The Relation Between Infant Social Engagement and Maternal Behavior in Infants at High-Risk for Autism Spectrum Disorder

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Abstract

This study examined maternal and infant behavior in infants at high and low-risk for autism spectrum disorder (ASD) during a parent-child free play session. Maternal responsiveness and directiveness at 9 months were examined as predictors of growth in infant social smiling between 9-18 months. Both maternal responsiveness and directiveness predicted growth in infant social smiling. Higher levels of responsiveness at 9 months were associated with increased growth in social smiling for both groups. Conversely, higher levels of maternal directiveness were associated with slower growth in infant social smiling for both groups. At 9 months, mothers of high-risk infants displayed higher levels of maternal directiveness, but not responsiveness, relative to mothers of low-risk infants. No group differences were found for trajectory of growth in infant social smiling between 9-18 months. These findings provide further evidence that early maternal behaviors may play an important role in the social development of infants at high and low risk for ASD.

Background

A strong body of research suggests that early parent-child interactions play an influential role in shaping a child's social and communicative development, and that the quality of these interactions may have an even greater impact on the development of children at high risk for developmental challenges (Landry et al., 2006). Two parenting behaviors that are particularly important for child development are maternal responsiveness and directiveness (Mahoney, 2008). *Maternal responsiveness*, defined as behavior that is contingent, immediate, appropriate and supportive of the child's social, emotional, communicative and play behavior (Bornstein et al., 2008; Mahoney, 2008), has been associated with positive cognitive, language, and social-emotional outcomes for typically developing children (Tamis-LeMonda et al., 2001) and children at high risk for developmental challenges (Landry et al. 2006). *Maternal directiveness*, defined as behavior with which the mother requests, commands, suggests, or physically prompts the child to direct his/her immediate attention or behavior (Mahoney, 2008), has been associated with mixed findings regarding its effects on child behavior for both typically developing children and children at high risk for developmental challenges (McCathren, Yoder, & Warren, 2005).

Little is known about the relation between maternal behavior and child outcomes in infant siblings of children diagnosed with ASD. These children are at high risk for developmental challenges, as approximately 20% receive a diagnosis of ASD, and another 20% display behavior associated with the broader autism phenotype (Messinger et al., 2013; Ozonoff et al., 2011). Infants at high-risk for ASD exhibit decreased social smiling compared to their low-risk peers (Cassel et al., 2007), which may affect the quality of parent-child interactions (Messinger & Fogel, 2007) and eventually lead to an increasingly atypical social developmental trajectory (Dawson, 2008).

It has been theorized that maternal behavior that promotes engagement and reciprocity during parent-child interactions (i.e., responsiveness) may attenuate ASD symptom development for high-risk infants (Dawson, 2008). Emerging research suggests that mothers of infants at high-risk for ASD display less responsive behavior and more directive behavior when interacting with their children compared with mothers of infants at low-risk for ASD (Wan et al., 2012). The purpose of the present study was to examine whether maternal responsiveness and/or directiveness predicts growth in infant social smiling, and whether these patterns differ as a function of risk group status.

Research Questions

1. Does maternal responsiveness and/or directiveness at 9 months predict growth in infant social smiling between 9-18 months?

2. Does risk group status moderate these associations?

Method

Sample

- **HR-infants** (*n*= 30, male=18) had at least one older sibling who was diagnosed with ASD, verified by the Autism Diagnostic Observation Schedule (ADOS), Autism Diagnostic Interview-Revised (ADI-R), and clinical diagnosis. (See Table 1).

- **LR-infants** (*n*=18, male=12) had at least one typically developing older sibling, verified through parental report and results on the Social Communication Questionnaire (SCQ), and no reported history of ASD in first, second, or third-degree relatives. (See Table 1).

- **Inclusion criteria for both groups:**
(1) absence of severe sensory or motor impairments; (2) absence of identified metabolic, genetic, or progressive neurological disorders; (3) gestational age ≥ 37 weeks; (4) birth weight at least 2500 grams.

