behavior consistently monitored and labeled her child's interests and activities (e.g., commented on the child's actions with toys), while a mother who demonstrated "Very Low" responsive behavior consistently failed to attend to her child's overt initiations (e.g., did not react to the child's requests for help). *Directiveness* was defined as the degree to which the mother requests, commands, suggests, and/or physically prompts in order to direct the infant's immediate attention or behavior (Mahoney 2008). A mother who demonstrated "Very High" directive behavior consistently directed her infant's play (e.g., instructed the infant to play with a particular toy), while a mother who demonstrated "Very Low" directive behavior consistently followed the infant's lead in play (e.g., allowed the child to play without providing suggestions or instructions). Within the current study sample, maternal responsiveness and directiveness were not significantly correlated with each other, $r(46) = -.19$, $p = .19$.

Three coders were trained to rate maternal responsiveness and directiveness with 80 % reliability using videos of infants not participating in the current study. To evaluate interobserver agreement, 20 % of the videos were coded independently by a Master's level supervisor of the coding team or the first author. Absolute-agreement intraclass

Table 1 Demographic characteristics of high-risk and low-risk samples

Characteristic	High-risk $n = 30$	Low-risk $n = 18$
Infant race # (%)		
White	21 (70)	16 (89)
Asian	2 (7)	0 (0)
Biracial/multiracial	7 (23)	2 (11)
Infant sex # (%)		
Male	18 (60)	12 (67)
Female	12 (40)	6 (33)
Maternal education # (%)		
High school only	1 (3)	0 (0)
College/some college	21 (70)	10 (55.5)
Advanced degree	8 (27)	8 (44.5)
Gestational age (weeks) M (SD)	39.24 (1.24)	39.83 (1.04)
Birth weight (grams) M (SD)	3563.82 (470.89)	3641.21 (482.51)

correlation coefficients (ICCs) were in the good to excellent range for responsiveness (72–.76) and directiveness (.84–.98).

Infant Social Smiling

Social smiling was chosen as the measure of social engagement due to its early developmental emergence, its key function in the maintenance of social interactions, and previous findings that ASD-related impairments in social smiling may emerge by 15 months in HR-infants regardless of later diagnostic outcome (Nichols et al. 2014). Social smiles were coded using ELAN, a multimodal digital annotation tool (Wittenburg et al. 2006). To be coded as a social smile, an infant's smile and eye contact to his/her mother's face had to occur either simultaneously or within 1/10 of a second of each other (i.e., smile begins within 1/10 of a second before or after eye contact, or vice versa; see Nichols et al. 2014). Videos were viewed at ¾ speed to ensure accuracy of timing and observations. While there were no significant differences in durations of the PCFP procedures between HR-infants and LR-infants across the four time points, $ps > .08$, social smiling was calculated as rate per minute to account for variability in duration. Three coders were trained to code social smiles. Interobserver agreement was measured through the independent coding of 20 % of the video recordings by the first author; ICCs were in the good to excellent range (.73–.95) across time points.

Results

A repeated-measures ANOVA was used to examine parenting style at 9 months (i.e., responsiveness vs. directiveness) by risk group (i.e., HR-infants vs. LR-infants). Results revealed a significant interaction between risk group and parenting style, $F(1, 46) = 4.78$, $p = .03$, $\eta_p^2 = .09$, but no significant main effects for parenting style, $p = .76$, $\eta_p^2 < .01$ or risk group, $p = .36$, $\eta_p^2 = .02$. Post-hoc analyses (Bonferroni-adjusted) indicated that: (1) mothers of HR-infants displayed significantly higher levels of directiveness than mothers of LR-infants, $p = .04$, Cohen's $d = .62$; (2) mothers of HR-infants did not differ significantly from mothers of LR-infants on levels of responsiveness, $p = .26$, Cohen's $d = .33$; and (3) within each risk group, levels of responsiveness and directiveness were not significantly different, $ps = .40$–$.60$, Cohen's $d = .44$–$.52$. Raw means for these variables are displayed in Table 2 and Fig. 1.

