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Emotional Availability and Touch among Deaf and Hearing Mother-Infant Dyads

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EMOTIONAL AVAILABILITY AND TOUCH AMONG DEAF AND HEARING MOTHER-INFANT DYADS

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Much attention has been paid in past literature to deaf children's development, especially in regard to how they compare to their hearing peers over time. Most deaf children (approximately 90%) are born to hearing parents. In these cases, the child's hearing impairment can be difficult to accommodate due to the parents' lack of familiarity with ways of interacting without heavy reliance on the auditory modality. Using Deaf parents as a model for comparison, previous research has found that frequent use of touch for purposes of gaining attention is an important strategy when interacting with a deaf child.

The purpose of this study is to serve as a constructive replication of a previous study which examined emotional availability (EA) and amount of touch used by hearing parents and their hearing or deaf/hard of hearing infants (Pipp-Siegel, Blair, Deas, Pressman, and Yoshinaga-Itano, 1998). The current study is a constructive replication because it examines EA and touch, which are the same constructs used in the Pipp-Siegel et al. (1998) study, but with the addition of Deaf parents. Also, the *functions* of touch displayed during 10 minute free-play interactions were coded, rather than only the overall frequency as in the Pipp-Siegel et al. study.

The current study's findings differed from Pipp-Siegel et al.'s results in regard to directions of correlations and/or significant findings. Comparisons among all four groups revealed significant differences for sensitivity and child responsiveness, and hearing mothers with deaf infants tended to score lowest in means for the various subcategories of EA. Significant differences were found among all four groups for attentional and total touch, with hearing mothers of *hearing* infants using the least amount of touch during their interactions. It is of particular interest, however, that hearing mothers do appear to be adjusting their behaviors so as to incorporate more tactile contact when interacting with a *deaf* infant. Thus, their behaviors on this measure look somewhat more similar to those of Deaf mothers, who use touch frequently and effectively to maintain their child's attention.

Implications about the importance of support and interventions for hearing mothers with deaf infants are discussed.

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Emotional Availability and Touch among Deaf and Hearing Mother-Infant Dyads

Of the approximately 5000 deaf children born each year to American families (Thompson, McPhillips, Davis, Lieu, Homer, & Helfand, 2001), more than 90% of them are born to hearing parents (Marschark, 1993b). To be clear about the term "deafness", the following is a breakdown of the levels of hearing loss typically used, according to Frazier-Maiwald and Williams (1999): mild loss (25 to 40 dB), moderate loss (40 to 65 dB), severe loss (65 to 90 dB), profound loss (over 90 dB). Individuals in the "mild" range of hearing loss may also be referred to as "hard of hearing". In order to understand the many implications of this fact for the development of deaf children raised by hearing parents, it is necessary to discuss the 10% born to Deaf[1] parents and to examine characteristics of their interactions that might make these families unique. These dyads serve as models for comparison with hearing parents of deaf infants and can provide useful guides regarding communication patterns that could be helpful in terms of intervention.

While there is considerable research documenting the early development of children born with hearing loss, few investigators have included Deaf parents in their observations or analyses. As mentioned above, since 90% of deaf children are born to hearing parents, this neglect in the research may not be a result of intention so much as lack of availability of the other 10% (Deaf parents of deaf infants), since access to this sample is rather limited.

In 1987 (and continuing until 1995), researchers with the Gallaudet Infancy Study began collecting data on Deaf or hearing parents with their deaf or hearing infants. Prior to this, few studies were published on deaf children younger than the age of two and so it seemed pertinent

[1] The standard protocol within the Deaf community and related literature is to capitalize Deaf when referring to adults who presumably identify with Deafness as a "culture". It is assumed that hearing people do not make this distinction or identification, and that deaf children are not yet old enough to do so. This protocol will be followed in the current paper as is consistent with publications about Deaf Studies that typically require this.

to the authors to begin a large scale, longitudinal study of the beginnings of development for deaf children (Meadow-Orlans, Erting, & Moores, 2004). In addition to its 12-month longitudinal design, collecting data on infants at ages 6, 9, 12, 15, and 18 months to examine their social, cognitive, and communicative development, this data set is unique in its inclusion of Deaf parents and their infants. It is therefore rife with data that can be used to examine a multitude of questions and to make a variety of comparisons among the four combinations of dyads (Deaf parent/deaf infant, hearing parent/deaf infant, Deaf parent/hearing infant, hearing parent/hearing infant).

This report will first summarize the literature related to Deafness in the context of parent-child communication in the early years. Particular emphasis will be placed on two important aspects of maternal behaviors: 1) emotional responsiveness and its relationship to emotional availability; and 2) the importance of touch as a component of the communication system that has special relevance for deaf children and their parents. These topics will be discussed in relation to child outcomes for both deaf and hearing children.

The inspiration for the current study was a previous one conducted by Pipp-Siegel, Blair, Deas, Pressman, and Yoshinaga-Itano (1998) which looked at emotional availability and touch among hearing mothers with either their hearing or deaf infants. Their findings will be described in detail as background for ways in which the current study was modeled after and varied from theirs. In the methods, hypotheses, and results sections, the similarities and differences of the Pipp-Siegel et al. (1998) study and the current one will be elucidated.

In addition to the methods and analyses, the discussion section will focus on potential implications of the findings, reiterate the importance of emotional availability and touch in the Deaf populations, and explore limitations affecting the current study.

Deafness – Children, Parents, and Communication

From the time they are born, both deaf and hearing children are immersed in a world of language. Infant-directed speech (IDS), also known as motherese or more colloquially as "baby talk," is an important part of the young child's language development. Not only does IDS help infants to learn to speak sooner (Thiessen, Hill, & Saffran, 2005), but it is a universal phenomenon found across cultures (even those that are indigenous, nonindustrialized, and nonliterate) (Bryant & Barrett, 2007). Given this universality, it should come as no surprise that Deaf parents also engage in their version of motherese: infant-directed sign. When communicating with their infant, Deaf parents modify their sign language by simplifying and repeating their signs, using affective facial expressing, and making somewhat exaggerated movements (Erting, Prezioso, and O'Grady Hynes, 1994; Masataka, 1996; Reilly & Bellugi, 1996). This is very similar to vocal motherese in which sentences are shortened, expressions are exaggerated, and pronunciation is clear with distinct pauses between speech segments. Additionally, Deaf mothers will sign on the child's body or move their hands to sign on or near an object that their infant is attending to (Mohay, 2000; Waxman & Spencer, 1997) – something not seen in adult-directed signing.

More corroboration for the universality of IDS comes from Masataka (1992, 1996, 1998) who found similar results. To summarize his work, deaf infants who were signed to in Japanese Sign Language (JSL) showed "greater attentional and affective responsiveness in infants who watched the infant-directed sign than in infants who watched adult-directed sign" (Masataka, 1998, p. 241). This was also true for hearing infants who had never been exposed to JSL, indicating that infants are prepared to detect motherese regardless of the modality (Masataka, 1998). Interestingly, Waxman and Spencer (1997) found that both "hearing and deaf mothers

used a similar proportion of modified (and nonmodified) signs" (p.112) across ages 9, 12, and 18 months in Deaf mother/deaf infant, hearing mother/deaf infant, and Deaf mother/hearing infant groups. This pattern continued as the child aged, with both groups of mothers accommodating their child's maturing ability to coordinate attention between an object and a social partner (Waxman & Spencer, 1997). A final related finding in regard to motherese is that when interacting with their hearing infant, Deaf mothers used their voices more and incorporated more features of motherese, thereby modifying their vocalizations based on their infant's hearing status (Traci & Koester, 1998). This is particularly interesting because, as most hearing children of Deaf parents learn sign language as their first language, it is not necessary for deaf mothers to vocalize in order to communicate with their child (Waxman & Spencer, 1997) yet they do it nonetheless.

Deaf parents' use of infant-directed sign (as well as hearing parents' use of infant-directed speech) can be viewed in terms of intuitive parenting, which Koester, Papoušek, and Smith-Gray (2000) describe as "communication strategies used by parents when interacting with their babies" and "may be related to deafness on either side of the dyad, parent or child" (pp. 56-57). Conceptually, these parenting behaviors can be thought of as parental responsiveness, both in regard to communication and attachment security.

At the core of the concept of intuitive parenting is the notion that parent-infant interactions are didactic, in which the more competent and experienced individual (the parent/adult) is motivated to share his/her knowledge with the less competent and inexperienced individual (the infant). Moreover, there is a discrepancy between the two in their communicative capacities, with the adult having advanced speech and the infant having none. According to the idea of intuitive parenting then, there are parental behaviors that occur intuitively, akin to the

speed of reflexes, of which the purpose is to convey preverbal information to the infant or to otherwise support the infant's immature cognitive and developmental capacities. Interestingly, parents are unaware that they are carrying out these behaviors and find them difficult to control if they do become aware. As Papoušek and Papoušek (1987) state, "The universality of such behaviors indicates the deep phylogenetic roots of observed behavior patterns" (p. 675). It is important to note that the term universal does not mean these behaviors are necessarily seen in every parent. The Papoušeks used a normative sample of German families in most of their own research, and extrapolated findings from other scholars to apply their theory to a variety of cultures and species. Thus, they do not claim that intuitive parenting is something that automatically takes place in all circumstances regardless of culture, mental state, or any of the many other variables that affect parents.

