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The effect of mother–infant skin-to-skin contact on infants' response to the Still Face Task from newborn to three months of age

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ABSTRACT

The effect of mother–infant skin-to-skin contact on infants' developing social expectations for maternal behavior was investigated longitudinally over infants' first 3 months. Infants with and without skin-to-skin contact engaged with their mothers in the Still Face Task at ages 1 week, 1 month, 2 months, and 3 months. Infants with skin-to-skin contact began responding to changes in their mothers' behavior with their affect at 1 month; infants without skin-to-skin contact did so at 2 months. At 3 months, infants with skin-to-skin contact increased their non-distress vocalizations during the still face phase, suggesting social bidding to their mothers. Skin-to-skin contact accelerated infants' social expectations for their mothers' behavior and enhanced infants' awareness of themselves as active agents in social interactions.

1. Introduction

Infants' early knowledge of self and other emerges with their awareness of the relation between their own actions and the social responses of others. This perceptually based knowledge, which occurs prior to representational thought, arises from infants' detection of the effect of their behavior on the external changes they perceive in their partner's behavior (Neisser, 1991, 1993). Infants can detect the relation between their own actions and the actions of a responding partner from a young age, possibly from birth. The awareness of the relation between their own actions and those of others allows infants to develop a sense of self efficacy in their social exchanges and builds expectations for others' behavior.

For most infants, this early perceptual understanding of self and other occurs readily in their interactions with others. Some infants, however, are at risk for acquiring this early knowledge, either through physical disability, such as blindness (Bigelow, 1995), or family circumstance, such as maternal depression (Field, Healy, & LeBlanc, 1989). These risks to infants' self efficacy are associated with delays or impairments in cognitive and social-emotional developments. Research on interventions to reduce such delays or impairments has typically involved infants from the risk populations (e.g., Field, 1995; Fraiberg, 1977). Yet knowing whether a proposed intervention operates to facilitate infants' early self knowledge is crucial. Thus, one strategy is to determine whether a proposed intervention facilitates the targeted development in low-risk infants. The present study investigated whether mother–infant skin-to-skin contact (SSC) affects infants' early understanding of self and other in a low-risk community sample of infants.

In SSC, the baby is placed between the mother's breasts dressed only in a diaper so that frontal body contact of mother and infant is skin-to-skin; the infant is secured and the mother is covered. In this way, the mother provides warmth and stimulation that simulates the prenatal environment. In the 1970s, Drs. Rey and Martinez began using the method in Colombia

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as a means of treating premature infants when incubators were overcrowded (Whitelaw & Sleath, 1985). The infants survived as well or better in SSC at home than if they remained in incubators in hospital.

In the past 30 years, the benefits of mother–infant SSC for premature and full-term infants have been extensively researched. Studies have shown that compared to newborns who do not have SSC with their mothers, newborns with SSC have more stable temperatures, heart rates, respiratory rates, and gastrointestinal adaptation (Bauer, Sontheimer, Fischer, & Linderkamp, 1996; Cleary, Spinner, Gibson, & Greenspan, 1997; Conde-Agudelo, Diaz-Rossello, & Belizen, 2000; Feldman, Eidelman, Sirota, & Weller, 2002; Fohe, Kropf, & Avenarius, 2000; Ludington-Hoe, Anderson, Swinth, Thompson, & Hadeed, 2004; Moore, Anderson, & Bergman, 2007). The infants' sleep is more restful (Feldman & Eidelman, 2003; Messmer et al., 1997), they cry less (Christensson et al., 1992; Christensson, Cabrera, Christensson, Uvnas-Moberg, & Winberg, 1995; Ferber & Makhoul, 2004; Michelsson, Christensson, Rothganger, & Winberg, 1996), grow faster (Bergman & Jurisoo, 1994; Lincetto et al., 1998; Rojas et al., 2003), breastfeed longer (Charpak, Ruiz-Pelaez, Figueroa de Calume, & Charpak, 2001; Meyer & Anderson, 1999), experience less pain from routine procedures (Gray, Miller, Philipp, & Blass, 2002; Gray, Watt, & Blass, 2000), and go home from hospital sooner (Cattaneo et al., 1998; Charpak, Ruiz-Pelaez, Figueroa de Calume, & Charpak, 1997; Charpak et al., 2001), thereby saving hospitals and health systems money. Most of the research on the benefits of SSC to infants has been conducted exclusively in the newborn period. Some of the studies have not controlled for confounding factors or had rigorous methodologies. Yet the converging evidence indicates that SSC has a positive effect on infants' neurophysiological adjustment to postnatal life (Charpak, Ruiz-Pelaez, & Figueroa de Calume, 1996; Ludington-Hoe & Swinth, 1996; Moore et al., 2007).