Table 1. Demographic Variables		
Characteristic	HR-infants #(%)	LR-infants #(%)
Race		
White/Caucasian	21(70%)	16(89%)
Asian	2(7%)	0
Multiracial	7(23%)	2(11%)
Maternal Education		
High School Only	1(3%)	0
Some College	7(23%)	2(11%)
2-4 Year College	14(47%)	8(44.5%)
Advanced Degree	8(27%)	8(44.5%)

Procedure

- Mother and infant behaviors were coded during a 5-minute, filmed free play interaction, for which mothers were instructed: "*Play with your child as you normally would at home.*"

- Video clips were coded for maternal and infant behavior; raters were blind to risk group status. Inter-rater agreement was examined by the blind coding of over 20% of the study sample video clips.

- Hierarchical Linear Modeling (HLM) was used to examine the extent to which maternal responsiveness and directiveness at 9 months predicted growth in social smiling between 9-18 months.

Measures & Variables

- **Maternal behavior**: Maternal responsiveness and directiveness were coded at 9 months using a modified version of the *Maternal Behavior Rating Scale* (Mahoney, 2008). Both variables were coded globally on a 9-point scale, with scores ranging from "Very Low" to "Very High." Intraclass correlation coefficients were used to measure inter-rater agreement, and were in the good to excellent range (maternal directiveness = .84-.98; maternal responsiveness = .72-.76).

  - For **maternal responsiveness**, a "Very High" score indicates consistent monitoring and labeling of the child's interests and activities, and a "Very Low" score indicates a consistent lack of awareness of and response to the child's overt initiations.

  - For **maternal directiveness**, a "Very High" score indicates consistent directing of the child's play (e.g., instructing the child to play with a particular toy), and a "Very Low" score indicates consistent following of the child's lead in play (e.g., allowing the child to play without providing suggestions).

- **Infant behavior**: Infant social smiling was coded at 9, 12, 15, & 18 months. Social smiling was coded when the infant was observed to laugh or smile within 1/10 sec. of eye contact directed to the mother's face (Nichols et al., 2013). Rate per minute of smiling was the variable of interest. Intraclass correlation coefficients were used to measure inter-rater agreement, and were in the good to excellent range (.73-.95).

Results

- T-tests revealed significant differences in levels of maternal directiveness at 9 months between HR-infants (*M* = 6.03, *SD* = 2.44) and LR-infants (*M* = 4.44, *SD* = 2.68); *t*(46) = 2.1, *p* = .04). No group differences were found for levels of maternal responsiveness at 9 months, *p* = .26. (See Figure 1). Maternal responsiveness and directiveness were not significantly correlated (r= 0.19).

- The final Level 1 HLM model indicated that the growth trajectory of social smiling was best modeled with a random intercept and linear slope. Group status was not a significant predictor of intercept.

- HLM revealed that maternal responsiveness significantly predicted growth in social smiling for both HR and LR-infants, in that higher rates of responsiveness were associated with increased growth in social smiling. (See Figure 2).

- Maternal directiveness significantly predicted growth in social smiling for both HR and LR-infants, in that higher rates of directiveness were associated with slower growth in social smiling. (See Figure 3).