According to Koester and Lahti-Harper (2010), "the notion of intuitive parenting is a useful integrative concept for understanding many of the processes that underlie interactions between parents and infants. The central idea is that caregiving behaviors serve important communicative, motivational, and emotional functions in support of the early adaptation of the immature infant, and may have been selected over time to optimize developmental outcomes" (p. 6). Koester and Lahti-Harper (2010) looked at a broad range of intuitive behaviors including infant-directed sign, imitation of infant behaviors (facial, gestural, and vocal), attention-getting strategies, and repetitive/rhythmic patterns of stimulation. Their results showed that both Deaf and hearing parents displayed many of these intuitive behaviors with their infant. In general though, Deaf parents exhibited a "wider range of subtle communicative strategies that are especially beneficial to the deaf child who is learning sign language" (p. 16). These findings

confirm the idea that certain behaviors may not be as intuitive to some parents (e.g., hearing parents of deaf children) as they are to others.

The majority of hearing parents with deaf children either do not know sign language or have very little skill using it, at least during the child's early years. However, deaf children who are able to participate actively in linguistic interactions with their parents from an early age have been shown to display better competence in social, cognitive, and language development (Vaccari & Marschark, 1997). Thus, it is clear that early communication has vast implications for development beyond just language as children learn not only facts about the world but also "behavioral and cognitive strategies, knowledge of self and others, and a sense of being part of the world" (Vaccari & Marschark, 1997, p. 793).

Part of communication with an infant requires acquiring and maintaining his/her attention. For deaf infants, this means their visual attention, which is why infant-directed sign is necessary and successful with deaf infants. This comes more naturally to Deaf parents than hearing ones. As Erting, Prezioso, & O'Grady Hynes (1994) state, "Deaf mothers have the cultural knowledge about how to interact with their infants…in order to get and maintain their attention, to focus their attention on signing as an activity, and to begin to relate the interaction to the environment in a meaningful way" (p. 106). Deaf parents are more likely than hearing parents to be sensitive to the visual communication needs of their deaf children (Vaccari & Marschark, 1997) and intuitively understand the need to use attention-getting strategies, such as tapping the child or waving within his/her visual field, before initiating signing (Swisher, 2000). Even Deaf parents who use spoken language instead of signing have been found to use extensive gestures to accompany their speech with their preschool-aged deaf children, who in turn develop and use similar gestures in their communication (de Villiers, Bibeau, Ramos, and Gatty, 1993).

However, these kinds of attention-getting strategies are not something hearing parents, especially those without previous experience with signing, are accustomed to incorporating into their interactions with an infant. Hearing parents may unintentionally ignore their deaf child's communicative efforts because they are not used to communicating in a visual-gestural modality. When hearing parents do not adapt to their deaf child's communication needs, as Jamieson (1994) states, "It appears that hearing adults, both parents and teachers, face a tremendous challenge in trying to unlearn habitual communication patterns and to replace them with patterns more appropriate to the visual mode" (p. 446).

Traci and Koester (1998) found that hearing mothers with deaf infants exaggerated their vocal pitch the most (compared to mothers in other hearing status dyads), seeming as though they were compensating for their infants' limited auditory modality. However, hearing parents typically do not adjust their language to make it *visible* for their deaf child and often continue to attempt to communicate in an auditory-verbal mode (Mohay, 2000). Therefore, deaf children of hearing parents are likely to receive only minimal information when they respond to their mothers' bids for attention; in addition, these bids are likely to be inadequate, decreasing in frequency over time. Thus, their communicative interactions are limited and less meaningful as compared to those between hearing or deaf children of Deaf parents (Waxman & Spencer, 1997). As mentioned above, those deaf children who are participating actively in linguistic interactions are more competent in their development, possibly due to having Deaf parents. Alternatively, these children may have "hearing parents who have acquired good sign and/or other communication skills that allow them to have *meaningful interactions* [emphasis added] with their deaf children at a variety of levels" and "the lack of such interactions raises the risk of deaf

(or hearing) children not being able to reach their full potentials" (Vaccari & Marschark, 1997, p. 793).

In the event that hearing parents do try to adjust their strategies, they do so in "clumsy and intrusive ways, such as turning the child's face toward them" (Mohay, 2000, p. 154). Even for hearing parents making the effort to learn sign language, it will take some time until they are not only fluent but also comfortable using the language and understanding its communicative nuances (e.g., tapping for attention). In contrast, Deaf parents have an intuitive understanding of their deaf child's sensory needs and of their need to access language in a visual-gestural mode (Koester & McCray, 2011). Thus, it may be important for interventionists to teach hearing mothers what their deaf child's cues or signals mean in addition to communication and attention-getting strategies (e.g., gestures, facial expressions, interfering with child's line of sight, waving in visual field, tapping) (Koester, 1995; Mohay, 2000; Waxman & Spencer, 1997).

Interestingly, Deaf mothers with hearing infants display modified communicative behaviors that are in between those of Deaf mothers with deaf infants and hearing mothers with deaf infants. According to Waxman and Spencer (1997), Deaf mothers with hearing infants, like hearing mothers with deaf infants, show higher rates of moving objects into their child's line of sight and produce fewer taps and waves on/toward the child as compared to the Deaf mothers with deaf infants. So, although a mismatched dyad, there are intuitive parenting behaviors displayed by Deaf mothers to accommodate their hearing child's sensory capabilities. Knowing their child has auditory abilities (despite having no communicative experience/history with it themselves), they modify their communication patterns (e.g., increasing their vocalizations to obtain attention) because of their child's characteristics (Waxman & Spencer, 1997). Relatedly, Spencer (1993) found that hearing mothers with deaf infants used object-related gestures (e.g.,

"showing objects, moving them to direct the infant's attention, and demonstrating actions with objects") more than hearing mothers with hearing infants. Although this may not support infant language acquisition, it "may support joint attention, effectively serving attention-getting and attention-maintaining purposes" (Spencer, 1993, no page numbers available).

It is important to note that current theories of child development do not view the child as passive. Children are active agents in their environment, and communicative interactions between mothers and their children are bidirectional, regardless of hearing status. As infants learn what elicits responses, they "develop expectations of attention and are more likely to use similar strategies to re-engage the mother when she becomes temporarily unresponsive" (Vaccari & Marschark, 1997, p. 795). Koester, Traci, Brooks, Karkowski, and Smith-Gray (2004) found that deaf infants used repetitious physical activity (e.g., waving their arms, opening and closing their hands, and kicking) more persistently than hearing infants, especially when their mothers failed to respond (i.e., during the Still Face procedure), regardless of maternal hearing status. Thus, infants were already learning their part in communicative interactions, and Deaf mothers seemed to interpret these repetitious movements as early efforts to communicate. Both nonverbal and vocal interactional strategies that develop between mothers and their infants vary depending on the hearing status combination of the dyad. This speaks to the importance of understanding not only the language development of the child but also the social development and how awareness of explicit strategies to enhance interactions with a deaf child is especially important in mismatched dyads. Although not necessary, behavioral compensations (particularly in non-auditory domains) on the parents' part can certainly be beneficial to the parent-child relationship (Vaccari & Marschark, 1997).

However, responsiveness extends beyond just communication. Part of responsiveness is also the emotional aspect that influences a child's attachment security. It is important to keep in mind that communication effectiveness will play a large role in the emotional development of the child. Vaccari and Marschark (1997) speak to this idea, stating that "the earlier establishment of an effective, reciprocal, mother-child communication system should facilitate social development in several ways…providing support for the establishment of a secure attachment bond, and making the mother more 'available' to the child in stressful or educational situations" (p. 795). Obviously, a lack of proper reciprocal interactions precludes any optimal emotional exchange that is to occur between mother and infant.

Emotional and Communicative Responsiveness

Responsiveness has been defined in many ways, but for the purpose of this discussion, it is best to think of it as part of maternal sensitivity. In other words, the concepts of responsiveness and sensitivity are greatly intertwined, as both reflect a mother's ability to understand her child's cues and developmental abilities so as to not over or underestimate her child's skills (Ainsworth, Blehar, Waters, & Wall, 1978; Wakschlag & Hans, 2000). However, not all parents are the same, and their individual characteristics may influence parental responsiveness (Koester and McCray, 2011). These characteristics include personality type, feeling of effectiveness in interactions with infants, perceived social support, and life stress. Moreover, infant characteristics such as temperament, readability, and predictability are also related to parental responsiveness (Bornstein & Lamb, 1992). As Traci and Koester (2010) assert, "in the case of temperament, however, the initial fit between parental expressive communication styles and the infant's receptive abilities and preferences will play an important role in determining the outcome for the deaf infant's early social, emotional, and linguistic development" (p. 205). By appropriately

balancing these factors, parents are able to be responsive caregivers, allowing the young child to develop a sense of security and trust as they explore their environments. In attachment terms, the child would ideally become securely attached.

Taken together, the communication and sensitivity aspects of responsiveness are reciprocal. The more a parent can communicate with his/her child in an appropriately sensitive manner, the more likely the child will have a sense of attachment security. For a hearing parent and deaf child, it may be a longer process to establish a positive parent-infant relationship as compared to a Deaf parent with a hearing child because of the extra hurdle that is needed to be cleared in establishing common ground for communication. However, it is important to note that the presence of matched hearing status does not guarantee secure attachment. Just as many hearing parents with hearing children have insecure attachments, a deaf child could also form an insecure attachment to his/her Deaf parent. Rather, it is simply that Deaf parents can attune more effortlessly to their child as compared to the hearing parent with a deaf child because of the shared experience with the visual-gestural mode of communication (Koester & McCray, 2011). This also does not mean that hearing parents with a deaf child are at a loss and should give up completely. Although parents with anxious or conflicted attitudes toward deafness have deaf children with less secure attachment styles (Hadadian, 1995), hearing parents can adapt to their deaf child's demands, especially with adequate support, and change their interaction patterns so as to meet their deaf child's emotional needs (Koester & McCray, 2011; Lederberg & Prezbindowski, 2000). Thus, consistent with clinical samples, it is the mother's characteristics that play the important role in forming the attachment relationship, not the child's deafness (Lederberg & Prezbindowski, 2000).