Hierarchical linear modeling (HLM; Singer and Willett 2003) was used to examine the growth trajectory of social smiling between 9 and 18 months and the extent to which risk group, maternal responsiveness, and maternal

Table 2 Means and standard deviations for parenting styles and social smiling of high-risk and low-risk samples

Characteristic	High-risk $n = 30$	Low-risk $n = 18$
Parenting styles *M* (SD)		
Responsiveness	5.03 (2.04)	5.77 (2.39)
Directiveness*	6.03 (2.44)	4.44 (2.68)
Social smiling *M* (SD)#		
9 months	.33 (.13)	.52 (.13)
12 months	.37 (.18)	.44 (.14)
15 months	.42 (.27)	.36 (.20)
18 months	.47 (.38)	.28 (.28)

* Group differences significant at $p = .04$

Social smiling means and standard deviations derived from the Bayesian estimates of the final HLM model

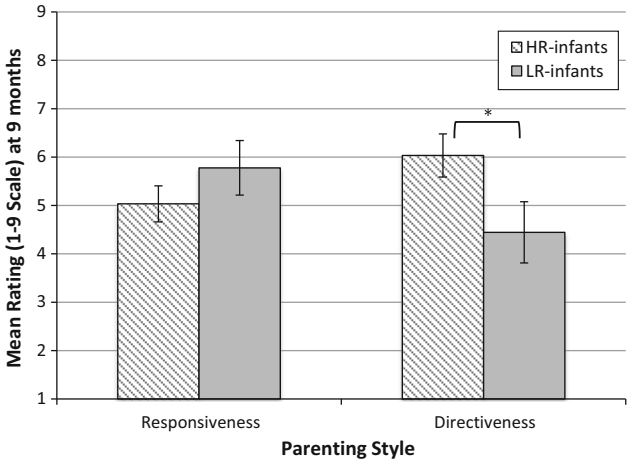

Fig. 1 Mean parenting style ratings at 9 months by risk group. $^{*}p = .04$

directiveness at 9 months separately and uniquely predicted growth over time. Time was centered so that 9 months was the intercept (i.e., baseline), responsiveness and directiveness were grand-mean centered, and the LR-infants (coded as 0) represented the comparison group. For the Level-1 model, both the intercept and the linear change terms for social smiling were modeled as random effects; the intercept was significantly greater than 0, $B_{00} = .40$, $p = .11$, and linear change was not significant, $B_{01} = -.001, p = .93$. As the first step in the Level-2 model building process, each of the three predictors was examined in a separate model, to parallel the way in which these predictors have been analyzed in previous infant studies (e.g., Wan et al. 2013). These initial results indicated that: (1) maternal responsiveness significantly predicted the intercept, $B_{01} = .05, p = .19$, but not the linear change, $B_{11} = .01$, $p = .09$; (2) maternal directiveness significantly predicted the linear change, $B_{11} = -.07$, $p = .04$, but not the intercept, $B_{00} = -.01$, $p = .44$, and (3) risk group was not a significant predictor of the intercept, $B_{01} = -.18$, $p = .11$, or the linear change, $B_{11} = .04, p = .09$.

For the second step in model-building, the same three predictors (i.e., risk group, maternal responsiveness, and maternal directiveness) were entered into the *same* model to examine: (1) the extent to which maternal responsiveness and directiveness were *unique* predictors of the intercept and/or linear change, and (2) whether risk group would emerge as a significant predictor of the intercept and/or linear change when parenting styles were controlled/accounted for in the same model. In the final combined model, the trajectory of social smiling included, at Level-1, an intercept that was significantly greater than 0, $B_{00} = .50$, $p = .01$, and linear change that approached significance, $B_{10} = -.03$, $p = .06$. At Level-2, maternal responsiveness continued to be a significant predictor of the intercept, $B_{01} = .04$, $p = .04$, and maternal directiveness continued to be a significant predictor of linear change, $B_{11} = -.01, p = .02$. However, in this model, risk group *was* a significant predictor of linear change, $B_{12} = .06$, $p = .02$. Thus, when accounting for levels of maternal directiveness (which were significantly higher in the mothers of HR-infants), HR-infants exhibited greater growth in social smiling between 9 and 18 months than did LR-infants. These results are presented in Table 2 and Fig. 2 as the modeled means and estimates.