There are few studies that have investigated the effects of SSC beyond the newborn period or on infants' cognitive and socio-emotional development. Those that have suggest that the benefits of SSC persist after contact has ended and extend to social cognitive developments in both premature and full-term infants. Feldman and colleagues (Feldman, Eidelman et al., 2002; Feldman, Weller, Sirota, & Eidelman, 2002) found that, compared to infants who did not receive SSC, infants at 3 months who received SSC as newborns had more efficient arousal modulation to novel stimuli, and at 6 months were more advanced in toy exploration and shared attention with mother. Ohgi et al. (2002) found that infants at 6 months who had previous SSC showed better state organization and orientation. At 12 months, infants with SSC experience performed better on infant development scales than infants without such experience (Feldman, Eidelman et al., 2002; Ohgi et al., 2002; Tessier et al., 1998).

Multiple reasons have been proposed for why SSC in the newborn period would facilitate infants' subsequent social cognitive development (Feldman, Eidelman et al., 2002; Feldman, Weller et al., 2002). The post-birth period constitutes a sensitive period for maternal contact in animal and human models (Field, 1995; Lehmann, Stohr, & Feldon, 2000; Scafidi et al., 1990; Wigger & Neumann, 1999), and tactile and proprioceptive stimulation are primarily important during this time (Gottlieb, 1976, 1991). SSC improves infants' state organization, particularly infants' sleep/wake cycles, as well as improves stress reactivity and physical maturation (Feldman, Weller et al., 2002; Michelsson et al., 1996). Such early physiological and behavioral regulation predicts later cognitive development (Beckwith & Parmelee, 1986; Doussard-Roosevelt, Porges, Scanlon, Alemi, & Scanlon, 1997; Feldman, Greenbaum, Yirmiya, & Mayes, 1996; Sigman, Cohen, & Beckwith, 1997). Mother–infant SSC also may facilitate infants' social cognitive development by increasing mothers' sensitivity to their infants. Mothers who provide SSC for their infants report more positive maternal feelings, positive perceptions of their infants, less depression, and more empowerment in their parenting role (Affonso, Bosque, Wahlberg, & Brady, 1993; Johnson, 2007; Neu, 1999; Roller, 2005; Tessier et al., 1998; Whitelaw, 1990). Yet again, most studies of the effects of SSC on maternal feelings and behavior have been conducted only in the newborn period; however, some have shown increased maternal behaviors of holding, touch, and infant-directed speech throughout the infants' first year (DeChateau & Wiberg, 1977, 1984; Feldman, Eidelman et al., 2002). SSC may promote infants' social cognitive development by affecting infants' behavioral and physiological regulation and mothers' maternal behaviors. Thus in mother–infant interactions, infants with SSC experience may have enhanced understanding of the relation between their own actions and their mothers' social responsiveness to them.

The Still Face Task has been used to examine infants' awareness of the effect of their behavior on others' responses. This task, first reported in a seminal study by Tronick, Als, Adamson, Wise, and Brazelton (1978), has mothers or other social partners engage infants in normal face-to-face interaction, then become suddenly still and expressionless, and then resume normal interaction. Infants tend to exhibit reduced visual attention and decreased positive affect, as demonstrated by changes in smiling and non-distressed vocalizations, during the still face phase compared to the interactive phases. Such change in the infants' behavior, known as the still face effect, has been shown in numerous studies, typically with infants between 2 and 9 months of age (Adamson & Frick, 2003; Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2009).

Studies using the Still Face Task with infants younger than 2 months are scarce. Tronick et al.'s (1978) original study examined 1–4 month old infants and found the still face effect or carryover effect at all ages. Carryover effects occur when the reduced attention or positive affect in the still face phase is maintained after normal interaction is resumed, indicating infants' behavior is influenced not only by the nature of the current display but also by expectations set up in the previous episode. Carryover effects are common in the Still Face Task (Fogel, Diamond, Langhorst, & Demos, 1982; Tronick et al., 1978), particularly at younger ages, suggesting younger infants do not recover from the perturbation of the task as readily as older infants. Bertin and Striano (2006) presented newborns, 1.5-, and 3-month-old infants with the Still Face Task. They found that the two older groups of infants showed a decrease in attention and positive affect in the still face phase compared to the initial interactive phase, but the newborns did not, although their attention showed a trend in this direction. Two other studies have presented the Still Face Task to newborns. Nagy (2008) found that neonates showed carryover effects with