Given the discussion of deafness, communication, and parental responsiveness, it is pertinent to discuss further the child's development in relation to the emotional aspects of the parent-child relationship. This provides another framework, related to but differentiated from attachment theory, that guides the hypotheses and methodology of the current research.

Emotional Availability

Grounded in attachment theory, emotional availability (EA) seeks to describe the quality of the parent-child relationship via the emotional exchanges during an interaction (Biringen, 2000; Biringen & Robinson, 1991). Emotional availability is consistent with attachment theory in that the maternal sensitivity and responsiveness that characterize adaptive exchanges between a mother and child over time contribute to a child's attachment security (Emde, 2000). Thus, as noted before, parental responsivity and sensitivity during communication lay the groundwork for the attachment relationship (in hearing or deaf dyads). Aviezer, Sagi, Joels, and Ziv, (1999) found that attachment security is associated with higher emotional availability and conversely, insecure attachments are associated with lower emotional availability. Biringen (2000) suggests that EA not only has a role in predicting attachment (including adult attachment representations) but also in the prediction of or correlation with other aspects of children's development (which will be discussed later).

Emotional availability is a relatively new concept. It was only a few decades ago that Mahler and Emde (as cited in Biringen & Robinson, 1991) used the term to describe a mother's supportive presence that spurs her child on to explore his or her world. In attachment theory, this maternal presence (provided by EA) is known as a secure base (Ziv, Aviezer, Gini, Sagi, & Koren-Karie, 2000). By acting as a secure base, the mother encourages her child to interact and learn from his/her environment by accepting and responding to the child's range of affectivity as

well as scaffolding the exploration (Biringen & Robinson, 1991). However, the mother's physical presence alone is not enough. The mother must be emotionally involved so as to promote pleasure and exploration in the child (Sorce & Emde, 1981). Emde (1980 as cited by Easterbrooks & Biringen, 2000) described EA as the "emotional responsiveness and 'attunement' to another's needs and goals; key is the acceptance of a wide range of emotions rather than responsiveness solely to distress" (p. 123). Thus, secure base behavior is enhanced by optimal emotional availability within the mother-child dyad (Pipp-Siegel & Biringen, 1998).

The aforementioned concepts clearly echo attachment theory as well as move beyond it to incorporate a wider range of contexts, not just distress-comforting or protection interactions (Easterbrooks & Biringen, 2000). A parent's acceptance of both positive and negative emotions, and response to affective expressions, allows the child to practice emotional regulation and exploration – a central developmental task of early childhood (Easterbrooks, Biesecker, & Lyons-Ruth, 2000; Pipp-Siegel & Biringen, 1998). As Volling, McElwain, Notaro, and Herrera (2002) summarize work done by Sroufe, "emotion regulation in the early years [is] a process moving from dyadic coregulation between the infant and caregiver in the first year, to an emergence in toddlerhood of autonomous self-regulation with caregiver-guided assistance, to the eventual internalization of emotional control in the preschool years" (p. 447). This central task is part of the attachment theory idea that "early interactive experience...guide[s] future relational behavior" with parents, peers, romantic partners, and children (Lovas, 2005). Moreover, differences in emotional regulation strategies depend on a caregiver's involvement and emotional availability in responding to an infant's signals (Volling et al., 2002). Thus, children learn adaptive emotion-regulation strategies by observing their caregiver's own self-regulation (Bretherton, 2000; Little & Carter, 2005). Again, EA moves beyond attachment theory as it is a

relational construct that "includes the child's contribution to the emotional regulation of the relationship, by virtue of examining the child's responsiveness to and involvement of the partner in interaction" (Easterbrooks & Biringen, 2000, p. 124).

Emotional availability is theoretically conceptualized into six dimensions, with four assigned to the parent and two to the child. This conceptualization is the framework for the Emotional Availability Scales (EAS), a coding system for assessing the EA constructs in research which allows for significant clinical applications (i.e., helping mother-child dyads in particular areas of EA) (Biringen, 2000; Biringen & Robinson, 1991). These scales were designed to evaluate mother-child interactions that theoretically link to the development of a secure attachment and healthy relationship (or lack thereof) (Lovas, 2005). The individual scales will be discussed in further detail in the Methods section.

Emotional Availability and Child Outcomes. Optimal parental emotional availability allows for a free exchange of emotions between the parent and child (Easterbrooks et al., 2000). Therefore, the more emotionally available a parent is, the more secure the attachment is likely to be (Lum & Phares, 2005). Ainsworth, Blehar, Waters, and Wall (1978) touched upon this concept in their Strange Situation study, indicating that a caregiver's emotional availability, specifically sensitivity, is important in promoting an infant's secure attachment. Ziv et al. (2000) found that securely attached infants had mothers who were more sensitive and structured play more optimally than those of insecurely attached infants; also, the secure infants were more responsive and involving of their mothers in play. Parents' emotional availability, specifically positive affect and sensitivity, is related to children's effortful attention, which promotes both the "intellectual and behavioral repertoire" of the child (Volling et al., 2002). To reiterate from the review on deaf and hearing mother-infant dyads, attention-getting strategies are an important part

of early parent-child communication (and of course play a unique role in the case of deaf infants). Furthermore, maternal responsiveness and overall EA are related to child compliance (Lehman, Steier, Guidash, & Wanna, 2002; Volling et al., 2002) and securely attached children are better able to regulate their negative affect (Volling et al., 2002). These findings underscore the importance of EA as comprised of both the parent-child attachment relationship as well as the quality of dyadic interactions.

Conversely, insecure attachments are characterized by difficulties in responsiveness, limited affective communication, and a restrictive range of emotional expression (Easterbrooks et al., 2000). Maternal sensitivity, infant responsiveness, and infant involvement are significantly less than optimal in these dyads (Ziv et al., 2000). This emotional unavailability is possible even when a mother is physically present and can be more distressing than actual physical absence in that it can lead to maladaptive functioning (i.e., emotional/behavioral problems) in the child (Lum & Phares, 2005). Some even suggest maternal unavailability to be worse than neglect or abuse (Egeland & Erickson, 1987 as cited in Ziv et al., 2000). Thus, emotional availability focuses on the positive aspects of the affective exchange, as provided by maternal emotional presence (Ziv et al., 2000). It also emphasizes the bi-directional nature of this early relationship, rather than focusing primarily on the infant (as in the attachment paradigm) or primarily on the caregiver (as in theories about maternal sensitivity).

Easterbrooks et al. (2000) found that at age seven, children who had secure attachments in infancy had more open and well-functioning emotional dialogue with their mothers than those with insecure attachments. Moreover, indicators of emotional availability (maternal sensitivity and structuring, child responsiveness and involvement) in middle childhood were predicted by secure attachment in infancy. This prediction is rather justified, considering that emotional

availability is relatively stable (as is the parent-child relationship) both in short-term intervals (Bornstein, Gini, Suwalsky, Putnick, & Haynes, 2006) and across the lifespan (Lum & Phares, 2005). Interestingly, children's and adolescents' reports of their parents' emotional availability are strongly correlated with parents' reports of their own EA (Lum & Phares, 2005). Also, the EA scales of maternal sensitivity, maternal structuring, child responsiveness, and child involvement are predicted by Adult Attachment Interview (AAI) classifications. (Maternal nonhostility and nonintrusiveness were unrelated to AAI measures.) In general, EA means were higher for mothers with secure attachment representations than those with insecure classifications (Biringen et al., 2000).

Maternal Variables. Psychological unavailability, a predecessor to EA, was developed by Egeland and Erickson (1987 as cited by Biringen & Robinson, 1991) who investigated negative effects of abuse on early development. In a sample of high-risk children, Egeland and Erickson found that one group of mothers was characterized by unresponsiveness to their child, often passively rejecting them, and they appeared to be detached and uninvolved during mother-child interactions. Although these mothers provided for their child's physical needs, they did not display any pleasure or positive responses to their child's attempts to engage in an interaction. They also were not very effective at comforting their child when distressed. Overall, their affect ranged from flat to depressed and they did not seem to derive any enjoyment from the relationship with their child. All of the children from this group of mothers had insecure attachments, with 86% of them classified as avoidant by 18 months. When these children reached their preschool years, they were less compliant, had poor social skills with peers, were more dependent on their teachers, and were more angry, impulsive, and withdrawn. Volling et al. (2002) posited that insecure-avoidant children minimize their emotional expression as a way to

cope with their rejecting caregiver and that insecure-resistant children maximize emotional expression so as to elicit care from an emotionally unavailable caregiver. These findings echo the aforementioned notion about different attachment patterns and later relational behavior.

Being that a child is so closely intertwined with his/her mother, it only makes sense that emotional availability in the mother-child interaction is so affected by maternal variables. One such variable, maternal depression, negatively affects mothers' sensitivity toward their children's signals and needs, which in turn creates an insecure mother-child attachment (Van Doesum, Karin, Hosman, Riksen-Walraven, & Hoefnagels, 2007). Another variable related to emotional availability is maternal mind-mindedness – the ability to understand and interact with infants as individuals with minds, not just as beings that need to have their needs met. By being able to focus on their child's mental attributes, mothers are able to be more emotionally available, particularly with non-hostility, while interacting with their child (Lok & McMahon, 2006). In regard to education, no correlation was found between mothers' education and EA (Biringen, Damon, Grigg, Mone, Pipp-Siegel, Skillern, & Stratton (2005); however, maternal education does predict sensitivity, structuring, and nonhostility (Biringen, Brown, Donaldson, Green, Krcmarik, & Lovas, 2000), all of which are specific elements of EA.