Discussion

The purpose of this study was to examine the unique contributions of maternal responsiveness and directiveness on growth in social smiling in infants at high and low risk for ASD. Results revealed that *within* each sample, mothers demonstrated similar levels of responsiveness and directiveness in interacting with their 9-month-old infants. This finding demonstrates that both parenting styles can occur concurrently within the same play interaction, highlighting the importance of considering both styles simultaneously rather than as mutually exclusive proclivities. In future studies with larger samples, examining the combination of responsiveness and directiveness as part of a superordinate *interactive profile,* and its stability across different activities (e.g., free-play vs. semi-structured, goal-oriented routine), may provide the most comprehensive picture of how parent interactive style influences a child's social development. For example, it is possible that parents with a profile characterized by high levels of both directiveness

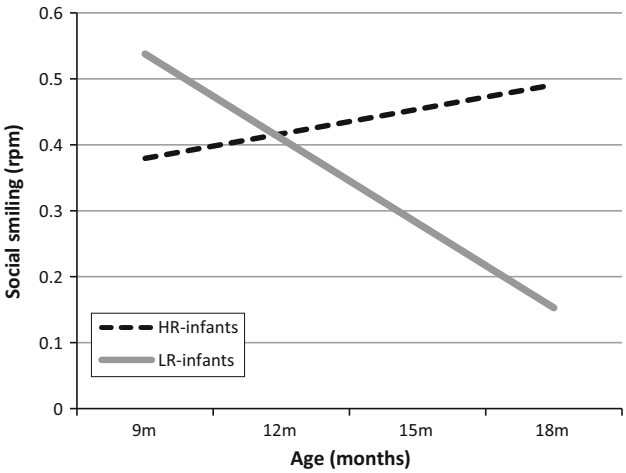

Fig. 2 The trajectory of social smiling between 9 and 18 months estimated from the final HLM model. The estimated trajectory for each group reflects a one-unit increase (from the grand mean) in maternal responsiveness (for the intercept) and directiveness (for the linear slope)

and responsiveness may be optimally equipped to adjust their interactive styles to accommodate the characteristics and needs of their child within a variety of different situational or contextual demands.

Comparisons *between* parenting style in the two risk groups revealed similar levels of responsiveness, but higher levels of directiveness in mothers of HR-infants compared with mothers of LR-infants. These findings are consistent with results from the only other study of HR- and LR-infants (Wan et al. 2012, 2013) that used a free-play context to examine associations between children's social engagement and maternal parenting style. There are several possible explanations for these findings. The higher levels of directiveness in the HR-infant group may reflect mothers' responses to the characteristics of their HR-infant, in terms of reduced social interest or play (Saint-Georges et al. 2011), and/or represent the carry-over of a behavioral style or intervention approach used with their older child with ASD. Wan et al. (2012) also suggested that the mothers of HR-infants may exhibit higher levels of directiveness due to higher levels of stress, which may negatively impact their emotional availability and ability to engage in non-directive behaviors. Empirical support for the positive relation between parenting stress and maternal directiveness has been found for the parents of children with developmental delays (Girolametto and Tannock 1994). Furthermore, it is possible that higher levels of directiveness in our sample may reflect lower levels of parenting self-efficacy, which has been found in other studies of parents of children with ASD (Meirsschaut et al. 2010; Rutgers et al. 2007). Factoring in HR mothers' parenting stress and parenting self-efficacy is an important next step for understanding how their well-being and self-cognitions influence their parenting style.

In our initial predictive models, responsiveness, directiveness, and risk group were each examined separately as predictors of change in infant social smiling. This strategy was employed to enable comparison with previous research conducted in this area. Our results revealed similar patterns across both groups, i.e., no main effect for risk group. However, the two parenting styles, as measured at 9 months, showed distinct patterns with reference to infant social smiling. *Across both groups*, maternal responsiveness was positively associated with infant social smiling at 9 months, while maternal directiveness was negatively associated with linear growth in social smiling through 18 months of age. Concurrent positive relations between maternal responsiveness and social engagement have been found previously for toddlers with ASD (Patterson et al. 2014) and for HR-infants (Wan et al. 2012). However, this is the first study to find an inverse, *predictive* relation between maternal directiveness at 9 months and social smiling over time in a sample including HR-infants. The effect of maternal directiveness on the trajectory of social smiling may be related to the age at which it was measured, as 9 months might be a time when mothers have a proclivity to direct their child's play. Evidence from a large at-risk sample (i.e., Early Head Start children) indicates that maternal directiveness begins to decline after 12 months of age, possibly because mothers' perceive their children as being more capable of directing their own play (Ispa et al. 2013).