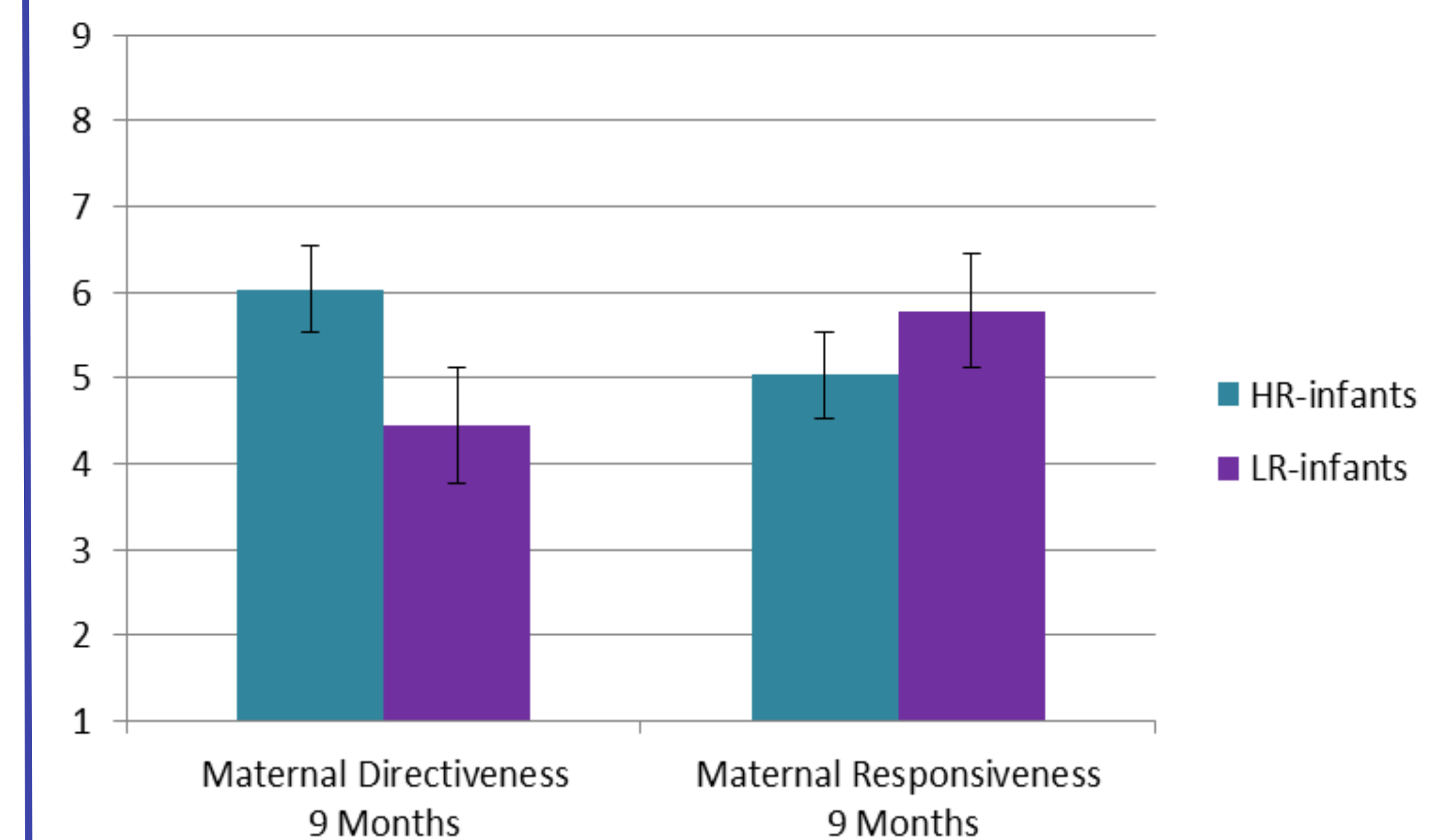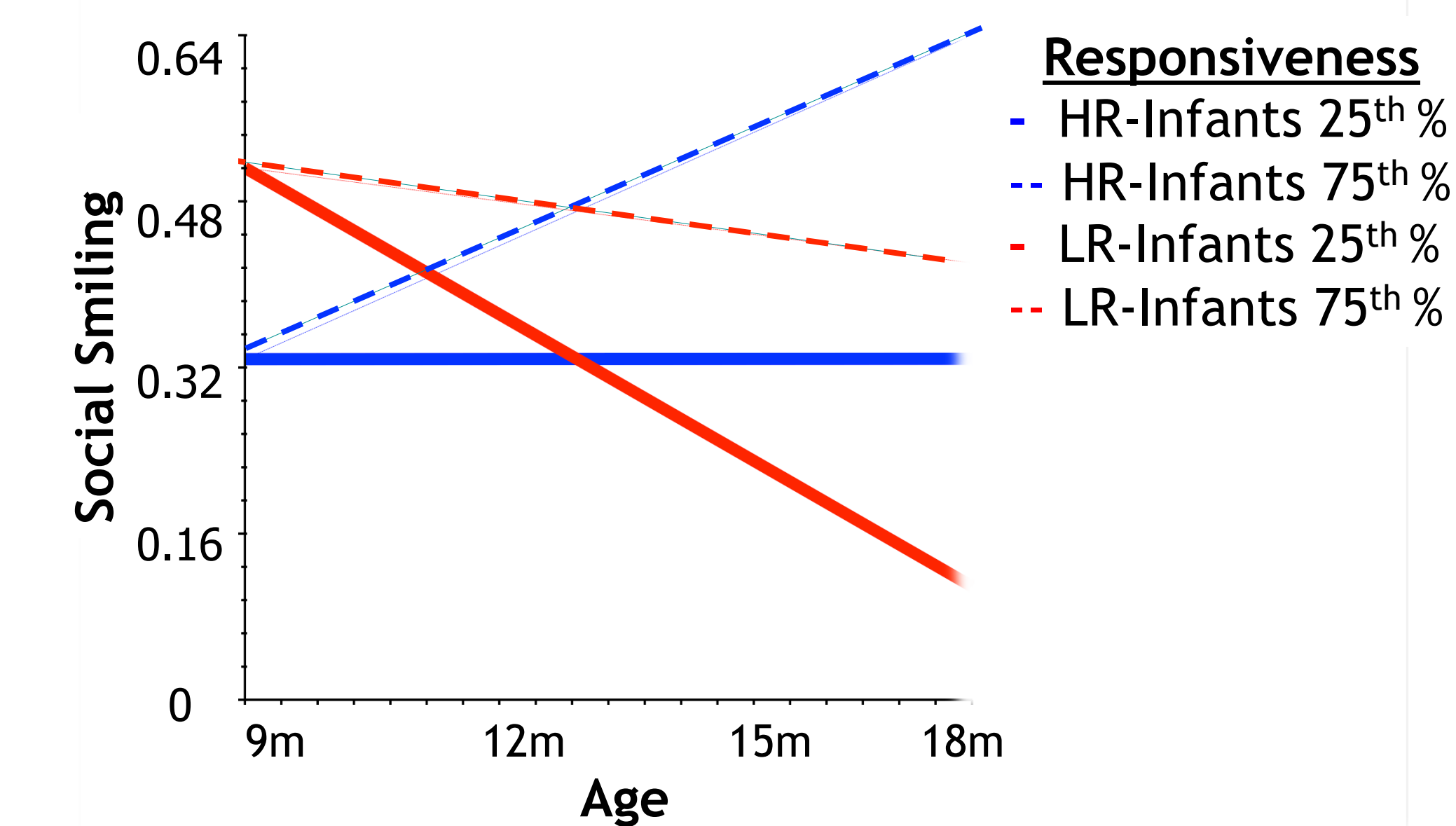Figure 1. Mean Maternal Behavior Ratings by Group

