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Mother–infant mutual eye gaze supports emotion regulation in infancy during the Still-Face paradigm

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ABSTRACT

This study was designed to examine the sequential relationship between mother–infant synchrony and infant affect using multilevel modeling during the Still Face paradigm. We also examined self-regulatory behaviors that infants use during the Still-Face paradigm to modulate their affect, particularly during stressors where their mothers are not available to help them co-regulate. There were 84 mother–infant dyads, of healthy full term 4 month old infants. Second-by-second coding of infant self-regulation and infant affect was done, in addition to mother–infant mutual eye gaze. Using multilevel modeling, we found that infant affect became more positive when mutual gaze had occurred the previous second, suggesting that the experience of synchronicity was associated with observable shifts in affect. We also found a positive association between self-regulatory behaviors and increases in positive affect only during the Still-Face episode (episode 2). Our study provides support for the role of mother–infant synchronicity in emotion regulation as well as support for the role of self-regulatory behaviors in emotion regulation that can have important implication for intervention.

1. Introduction

Emotion regulation is a central issue in developmental research. Recent studies highlight the relationship between infant regulation and socio-emotional outcome (Denham et al., 2003; Eisenberg et al., 2003). The ability to regulate emotions has been associated with the development of social competence (Denham et al., 2003; Eisenberg et al., 2003), conscience (Kochanska, Murray, & Coy, 1997), resiliency in early to middle childhood (Eisenberg et al., 1997), and development of secure attachments (Vondra, Shaw, Swearingen, Cohen, & Owens, 2013). In contrast, emotion regulation deficits in early childhood have been linked with later behavioral problems and are considered developmental precursors to childhood psychopathology (Calkins & Dedmon, 2000; Calkins & Fox, 2002; Keenan, 2000). Stifter, Spinrad, and Braungart-Rieker (1999)

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found that emotional reactivity and poor regulation at 5, 10, and 18 months of age predicted noncompliant behaviors, such as defiance and avoidance, at 30 months.

As our understanding of emotion regulation improves, the critical role that the parent–child relationship plays in this process has been increasingly recognized (Calkins & Hill, 2007; Feldman, 2007a). Infants' regulatory capacities are acquired in the context of the parent–infant relationship, as it is in these interactions that infants gradually learn to independently regulate their emotions (Feldman & Eidelman, 2004; Jaffe et al., 2001). Although the process by which infants learn to regulate their emotions is still being studied, research highlights how important synchronous interactions between parent and child are to this process, meaning the temporal matching of micro-level behaviors such as gaze, affect, vocalization, body movements, and arousal indicators (Feldman, 2007a). Studies show that mothers often coordinate their behaviors based on the cues of their infants and that with time, infants and mothers begin to synchronize their behaviors, forming a repetitive-rhythmic organization to mother–infant face-to-face interactions (Feldman, 2012; Jaffe et al., 2001; Lavelli & Fogel, 2013) with both the infant and mother adapting their behavior based on each other. Many have shown that the adaptation of mothers' behavior to infants' cues is essential to infants' social emotional development, particularly the development of emotion regulation (Baker & McGrath, 2011; Feldman, 2012; Jaffe et al., 2001). An early longitudinal study by Gable and Isabella (1992), for instance, illustrated how the matching of maternal behaviors to infant's cues predicted later regulatory skills. In their study, mothers who were alert, attentive, and displayed appropriate levels of stimulation with their one month old infants during face to face interactions, thereby adapting their behaviors to that of the infant, had infants who showed better regulatory skills at four months of age. Though different terms, such as maternal responsivity, maternal sensitivity, and maternal attunement, are used to describe the process by which mothers adapt their behaviors to infants' cues and needs, mother–infant synchrony is the only one to capture this process on a temporal, micro-level basis (Feldman, 2007a).

Through his analysis of the structure and timing of mother–infant interactions, Daniel Stern was one of the first to describe the critical role face-to-face mother–infant interactions play in the infants' developing understanding of the social world (Stern, 1974, 2009). His analysis of mother–infant interactions highlighted how the regulation of affect and arousal within interactions occurs through moment to moment coordination of maternal and infant behavior, describing this coordination as a dance that allows optimal affect and arousal to be maintained. Stern as well as others (e.g., Beebe, 2006; Brazelton, Koslowski, & Main, 1974; Condon & Sander, 1974; Field, 1984; Jaffe et al., 2001; Tronick & Cohn, 1989) emphasized that to regulate the high arousal found in face to face interactions, mothers and infants learn to synchronize their behavior. Through the repeated co-occurrence of social gaze, matching of affective states, co-vocalization, coordination of body tone and movements, and matching of arousal level, infants begin the process of learning how to regulate their own affect and arousal (Feldman, 2007a).

In their analysis of the contingencies and structure mother–infant interactions and their Mutual Regulation Model, Tronick and colleagues also emphasized the importance of synchronicity (Beeghly & Tronick, 1994; Tronick, 2007; Tronick & Cohn, 1989). Their work highlighted how typical interactions move between coordinated/synchronous states and miscoordinated/asynchronous states where both members of the dyad adjust his/her behaviors to that of the other in an attempt to maintain coordinated states. Through mutual regulation and the active participation of the mother and infant, the dyad moves from miscoordinated/asynchronous to coordinated/synchronous states, a process referred to as repair. According to this model, both coordinated/synchronous states as well as repairs generate positive affective states while miscoordinated/asynchronous states generate negative affect (Tronick, 2007). Tronick (2007) further highlighted how it is through repeated reparation from miscoordination to coordination that infants learn the communicative and coping strategies necessary for emotion regulation.

Through her early work examining the interaction patterns of depressed mothers and infants, Field and her colleagues also emphasized the importance of synchronous interactions by illustrating the impact of asynchroncity (e.g., Field, Healy, Goldstein, & Guthertz, 1990). Her work illustrated how compared to optimal mother–infant interactions whereby a mother carefully modulates her behaviors in response to her infant's cues and synchronizes her behaviors in order to provide adequate stimulation, promoting matched interactions, the interactions of depressed mothers and infants show more distress and are characterized by non-contingent and asynchronous behaviors (Field, 1984; Field et al., 1990). Consistent with this, Feldman et al. (2009) showed that compared to nondepressed mothers, depressed mothers took five times longer than controls to reach the first episode of gaze synchrony and the period gaze synchronicity were seven times longer.

Longitudinal studies by Feldman and colleagues have also highlighted the developmental impact of synchroncity, showing that mother–infant synchrony early in the child's life is predictive of children's later attachment security, increased levels of empathy, and lower behavioral difficulties across childhood and adolescence (Baker & McGrath, 2011; Evans & Porter, 2009; Feldman, 2007a, 2007b, 2007c). Studies by Feldman and her colleagues have specifically highlighted the role of synchronicity in the development of regulatory capacities. In a study examining mother–infant affect synchrony, the matching of affective states at 3 and 9 months predicted self-control (a component of emotion regulation that required children to comply with maternal requests), at 2, 4, and 6 years (Feldman & Greenbaum, 1997). Feldman and colleagues identified similar findings with mutual eye gaze at 5 months predicting self-control at 33 months in a sample of Israeli dyads (Feldman, Masalha, & Alony, 2006). In a sample of children born preterm assessed at discharge, 3, 6, 12, and 24 months adjusted age, and at 5 and 10 years, Feldman, Magori-Cohen, Galili, Singer, and Louzoun (2011) reported that mother–child synchrony measures predicted self-regulation at the next assessment point, particularly regulation measures assessing emotion regulation. Taken together, these studies highlight the lasting importance of parent–child synchronicity in the development of regulation skills.