In our final model, responsiveness, directiveness, and risk group were entered *simultaneously* to examine whether maternal responsiveness and directiveness were unique predictors of social smiling, and whether risk group would emerge as a significant predictor of social smiling after accounting for parenting styles (in particular, the higher level of directiveness in the HR-infant group). Results revealed that HR-infants demonstrated increased growth in social smiling relative to LR-infants, suggesting that maternal directiveness was a confounding variable that suppressed the relation between risk group and social smiling. In other words, the growth rate of social smiling in the HR-infants was underestimated in the initial model. In addition, it is possible that decreases in social smiling over this period–as demonstrated by the LR-infant group–might reflect a more normative pattern, as smiling is replaced by more complex social engagement behaviors (e.g., language and gestures) during the second year of life. Decreases in social smiling for LR-infants have been reported between 10 and 12 months for smiles occurring within the context of initiating joint attention bids (IJA; Gangi et al. 2014). Although the present study did not limit the measurement of smiling to its occurrence within IJA, declines in IJA in typical development are thought to reflect the rapid growth of language and motor skills that occurs at this time (Mundy et al. 2007).

Overall, these results have several important implications. First, they underscore the importance of accounting for parent behaviors to better understand social behavior development and expression in HR-infant and LR-infant samples. More broadly, these results signal the possibility that studies may mischaracterize (i.e., underestimate or overestimate) the impact of child factors (e.g., risk group) on social engagement, by not factoring in the social partner's behaviors (parent or examiner). Second, they provide additional support for incorporating maternal responsiveness training in parent-implemented interventions aiming to increase social engagement in HR-infants [e.g., Project ImPACT (Ingersoll and Wainer 2013); Early Start Denver Model (ESDM; Dawson et al. 2010)]. Third, they indicate that mothers exhibit both responsive and directive behaviors within the context of parent–child play interactions, and highlight the need to consider how both styles interact to optimize children's social engagement and learning

across different settings. Though directiveness may have a negative effect on the production of social smiling during free play, it may still play a facilitative role in more structured activities and contexts. For example, directive behaviors may promote development if they are used to sustain a child's engagement in an activity, direct the attention of an unengaged child, or teach a child a new skill; however, they may be detrimental if they are used to redirect the attention of a child who is already actively engaged in a productive activity (McCathren et al. 1995).

This study illustrates a novel approach for understanding the predictive relations between parenting style and growth in social smiling, and employs some methodological improvements over previous studies, such as measuring parent–child interactions within a free play context. However, several limitations should be considered in interpreting our findings. First, our sample size was relatively small, which may affect the generalizability of these results. Second, because the free play session lasted only 5 min and occurred in a research setting, it may not provide an accurate reflection of typical parent–infant interactions in everyday contexts. Third, parenting style was measured only at 9 months, which prevented us from investigating the bidirectional relations between parent and infant behaviors. Fourth, data on the verbal and non-verbal abilities of the infants at each time point were not collected; therefore, it is not possible to determine how much of the variability in our findings might be due to infant verbal skills or overall developmental level. Future studies might include a broader array of infant social engagement behaviors and measure their concurrent relations to parenting styles at multiple ages to capture more fully the richly complex and transactional nature of early parent–infant interactions. These limitations notwithstanding, the present study provides an initial step in this process, by highlighting the potential value of considering the contributions of both directiveness and responsiveness in facilitating social development and engagement in HR-infants.

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Author Contribution CH conceived of the study, participated in its design and coordination, performed the measurement, participated in the statistical analysis and interpretation of the data, and helped to draft the manuscript. LI performed the statistical analysis, participated in the interpretation of the data, and helped to draft the manuscript. TN participated in the coordination of the study and performed the measurement. WS conceived of the study, participated in its design and coordination, participated in the interpretation of the data, and helped to draft the manuscript. DM provided guidance about the manuscript draft and study design. All authors read and approved the final manuscript.

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Compliance with Ethical Standards

Conflicts of interest The authors declare that they have no conflicts of interest to disclose.

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