Deafness & Emotional Availability

In addition to the aforementioned outcomes of children's attachment patterns, a strong association has been found between quality of attachment and the infant's language development. Specifically, secure children have better language than insecure children probably due to the types of interactions and communication they have with their attachment figures (van IJzendoorn, Dijkstra, & Bus, 1995). This makes sense given that more advanced cognitive development and language acquisition occur when a caregiver effectively responds to a child's

signals and provides feedback to them. Children learn to understand and identify their feelings verbally through interactions with parents (Barton & Brophy-Herb, 2006). In EA terms, this is sensitivity.

In general, sensitive and responsive parenting serves as a positive influence on language development for children, whether they have normal hearing or are deaf or hard of hearing (D/HH) (Pressman, Pipp-Siegel, Yoshinaga-Itano, Kubicek, & Emde, 1998). Specific to maternal sensitivity, Pressman, Pipp-Siegel, Yoshinaga-Itano, and Deas (1999) found it to predict language gains in preschool children with hearing loss, even when the differences between children and families in initial child language level, mode of communication, severity of child hearing loss, and maternal education were controlled. This is important in that children who are D/HH with hearing parents often show language delays and deficits as compared to D/HH children of Deaf parents or normally hearing children of hearing parents. Thus, these children may benefit even more from sensitive parenting (and emotional availability) than children with normal hearing (Pressman et al., 1998).

However, much of the literature on interactions between hearing mothers and their D/HH children states that hearing mothers are more rigid, intrusive, and negative toward their D/HH children as compared to hearing mother and hearing child dyads (Pipp-Siegel & Biringen, 1998; Pressman et al., 1998). Hearing mothers with deaf infants have been observed as being more physically directive, playing “a far more active, if not intrusive role in their children’s day-to-day behaviors than mothers of hearing children” (Marschark, 1993a, p. 15). When comparing hearing mothers and their D/HH or hearing children on structuring and nonhostility, the hearing dyads received higher scores (Pipp-Siegel et al., 1998). A multitude of studies referenced by Pressman et al. (1998) found hearing mothers to comment and respond less to their D/HH child’s focus of

attention or topic choice. Again, these children are likely to be receiving minimal information in their limited communicative interactions (Waxman & Spencer, 1997). Additionally, hearing mothers with D/HH children were found to have more antagonistic verbal exchanges and praise less frequently than mothers in dyads matched for hearing status (Goss, 1970 as cited by Pressman et al., 1998). Not only is there less interaction between these dyads but the D/HH children are less responsive, active, and involving (Pipp-Siegel & Biringen, 1998; Pressman et al., 1998). This obviously leads to questions for this group in regard to EA.

Contrary to the aforementioned studies that found less optimal EA in dyads with D/HH children, Pressman et al. (1998) found no significant differences between hearing mothers of D/HH children and hearing mothers of hearing children for maternal sensitivity. The authors note that "this was surprising" because the mothers of the hearing children had significantly more education than the mothers of the D/HH children (and as previously mentioned, maternal education predicts EA – see Biringen et al., 2000). The authors also mention that although their results are contrary to the many that found less optimal interactions, their research does concur with results from a previous study (see Lederberg & Mobley, 1990) in which no significant differences in attachment were found for D/HH toddlers in the Strange Situation and free play. Pressman et al. (1998) also found that EA predicted child language gain, similar to the aforementioned findings of Pressman, Pipp-Siegel, Yoshinaga-Itano, and Deas (1999). The idea behind this is that "the affective climate of a parent-child relationship… facilitate[s] child development in domains such as exploration and competence in the physical, social, and linguistic worlds" (Pressman et al., 1998, page numbers not available). Interestingly, maternal EA (not child EA) was more predictive of language gain in dyads with D/HH children than hearing children. For children not at risk for language delays (i.e., normally hearing children),

language acquisition may occur typically, even in contexts with less-than-optimal maternal EA. However, for D/HH children who are at risk for language delays, maternal EA becomes "significantly and positively more predictive of language gains" because of "the extra flexibility and sensitivity necessary for hearing caregivers to make compensatory adjustments to the communicative needs of children who are deaf or hard of hearing" (Pressmen et al., 1998, page numbers not available).

In a related study, Koester and Silvia (2010b) looked at attachment behaviors (proximity seeking, contact maintenance, resistance, and avoidance) during the Strange Situation Procedure (SSP), and at maternal EA during a teaching task in the following dyads with mothers and their 18-month-old children: Deaf mothers with hearing infants (D/h), hearing mothers with deaf infants (H/d), and hearing mothers with hearing infants (H/h). Higher maternal sensitivity was associated with lower proximity seeking and contact maintenance by infants in H/d, but not H/h or D/h dyads. Higher levels of maternal hostility were associated with higher levels of resistance by infants in H/d, but not H/h or D/h Dyads. Non-optimal maternal structuring was associated with increased proximity-seeking and contact-maintenance in H/d, but not H/h or D/h dyads. In other words, these infants (in H/d dyads) appear to lack autonomy during the SSP. In the Teaching Task, this pattern is manifested by limited success (according to EA scores) in the child's response to the mother's attempts to instruct. Consistent with some earlier reports, no differences in maternal intrusiveness were found during the interactions for all three dyads (Lederberg & Prezbindowski, 2000).

In the same study (Koester & Silvia, 2010b), differences between the groups for contact-maintenance seem to imply that a reverse trend is occurring with the D/h dyad. Unlike the H/d dyad, the infants with Deaf mothers display more autonomous behavior during the SSP,

indicating an increased level of self-reliance. Hearing children with Deaf parents grow up bilingual and therefore are often expected to interpret for their parents. Perhaps this additional parent-child dynamic makes it understandable that a hearing child of Deaf parents would display increased autonomy during interactions. However, it was hardly expected that this characteristic would be evident as early as age 18 months.

Findings from this study emphasize the need for further research to explore the intricacies of communication in mismatched hearing status dyads. Thus, in line with EA and the "extra flexibility and sensitivity" that Pressman et al. (1998) mentioned, perhaps when a common language is not yet available (as in the case of H/d dyads), emotional attunement takes on a heightened importance or becomes more salient during these early interactions. In other words, it may be that there is a greater need for hearing mothers with deaf infants to be highly sensitive to the child's non-verbal cues and to respond appropriately in the absence of spoken communication. If so, hearing mothers and D/HH children "may be at more risk in social and emotional aspects of interactions" (Pipp-Siegel & Biringen, 1998), thereby benefiting from intervention aimed at emotional availability training to "facilitate children's mastering of age-appropriate social-emotional developmental tasks of childhood" (Pipp-Siegel & Biringen, 1998).

It is obvious by this point that parent-infant interactions are complex and multi-faceted. Just as communication is so intricately intertwined with emotional availability and vice versa, the multiple modalities through which communication may be perceived are also intertwined with these latter two. This leads to the importance of touch. For infants with a hearing loss, the role of tactile contact assumes greater importance and relevance in terms of the effectiveness of early interactions with a caregiver.

Touch

The skin is the largest and earliest maturing sensory system of the human body. Tactile contact is an important part of early development, parent-child interactions, and serves many functions (e.g., comfort, calming, soothing, maintaining alertness) (Stack & Muir, 1992). Touch contributes to an infant's overall health, emotional development, supports physical growth, and increases social responsiveness (Eliot, 1999; Stack & Muir, 1992; Tronick, 1995). However, one of the lesser explored roles of touch is that of communication (Stack & Muir, 1992). Not only is sense of touch highly developed at birth, but the newborn has more somatosensory nerve endings than adults, which means that the infant is "particularly *receptive* to touch as a language of communication with social partners" (Koester, Brooks, & Traci, 2000).

Mothers commonly use tactile stimulation during face-to-face interactions with their babies. During the still-face procedure in which a period of neutral, nonresponsive gazes at a young infant (around 3 months old) follows normal interactions (with touch permitted), the babies often become distressed. Some posit that maternal touch during the normal interaction periods facilitates infants' attention (Stack & Muir, 1992). Koester, Brooks, and Traci (2000) expand on this idea in regard to deafness, stating that not only does touch elicit visual attention, but also that it helps to maintain contact when the deaf child has looked away, alert the infant that signed communicating is coming, and even regulate emotions. In a series of studies by Stack and Muir (1992), findings showed that 5 month olds would respond positively to active (as opposed to passive) touch by both mothers and female strangers even if they were still-faced. Stack and Muir (1992) speculated that this active touch "serves to regulate the infant's state, keeping a receptive mood in place for receiving affective signals from the adult's face and voice" (p. 1522).

In regard to the communicative function, Stack and Muir (1992) mention that the tactile stimulation may serve as a social signal sent by the adult to "carry on mutually reciprocal interchanges with their infants" (p. 1523). In other words, the infant is learning to return signals and continue the "conversation" (Stack & Muir, 1992). An adult's touch (assuming it is gentle, playful, and appropriate in nature) leads to an infant's smile, which in turn leads to an adult's vocalization, leading to an infant's gaze, and so on. Parents intuitively respond to these signals or "body language," which are the preverbal infant's form of "expressive communication" (Koester, Brooks, & Traci, 2000). This, in essence, is the beginning stages of turn-taking, a very important skill that promotes communication, language development, and early adult-infant social interaction. As Vaccari and Marschark (1997) state, "During the earliest stages of social interaction, mother and child become attuned to each other through the development of *synchrony* and *reciprocity*" (pp. 793-794). Although not a verbal exchange, the infant is communicating needs, comfort level, states of arousal to which the parent responds with appropriate caregiving behaviors (e.g., gestures, touch, stroking). Furthermore, this may contribute to the child's social development as they learn the boundaries between self and other.