Figure 2. Maternal Responsiveness at 9 Months as a Predictor of Infant Social Smiling by Group

Responsiveness
- HR-Infants 25th %
-- HR-Infants 75th %
- LR-Infants 25th %
-- LR-Infants 75th %

25th%: 25th percentile (low responsiveness)
75th%: 75th percentile (high responsiveness)

Final Model for Linear Growth			
Predictor	B	SE B	p
Maternal Responsiveness 9m	0.01	0.01	0.04
Group	-0.05	0.02	0.07
Maternal Responsiveness 9m*Group	-0.01	0.01	0.28

Figure 3. Maternal Directiveness at 9 Months as a Predictor of Infant Social Smiling by Group

Directiveness
- HR-Infants 25th %
-- HR-Infants 75th %
- LR-Infants 25th %
-- LR-Infants 75th %
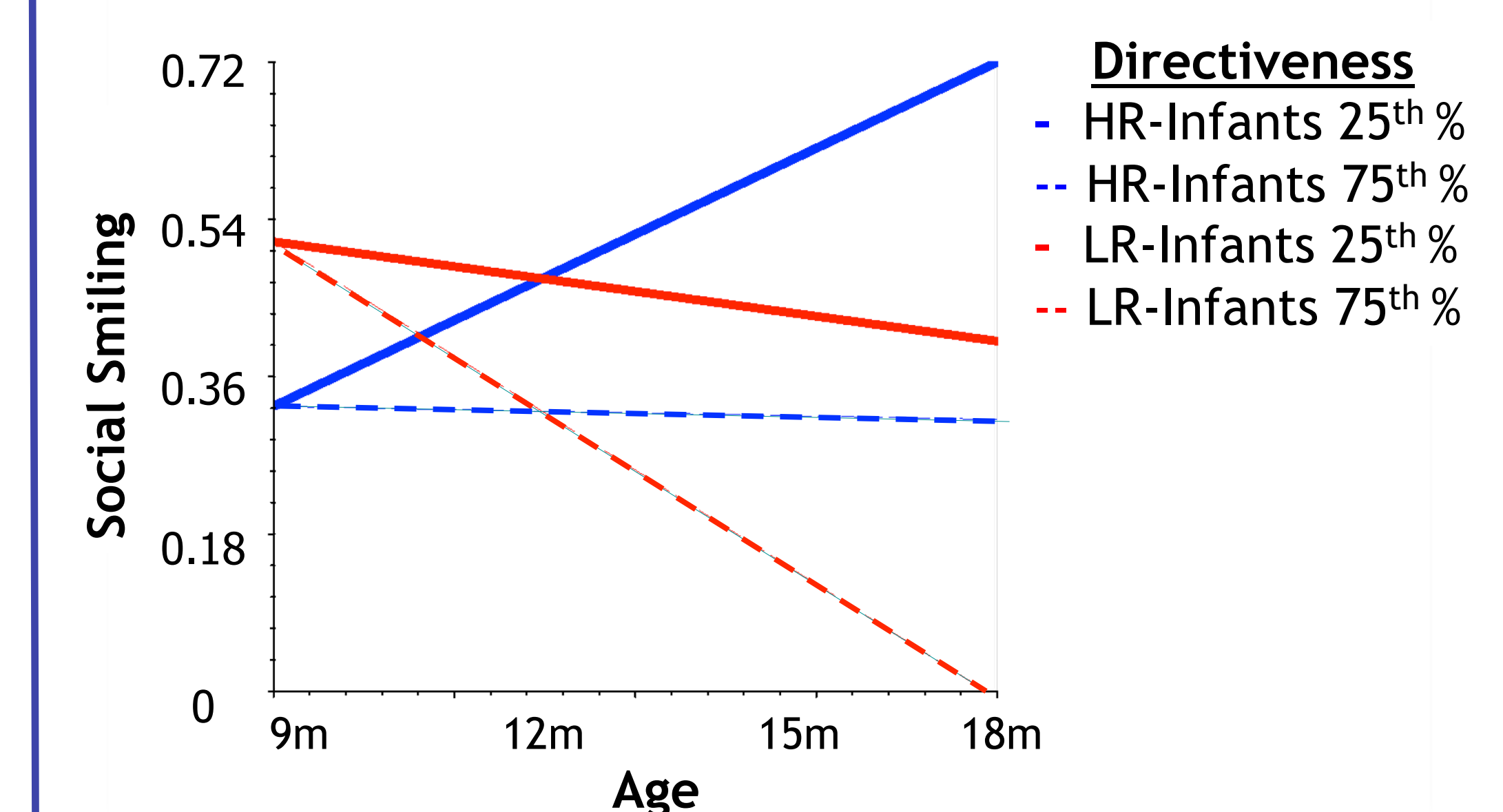
25th%: 25th percentile (low directiveness)
75th%: 75th percentile (high directiveness)

Final Model for Linear Growth			
Predictor	B	SE B	p
Maternal Directiveness 9m	-0.01	0.004	0.02
Group	-0.06	0.02	0.02
Maternal Directiveness 9m*Group	0.004	0.007	0.5

Conclusions

- The present findings of an association between high maternal responsiveness and increased growth of social smiling (for both groups) are consistent with previous research linking maternal responsiveness with positive developmental outcomes for children at high and low risk for developmental challenges.

- Our finding that higher levels of early maternal directiveness are associated with slower growth in infant social smiling suggests the need to further explore the construct of directiveness, to identify specific maternal behaviors that may be more and less facilitative of development across different domains and within different contexts, particularly for high-risk infants.

- Additional research is needed to: (a) examine potential child influences on maternal behavior, to further clarify the bi-directional processes inherent in parent-child interactions; (b) examine parenting patterns defined by high/low levels in both responsiveness and directiveness; and (c) determine the extent to which this brief lab-based measure is representative of parenting styles in different contexts. Data collection and coding are ongoing.