For deaf children in particular, their mothers' use of highly salient sensory channels helps them learn to communicate in a visual-gestural modality. Thus, it is not the language modality but rather language ability and availability of models that are important, and varied sensory input can promote curiosity in young children. Pipp-Siegel et al. (1998) found that between hearing and deaf children of hearing mothers, "the number of maternal and child touches increased with the severity of hearing loss" (no page numbers available). They speculate that in dyads that have at least one member with hearing loss, the use of touch may be a compensatory mechanism (Pipp-Siegel et al., 1998). As long as they are rhythmically patterned, child-directed

vocalizations can be replaced by visual and tactile cues (Vaccari & Marschark, 1997). However, this can potentially be a problem in mismatched hearing status dyads in which the mother does not know how to intuitively compensate with sensory input for her infant (e.g., hearing mothers not increasing their use of visual activities and multimodal games with their deaf infant; deaf mothers not increasing the rate and pitch variability of their vocalizations to their hearing infant). Understanding that touch is an important factor when visual-gestural communication is required would be more natural for a Deaf parent than a hearing one and may take some learning, remembering, and conscious effort on the latter's part. For example, just as hearing parents exaggerate their pitch in IDS, Deaf parents intuitively use touch in their tap/sign strategy in which they tap (often a double tap) on the infant's body to alert them that a sign is coming (Koester, Brooks, & Traci, 2000). Waxman and Spencer (1997) found this exact pattern in that, although hearing mothers of deaf infants would tap or point to an object to gain their child's visual attention to the object, hearing mothers did not adopt the strategy of tapping on the child or waving in their visual field. Thus, it does not appear to be an intuitive attention-getting strategy for hearing parents yet is "transmitted culturally" among the Deaf so as to teach children to coordinate attention between an object and a social partner (Waxman & Spencer, 1997).

However, this is not to say that hearing parents are incapable of communicating with their deaf children. Spencer (1993) found that hearing mothers with deaf infants used more gestural and tactile communication as compared to hearing mothers with hearing infants. In other words, they "directed as much language toward infants with hearing loss as toward hearing infants" (Spencer, 1993) and these mothers tried to communicate and interact with their infant in verbal and nonverbal ways, even though their object-related gestures and physical manipulations may have served a communication purpose rather than stimulating language development. As

Spencer (1993) notes: “Only 6 of the 18 mothers of infants with hearing loss ever signed to their infants on a regular basis, and only 3 of those mothers produced significant amounts of signed language. It is not surprising, therefore, that only 4 HL [hearing loss] infants produced any signs expressively at 18 months” (no page number available).

Rationale

The purpose of this study is to serve as a constructive replication of a previous study by Pipp-Siegel, Blair, Deas, Pressman, and Yoshinaga-Itano (1998), entitled “Touch and emotional availability in hearing and deaf or hard of hearing toddlers and their hearing mothers”.

The purpose of the Pipp-Siegel et al. (1998) study was twofold: 1) to examine the role of interpersonal touch in hearing or deaf/hard of hearing children with their hearing mothers; and 2) to examine the role of touch in the context of the quality of the interactions between hearing mothers and their hearing or deaf/hard of hearing children. This study had 48 dyads, half with children who were deaf/hard of hearing and the other half with children who were hearing. Both groups had hearing mothers. The deaf/hard of hearing group included 17 males and 7 females, ages 18-29 months (M = 22.75, SD = 2.72), and was primarily Anglo-American. The hearing group included 17 males and 7 females, ages 14-29 months (M = 22.71, SD = 3.79), and was primarily Anglo-American. The hearing and deaf/hard of hearing children were matched based on gender and age (+/- 4 months).

In their study, dyads were videotaped during a free play session, with mothers being instructed to engage in free play as normal. The first 10 usable minutes of recordings were coded for the number of touches and emotional availability. These two codings were done by separate coders. Touch was measured in frequencies for touch initiated by the mother and touch initiated by the child. Emotional availability was coded according to the Emotional Availability Scales,

which are described in the Measures section later in this study. Pipp-Siegel et al. also reported having used an additional scale to measure "child hostility", but this was not used as part of the dissertation study as it was not directly related to the planned hypotheses or rationale.

The following are the main findings from the Pipp-Siegel et al. study, categorized according to those authors:

1) *Quantity of touch*: Mothers initiated touch more often than did their hearing or deaf/hard of hearing children. In dyads with deaf/hard of hearing children, both mother and child touched more than their hearing counterparts, with more touches observed as the severity of hearing loss increased.

2) *Relationships among all variables (except touch)*: Maternal sensitivity, child responsivity, and child involvement were significantly correlated with each other and combined into the score labeled "emotional openness". Interactions involving higher maternal hostility were less likely to show maternal sensitivity and child responsivity and more likely to show child hostility. Moreover, interactions that included child hostility were characterized by less child responsivity and involvement.

3) *Relationship between emotional availability and hearing status*: Contrary to previous research (according to Pipp-Siegel et al.), emotional openness did not differ based on child hearing status and mothers of deaf/hard of hearing children were not found to be less sensitive than mothers of hearing children. Also, deaf/hard of hearing children were not found to be less responsive or involved than their hearing counterparts. In accordance with previous research, mothers of deaf/hard of hearing children were found to structure their children's play more than mothers of hearing children; however, both were in the optimal range of structuring. Also in line

with previous research, twice as many mothers of deaf/hard of hearing children showed more hostility than mothers of hearing children.

4) *Relationships among touch, emotional availability, and hearing status*: For hearing children, higher maternal touch was significantly correlated with lower maternal sensitivity, child involvement, and emotional openness as well as the presence of maternal hostility. For deaf/hard of hearing children, higher maternal touch was correlated with the presence of child hostility. "Interactions between children and their parents that were characterized by maternal hostility were marginally correlated with decreases in touch by both children who are deaf or hard of hearing and their parents" (Pipp-Siegel et al., 1998, no page number available). Mothers of hearing children who exhibited hostility touched significantly more ($r = .61$, $p = .002$). Mothers of deaf/hard of hearing children who exhibited hostility touched their children less ($r = -.40$, $p = .042$). Thus, "maternal hostility accounted for most of the variance in parental touches"; recall, however, that only *hearing* mothers were used in this study (Pipp-Siegel et al., 1998, no page number available).

Specifically, the current study models Pipp-Siegel et al.'s work by examining the relationship between touch and EA in both Deaf and hearing mother-infant dyads during a 10 minute free play interaction. As Lederberg and Prezbindowski (2000) mention, "The impact of child deafness on mother-child relationships has traditionally been examined by noting defining features of maternal and child behavior during free play" (p. 79). Therefore, the previous study was modified by including Deaf mothers but was based on observations similar to those used in the original investigation. Thus, instead of Pipp-Siegel et al.'s two groups (hearing mother with a hearing child or hearing mother with a deaf /hard of hearing child), this study added Deaf mothers with a hearing child and Deaf mothers with a deaf child. This study also extends the

Pipp-Siegel et al. study by including function (or quality) of touch rather than just frequency/quantity. As Pipp-Siegel et al. (1998) note in their discussion, “An important question is whether the quality – not just the quantity – of touch differs between hearing children and children who are deaf or hard of hearing” (no page numbers available).

This study also differs from the Pipp-Siegel et al. study in that it uses only 18-month-old children rather than those from a broader age range (14-29 months). However, this seems justifiable in terms of the developmental similarities among children within this age range. Moreover, the original Gallaudet Infancy Study only collected data on children up to 18 months old, and yet this represents one of the very few data sets to have included Deaf mothers and will therefore allow an important extension of previous research with this population.

Methods

Background

The original database resulted from a longitudinal project (referred to here as the Gallaudet Infancy Study) investigating the impact of early deafness on the cognitive, social, and communicative development of deaf and hearing infants with their Deaf or hearing mothers in the first 18 months of the child's life. The Gallaudet research was supported by grants from the Office of Special Education and Rehabilitation Services, the Department of Maternal and Child Health, and the March of Dimes/Birth Defects Foundation. Observations were videotaped during the following procedures: Face-to-Face Interactions (6 and 9 months); Mastery Motivation (9 and 12 months); Free Play with Toys (9, 12, and 18 months); Strange Situation Procedure (12 and 18 months); Teaching Task (18 months); Self-Recognition (18 months); Parental Interview (6, 9, 12, 15, and 18 months); Questionnaires (9 and 15 months) (Meadow-Orlans, 2004).

Participants

Participants in the original Gallaudet Infancy Study were predominantly from Caucasian, middle class families, with both parents present in the home. Hearing status groups and number of male/female infants were as follows (see Table 1 for more detailed demographics for the current sample):

1. Deaf parents / deaf infant (D/d): 12 boys, 8 girls
2. Hearing parents / deaf infant (H/d): 10 boys, 10 girls
3. Deaf parents / hearing infant (D/h): 9 boys, 10 girls
4. Hearing parents / hearing infant (H/h): 12 boys, 9 girls

Table 1

Mean Age and Years of Education for Mothers, by Hearing Status Group.

	Group				
	D/d	H/d	D/h	H/h	Total
N[a]	14	15	10	15	54
Age (years) (SD)	31.29 (3.67)	31.20 (4.36)	31.10 (5.51)	32.20 (3.67)	31.48 (4.15)
Education (years)	15.93 (1.86)	15.87 (2.23)	15.90 (1.79)	16.27 (2.12)	16.00 (1.98)

a. Demographic background not available for all 60 participants in current study.

It is important to note that there were two children with only mild hearing loss in this sample. However, the original Gallaudet Infancy Study team deemed it best to categorize these two children as deaf based on parental interviews indicating that these children were being reared as though they were deaf. Otherwise, unlike the comparison study by Pipp-Siegel et al., infants classified as "hard of hearing" were not included in this sample.

The primary site for the original study, begun in 1987, was Gallaudet University (Washington, DC). However, due to difficulties in obtaining a sufficient sample of H/d dyads at a very young age (prior to implementation of Universal Newborn Hearing Screening), some participants were recruited and videotaped at other universities; these were located in Dallas, TX, Pittsburgh, PA, Amherst, MA, and Atlanta, GA. Research teams at these locations were trained to implement the same procedures and use the same materials as were being used at the Gallaudet research laboratory. Procedures involving infants and mothers were videotaped in a laboratory setting in which two cameras were placed behind one-way mirrors on two adjacent sides of a room. Whenever possible, one camera focused on the infant, the other on the mother. A special effects generator was used to produce a split-screen image so that coders are able to

isolate views of each participant in most cases. The Free Play procedure involved a standard set of toys used at each site, with the toys distributed on a blanket on the floor so that both mother and child could have easy access to play materials as they were seated together. Although taping lasted 20-30 minutes (depending on age and interest or stamina of the child), the first 10 minutes of this procedure are coded to avoid possible fatigue effects for the infants; this is consistent with the protocol used by Pipp-Siegel and her colleagues.

The infants in the proposed study were all 18 months old, which falls within the 14-29 month age range used in the Pipp-Siegel et al. study and as noted above, reflects the same general developmental period. There were a total of 60 participants divided into four groups of 15 mother/infant dyads each, grouped according to the same hearing status categories as mentioned previously. This study was approved June 13, 2011 by The University of Montana Institutional Review Board as part of an annual continuation review of all new analyses being carried out on the Gallaudet data in Dr. Koester's Parent-Infant Lab.

Measures

Emotional Availability Scales (EAS). The EAS consist of four parental scales and two child scales. The following are the parental scales: sensitivity, structuring, nonintrusiveness, and nonhostility. For the child, the scales are responsiveness and involvement (of the parent) (Biringen, 2000; Lovas, 2005). The individual scales will now be presented in further detail (see Appendix A for EA Coding Sheet).

Parental Sensitivity (9-point scale). This scale ranges from 1 (highly insensitive) to 9 (highly sensitive), with 5 (inconsistently sensitive) and below denoting the non-optimal range. In attachment theory, parental sensitivity refers to the mother's ability to accurately perceive the child's cues and respond to them appropriately via warmth and attunement (Ainsworth, Blehar,

Waters, & Wall, 1978). The EA concept of sensitivity expands upon Ainsworth's by incorporating the "affective interactions and negotiation of conflict and dyssynchronous interactions" (Biringen, 2000, p. 105). EA sensitivity emphasizes the exchange, expression, and reception of emotion in both the parent and child (Biringen, 2000). Characteristics of sensitivity in the emotional availability construct include: "parent's affect, accessibility, perceptual clarity, appropriateness of responses and timing, flexibility, variety, and creativity in play, acceptance of the child, amount of interaction, and style of conflict negotiation" (Lovas, 2005, p. 331).

Structuring (5-point scale). This scale ranges from 1 (non-optimal) to 5 (optimal structuring), with 3 (inconsistent structuring) and below denoting the non-optimal range. Structuring is the parent's ability to support the child's learning and exploration in a way to which the child is receptive and without infringing on his/her autonomy (Biringen, 2000). This references the attachment theory concept of the mother as a secure base in which she is perceived as available, able, and willing to respond if needed during the infant's exploration. However, because EA is a reciprocal exchange between parent and child, structuring is only optimal when the parent's bids or attempts at scaffolding the interaction are successful. As Biringen (2000) states, "the parent can only structure in the 'zone of proximal development' by attending to the child's cues" (p. 106). This does not refer to an evaluation of cognitive stimulation offered to the child but rather to setting limits and expectations for the child and the relationship (Biringen, 2000). Successful structuring by the parent does not include directing, controlling, or passively watching the child's activity (Lovas, 2005). "It is the interaction, not the parent's individual or discrete behavior, that is taken into account" (Biringen, 2000, p. 106).

Nonintrusiveness (5-point scale). This scale ranges from 1 (intrusive) to 5 (non-intrusive), with 3 (moderately intrusive) and below denoting the non-optimal range.

Nonintrusiveness is the ability to be available to the child, specifically by being emotionally present (Biringen, 2000). This means that the parent "create[s] a spacious environment in which the child can take the lead in expressing his/her preferences, desires, and creativity" (Lovas, 2005, p. 331). As the child gets older, the quality of nonintrusiveness allows for the parent to listen, rather than talk for the child, and to allow some autonomy in making important daily decisions (Biringen, 2000, p. 105).

It is important to note that, originally, the dimensions of structuring and nonintrusiveness were developed as one curvilinear construct ranging from unstructuring to inconsistently structuring to optimal structuring to overstructuring/intrusive behavior (Biringen, 2000). However, as described above, the two qualities actually describe two different concepts. Although related in the grand scheme of EA, structuring refers more to the framework and scaffolding of the interaction (Lovas, 2005) whereas nonintrusiveness describes the parent's emotional presence (i.e., availability when needed) (Biringen, 2000).

Nonhostility (5-point scale). This scale ranges from 1 (markedly overly hostile) to 5 (non-hostile), with 4 (somewhat non-hostile) and below denoting the non-optimal range. Parental nonhostility assesses the level of covert or overt hostility displayed during an interaction (Lovas, 2005). A parent who is nonhostile interacts with their child in a way that is generally patient, pleasant, and harmonious in both speech and behavior. However, this does not mean that the parent cannot be assertive or express anger when necessary and appropriate. In other words, the "parent's emotion regulation is context-appropriate, and takes the child into account" (Biringen, 2000, p. 106).

Child Responsiveness (7-point scale) & Involvement of Parent (7-point scale). Child responsiveness ranges from 1 (non-optimal responsiveness) to 7 (optimal responsiveness), with 4

(inconsistent responsiveness) and below denoting the non-optimal range. Child involvement ranges from 1 (clearly non-optimal involvement) to 7 (optimal involvement), with 4 (moderate/low involvement) and below denoting the non-optimal range. These two child EA scales refer to the "balance of emotional connection and emotional autonomy between parent and child" (Biringen, 2000, p. 107). Together, the scales describe the affective interaction between parent and child, with a focus on the child's own contribution to these dynamics (Biringen, 2000). The following is a description of each:

Child responsiveness "assesses the child's eagerness and willingness to engage with the parent and his or her affect and degree of pleasure in the interaction" (Lovas, 2005, p. 331). This is the counterpart to the parental quality of sensitivity in that a responsive child indicates that the mother is successfully providing emotional support by cueing into the child's signals (Biringen & Robinson, 1991). Moreover, the responsive child displays appropriate emotional connection to his/her parent (Biringen, 2000) and becomes prepared "to be an active participant in elaborating and promoting engagement in other social relationships" (Biringen & Robinson, 1991, p. 263).

As child responsiveness is the counterpart to parental sensitivity, child involvement of parent is the counterpart to parental nonintrusiveness in that involvement and nonintrusiveness both assess the balance of control during the interaction. The extent to which the child includes the parent in activities reflects the child's ability and willingness to involve the parent (Biringen & Robinson, 1991). This involvement is assessed by the child's maintenance of an optimal balance between drawing the parent into play and expressing age-appropriate autonomy (Lovas, 2005). Optimal involvement would be neither over- nor under-involving styles of interaction (Biringen, 2000) in that learning "how to invite and include another in play are important social skills" (Biringen & Robinson, 1991, p. 264).

Conceptually, emotional availability emphasizes the emotional signaling and understanding from/to both the parent and child as essential to assessing the "quality and health of parent-child interactions" and the affective relationship (Biringen, 2000, p. 105). Although there are separate parent and child dimensions, emotional availability is a dyadic construct that can only be evaluated within the interaction and relational context (Biringen & Robinson, 1991; Easterbrooks & Biringen, 2005; Emde, 2000; Pipp-Siegel & Biringen, 1998). In other words, the parent's behavior cannot be assessed independent of the child's behavior; this is the first assumption underlying EA (Pipp-Siegel & Biringen, 1998). Children are active contributors to the relationship (Bretherton, 2000). The second assumption of EA is that the parent displays behaviors appropriate for the child's developmental level. The third assumption of EA is that it is a global assessment of interaction quality. This means that contextual qualities are taken into account rather than focusing on discrete counts of behavior during the interaction (e.g., assessing positive affection overall rather than number of times a mother smiles at her child) (Pipp-Siegel & Biringen, 1998). Moreover, an important characteristic of EA is that its qualities can be observed in parents of children at any age (Biringen, 2000).

Caregiver Touch Coding System

As previously mentioned, the importance of tactile contact as a component of early interactions has often been overlooked in the infancy research literature. Parent-infant dyads in which one or both partners are deaf provide a unique opportunity to examine this sensory modality with a focus on the potential functions of various kinds of touch during play interactions.

This research measures touch in frequency, similar to the Pipp-Siegel et al. study, but furthers it by also categorizing each type of touch according to function. As Koester, Brooks, and

Traci (2000) note, “both quantity and quality are distinguishing elements of touch with important implications for its functional use and its effectiveness in mother-infant dyads” (p. 128). Thus, The Caregiver Touch Coding System (Koester & Silvia, 2010) was designed to capture the various purposes of touch, from mother to child (see Appendix B for operational definitions provided to the coders, and Appendix C for an example of the coding sheets used for this scale). Each instance of maternal touch, initiated by the mother, is coded in the first 10 minutes of free play, resulting in frequencies for each category. Touch initiated by the child to the mother is not coded as children of this age are just learning to communicate and so their initiated touches would be difficult to categorize for function or intent. Moreover, children of this age are still learning to balance themselves upright and often touches from them are simply for purposes of stability. Note that there is a seventh category on the coding sheet entitled *incidental*, which was created as a kind of “catchall” category for cases when touch clearly occurs but has no apparent purpose or function. An example of this may be the mother adjusting the child’s overalls and her hand grazing the child’s chin. Thus, the six categories that are of interest, and meant to be mutually exclusive, are as follows:

1) **Affection:** This touch has a gentle, nurturing quality, although it can include more playful movements as in the case of tickling. Examples include stroking, patting, tickling, nuzzling, hugging, and kissing.

2) **Play-Directed:** Touching child as part of play, but with no apparent intent to instruct or teach child about toy. Examples include playing peek-a-boo by placing own hands over child’s face; placing a doll in the infant’s lap, then pointing to infant’s nose, then doll’s nose, then mom’s nose; using the doll to nuzzle the child.

3) **Attentional:** Tapping on the child's body prior to communicating; typically (for Deaf parents) this is a tap/sign sequence occurring several times before the infant looks at caregiver, or before signing begins. An example of this is the infant examining a book and the mother tapping the child's shoulder several times to elicit eye contact or visual attention in order to sign about the pictures in the book.

4) **Instructive:** Guiding child's use of toy, modeling appropriate behavior, or prompting the child in relation to toy use. This is only coded if the mother's behavior does not go against child's current interest or against child's will. Examples include the child trying to use a hammer, but holding it upside down so the mother helps to put hammer into child's hand in correct position; the child is looking at book but has difficulty turning pages so the mother assists by showing child how to lift one page at a time; the mother moves baby's hand repeatedly over the fuzzy part of a tactile/textural book, demonstrating how that particular book is to be used.

5) **Prohibitive:** Caregiver restricts or re-directs child, e.g. by preventing child from engaging with specific toy or behavior, or by restraining child's movement. Typically, this kind of touch results in a conflict of wills. Examples include the mother holding the child's hand firmly so that child cannot bang object on floor; the mother removing a toy from child's grasp, touching him/her in the process; the mother pulling the child toward her when s/he tries to walk away.

6) **Reposition:** Mother picks up or holds infant in order to move him/her into better position related to toys, the camera, her vision, etc. Examples include the child trying to sit in mother's lap, so mother assists by helping to stabilize child or settle him/her into comfortable position; the infant is sitting on some of the toys, so mother lifts and moves him/her onto clear

space on blanket; the infant is seated facing away from mother, who then turns him/her around for better visual contact.

To be considered reliable, coders were first trained on a set of "master tapes" that had been coded by the developers of the Caregiver Touch Coding System, and achieved 80% or greater inter-rater reliability on all categories of touch prior to coding actual tapes for the study. The coding was completed by a team including two graduate students, one or two undergraduates, and the faculty supervisor.

Procedures

Infants were videotaped during free play interactions with their mothers. The first 10 minutes of these interactions were coded for EA and touch. Due to the more subjective nature of the measure, EA was dual-coded to ensure better reliability. That is, for each dyad being observed, two coders watched the video together and resolved any discrepancies by consensus after determining their score for each subscale. For each EA subscale, two codes were assigned (e.g., sensitivity receives a 6/7). After watching the entire interaction twice to ensure nothing was overlooked (e.g., coder did not see something while taking notes), the two coders conferred on their code, arriving at an agreed-upon score. For scores that overlapped, the common code was assigned for the EA subscale (e.g., on sensitivity, Coder 1 gives a 6/**7** and Coder 2 gives a **7**/8, so the overlapping score of 7 is used). This allowed for any potential bias in which an individual coder tends to code higher or lower. In the event that both coders gave the same score (e.g., both give a 6/7 for sensitivity), then they went with their first score (e.g., 6) since this was marked as their primary choice. In the event that both coders gave the same score but in different primary orders (e.g., Coder 1 puts down a 6/7 and Coder 2 puts down a 7/6), then the coders conferred as to which was a more accurate score for the interaction they just watched. Touch coding was done

by one trained coder per videotape, noting each time a touch is initiated by the mother to child. These touches were coded into their given category and their frequencies later totaled.

Hypotheses

Based on findings from Pipp-Siegel et al. (1998), it was hypothesized that:

1. Hearing mothers of deaf infants (H/d) will be more structuring than the other hearing mothers or Deaf mothers and their infants. (However, it is important to note that the structuring scores found by Pipp-Siegel et al. (1998) were within the optimal range.)
2. There will be a negative relationship between maternal sensitivity and overall total quantity of touch for H/h dyads.
3. There will be a negative relationship between nonhostility and quantity of touch in H/h dyads. That is, hearing mothers who exhibit hostility will also have high frequency scores for overall use of touch with their hearing children.
4. There will be a positive relationship between nonhostility and quantity of touch in H/d dyads. That is, hearing mothers who exhibit hostility will have low scores for overall frequency of touch with their deaf children.
5. There will be a negative relationship between maternal hostility and child responsiveness. That is, the more hostile a mother is, the less responsive a child will be. According to Pipp-Siegel et al. (1998), this was true across groups.
6. There will be a negative relationship between overall total quantity of touch and child responsiveness. That is, the more parents touch their children, the less responsive the child will be. According to Pipp-Siegel et al. (1998), this was true across groups.
7. According to Pipp-Siegel et al. (1998), 58.3% of children who were deaf showed hostility toward their mothers, compared with 25% of hearing children. In this study, it would be

expected that this child hostility (which is not being coded per se) will be shown as decreased responsiveness and decreased involvement during interactions.

The study by Pipp-Siegel et al. (1998) was a first effort that gave a certain amount of useful information about differences in interactions between *hearing mothers* and their deaf/hard of hearing, or hearing infants. However, the current study contributes more to this body of research as it attempts to answer important questions about the other half of the population, *Deaf mothers* with hearing or deaf infants. These results are therefore exploratory, examining the addition of Deaf mothers and their interactions with their infants in regard to EA and touch, which has not been previously studied. Due to the exploratory nature of this effort, it is reasonable not to list specific directional hypotheses. However, based on previous literature, it was expected that the relationship of EA to the various functions of touch would vary by group. For hearing children, touch may be related to lower EA because it does not play as central a role in the communicative interaction. Combined with the toddlers' emerging autonomy at that developmental age, touch may be interpreted as intrusive or unnecessary to the hearing child, but may be a crucial aspect of effective communication for a child with a hearing loss.

Results

The following results will be discussed in three sections: Emotional Availability, Touch, and then the relationship between EA and Touch. In the separate examinations of EA and touch, each section will first report significant findings for all four groups, then be followed by differences between two groups, divided according to mother's hearing status (i.e., hearing mothers, Deaf mothers). Due to the current study being a variation on the Pipp-Siegel et al. (1998) study, it seems appropriate to examine all four groups that are present in this sample, as well as investigate groups via mother's hearing status; this approach is inspired by the Pipp-Siegel et al. (1998) study which used only hearing mothers. Thus, each set of results (EA, Touch, EA and Touch) will be presented in the following format/order:

- All four groups (exploratory expansion of the Pipp-Siegel et al. study)
- Hearing mothers (replication)
- Deaf mothers (exploratory expansion)

A final explanatory note is in order: because of the exploratory nature of the current study, all alpha levels of $p < .10$ will be reported as significant or approaching significance. This is a common alpha level as accepted for exploratory research (Sproull, 2002; Warner, 2008).

Emotional Availability & Dyadic Hearing Status

Emotional Availability (All Groups). A 4 (group) x 6 (EA) multivariate analysis of variance (MANOVA) was conducted with group (parent/infant hearing status: D/d, D/h, H/d, H/h) as the independent variable and EA (parent scales: sensitivity, nonhostility, nonintrusiveness, and structuring; child scales: responsiveness, involvement) as the dependent variable. Results yielded a nonsignificant multivariate effect of group, Wilks' Lambda $F(3, 56) =$

1.13, $p = .33$, partial $\eta^2 = .12$. There was a significant difference between groups for sensitivity, $F(3, 56) = 2.23$, $p < .10$ and child responsiveness, $F(3, 56) = 3.04$, $p < .05$ (see Table 2).

Table 2

Multivariate Analysis of Variance for Emotional Availability between Hearing Status Groups.

EA Scale	Group	Mean	*F*	p-value
Sensitivity	Deaf/deaf	6.93	2.23	.10
	Hearing/deaf	5.53		
	Deaf/hearing	6.73		
	Hearing/hearing	6.67		
	Total	6.47		
Nonhostility	Deaf/deaf	5.00	2.05	.12
	Hearing/deaf	4.73		
	Deaf/hearing	5.00		
	Hearing/hearing	4.87		
	Total	4.90		
Nonintrusiveness	Deaf/deaf	4.87	0.57	.64
	Hearing/deaf	4.53		
	Deaf/hearing	4.60		
	Hearing/hearing	4.67		
	Total	4.67		
Structuring	Deaf/deaf	4.20	1.10	.36
	Hearing/deaf	3.67		
	Deaf/hearing	4.23		
	Hearing/hearing	4.13		
	Total	4.07		
Child Responsiveness	Deaf/deaf	5.60	3.04	.04
	Hearing/deaf	4.27		
	Deaf/hearing	5.60		
	Hearing/hearing	5.47		
	Total	5.23		
Child Involvement	Deaf/deaf	5.73	1.97	.13
	Hearing/deaf	4.60		
	Deaf/hearing	5.67		
	Hearing/hearing	5.40		
	Total	5.35		

Post Hoc Tests for Significant F's. Tukey's HSD post hoc tests for **sensitivity** did not reveal any significant differences between the four groups. The only group differences *approaching* significance were between D/d (M = 6.93) and H/d (M = 5.53), p = .102. An EA score of 5 or below is considered the non-optimal range for sensitivity, thus the means for these groups are all above the optimal range. However, it is important to remember that means incorporate the lowest and highest values, making the H/d mothers' sensitivity mean of 5.53 questionable as to its interpretation of representing optimal sensitivity.

Tukey's HSD post hoc tests for **child responsiveness** revealed significant differences between the following groups: D/d (M = 5.60) and H/d (M = 4.27), p = .065; D/h (M = 5.60) and H/d (M = 4.27), p = .065. The non-optimal range for child responsiveness scores is between 1 and 4. Scores of 5, 6, and 7 mean the child is displaying "moderately optimal responsiveness", "mostly optimal responsiveness", and "optimal responsiveness", respectively.

Emotional Availability (Hearing Mothers). A 2 (group) x 6 (EA) multivariate analysis of variance (MANOVA) was conducted with mother's hearing status (H/d, H/h) as the independent variable and EA (parent scales: sensitivity, nonhostility, nonintrusiveness, and structuring; child scales: responsiveness, involvement) as the dependent variable. Results yielded a nonsignificant multivariate effect of group, Wilks' Lambda $F(1, 28) = 1.51$, p = .22, partial η^2=.28. There was a significant difference between hearing mothers with deaf infants and hearing mothers with hearing infants on **sensitivity**: H/d (M=5.53) and H/h (M=6.67), $F(1, 28)$ = 4.02, p = .055. Again, the non-optimal range for sensitivity scores is 5 or below. There was a significant difference between hearing mothers with deaf infants and hearing mothers with hearing infants on **child responsiveness**: H/d (M=4.27) and H/h (M=5.47), $F(1, 28) = 4.83$, p =

.036 (see Table 3). Again, the non-optimal range for child responsiveness scores is between 1 and 4.

Table 3

Multivariate Analysis of Variance for Emotional Availability between Hearing Mothers.

EA Scale	**Group**	**Mean**	***F***	**p-value**
Sensitivity	Hearing/deaf	5.53	4.02	.06
	Hearing/hearing	6.67		
	Total	6.10		
Nonhostility	Hearing/deaf	4.73	.56	.46
	Hearing/hearing	4.87		
	Total	4.80		
Nonintrusiveness	Hearing/deaf	4.53	.22	.64
	Hearing/hearing	4.67		
	Total	4.60		
Structuring	Hearing/deaf	3.67	1.47	.24
	Hearing/hearing	4.13		
	Total	3.90		
Child Responsiveness	Hearing/deaf	4.27	4.83	.04
	Hearing/hearing	5.47		
	Total	4.87		
Child Involvement	Hearing/deaf	4.60	1.94	.17
	Hearing/hearing	5.40		
	Total	5.00		

Emotional Availability (Deaf Mothers). A 2 (group) x 6 (EA) multivariate analysis of variance (MANOVA) was conducted with mother's hearing status (D/d, D/h) as the independent variable and EA (parent scales: sensitivity, nonhostility, nonintrusiveness, and structuring; child scales: responsiveness, involvement) as the dependent variable. Results yielded a nonsignificant

multivariate effect of group, Wilks' Lambda $F(1, 28) = .38$, $p = .86$, partial $\eta^2 = .07$. There were no significant differences between Deaf mothers of deaf infants and Deaf mothers of hearing infants on any EA scale (see Table 4). (Note: Deaf mothers all received "5" on nonhostility, which is the highest possible score indicating no expressions of hostility, and rendering an F value impossible to calculate.)

Table 4

Multivariate Analysis of Variance for Emotional Availability between Deaf Mothers.

EA Scale	**Group**	**Mean**	***F***	**p-value**
Sensitivity	Deaf/deaf	6.93	0.10	0.75
	Deaf/hearing	6.73		
	Total	6.83		
Nonhostility	Deaf/deaf	5.00	---	---
	Deaf/hearing	5.00		
	Total	5.00		
Nonintrusiveness	Deaf/deaf	4.87	1.12	0.30
	Deaf/hearing	4.60		
	Total	4.73		
Structuring	Deaf/deaf	4.20	0.04	0.85
	Deaf/hearing	4.27		
	Total	4.23		
Child Responsiveness	Deaf/deaf	5.60	0.00	1.00
	Deaf/hearing	5.60		
	Total	5.60		
Child Involvement	Deaf/deaf	5.73	0.02	0.89
	Deaf/hearing	5.67		
	Total	5.70		

Touch & Dyadic Hearing Status

Touch (All Groups). A 4 (group) x 7 (touch) multivariate analysis of variance (MANOVA) was conducted with group (parent/infant hearing status: D/d, D/h, H/d, H/h) as the independent variable and touch (affection, play-directed, attentional, instructive, prohibitive, re-position, total/quantity) as the dependent variable. Results yielded a significant multivariate effect of group, Wilks' Lambda $F(3, 56) = 2.24$, $p = .002$, partial $\eta^2 = .266$. There was a significant difference between groups for attentional touch, $F(3, 56) = 14.97$, $p < .00$ and total touch, $F(3, 56) = 3.00$, $p < .05$ (see Table 5).

Table 5

Multivariate Analysis of Variance for Touch between Hearing Status Groups.

Touch Category	**Group**	**Mean**	***F***	**p-value**
Affection	Deaf/deaf	2.00	1.51	.22
	Hearing/deaf	2.60		
	Deaf/hearing	1.13		
	Hearing/hearing	2.53		
	Total	2.07		
Play-Directed	Deaf/deaf	5.07	1.51	.22
	Hearing/deaf	8.20		
	Deaf/hearing	3.67		
	Hearing/hearing	7.73		
	Total	6.17		
Attentional	Deaf/deaf	15.20	14.97	.00
	Hearing/deaf	2.93		
	Deaf/hearing	15.13		
	Hearing/hearing	.13		
	Total	8.35		
Instructive	Deaf/deaf	3.67	1.19	.32
	Hearing/deaf	2.53		
	Deaf/hearing	4.87		
	Hearing/hearing	1.13		
	Total	3.05		
Prohibitive	Deaf/deaf	.93	.97	.41
	Hearing/deaf	1.73		
	Deaf/hearing	1.00		
	Hearing/hearing	.80		
	Total	1.12		
Reposition	Deaf/deaf	1.20	.77	.52
	Hearing/deaf	2.73		
	Deaf/hearing	2.07		
	Hearing/hearing	1.80		
	Total	1.95		
Total Touch	Deaf/deaf	28.07	3.00	.04
	Hearing/deaf	20.87		
	Deaf/hearing	27.87		
	Hearing/hearing	14.27		
	Total	22.77		

Post Hoc Tests for Significant F's (All Groups). Tukey's HSD post hoc tests for **attentional touch** revealed significant differences between groups: D/d (M = 15.20) and H/d (M = 2.93), p = .001; D/d (M = 15.20) and H/h (M = 0.13), p = .000; D/h (M = 15.13) and H/d (M = 2.93), p = .001; D/h (M = 15.13) and H/h (M = 0.13), p = .000. It is important to remember that the Touch Coding System measures frequencies of touch, so each mean is the group's averaged amount of touches *in each category* from mother to child during a 10 minute free-play session. Total touch refers to the average amount of touches per group from *all categories combined*. Tukey's HSD post hoc tests for **total touch** revealed significant differences between groups: D/d (M = 28.07) and H/h (M = 14.27), p = .061; D/h (M = 27.87) and H/h (M = 14.27), p = .066.

Touch (Hearing Mothers). A 2 (group) x 7 (touch) multivariate analysis of variance (MANOVA) was conducted with mother's hearing status (H/d, H/h) as the independent variable and touch (affection, play-directed, attentional, instructive, prohibitive, re-position, total/quantity) as the dependent variable. Results yielded a nonsignificant multivariate effect of group, Wilks' Lambda $F(1, 28) = 1.93$, p = .11, partial η^2=.21. There was a significant difference between hearing mothers of deaf infants and hearing mothers of hearing infants for attentional touch, $F(1, 28) = 8.46$, p = .007 (see Table 6).

Table 6

Multivariate Analysis of Variance for Touch between Hearing Mothers.

Touch Category	**Group**	**Mean**	***F***	**p-value**
Affection	Hearing/deaf	2.60	.01	.94
	Hearing/hearing	2.53		
	Total	2.57		
Play-Directed	Hearing/deaf	8.20	.03	.87
	Hearing/hearing	7.73		
	Total	7.97		
Attentional	Hearing/deaf	2.93	8.46	.01
	Hearing/hearing	.13		
	Total	1.53		
Instructive	Hearing/deaf	2.53	1.09	.31
	Hearing/hearing	1.13		
	Total	1.83		
Prohibitive	Hearing/deaf	1.73	1.64	.21
	Hearing/hearing	.80		
	Total	1.27		
Reposition	Hearing/deaf	2.73	.84	.37
	Hearing/hearing	1.80		
	Total	2.27		
Total	Hearing/deaf	20.87	2.33	.14
	Hearing/hearing	14.27		
	Total	17.57		

Touch (Deaf Mothers). A 2 (group) x 7 (touch) multivariate analysis of variance (MANOVA) was conducted with mother's hearing status (D/d, D/h) as the independent variable and touch (affection, play-directed, attentional, instructive, prohibitive, re-position, total/quantity) as the dependent variable. Results yielded a nonsignificant multivariate effect of group, Wilks' Lambda $F(1, 28) = .85$, $p = .56$, partial $\eta^2 = .21$. There were no significant differences between Deaf mothers of deaf infants and Deaf mothers of hearing infants on any touch category (see Table 7).

Table 7

Multivariate Analysis of Variance for Touch between Deaf Mothers.

Touch Category	**Group**	**Mean**	***F***	**p-value**
Affection	Deaf/deaf	2.00	2.20	.15
	Deaf/hearing	1.13		
	Total	1.57		
Play-Directed	Deaf/deaf	5.07	.40	.53
	Deaf/hearing	3.67		
	Total	4.37		
Attentional	Deaf/deaf	15.20	.00	.99
	Deaf/hearing	15.13		
	Total	15.17		
Instructive	Deaf/deaf	3.67	.22	.65
	Deaf/hearing	4.87		
	Total	4.27		
Prohibitive	Deaf/deaf	.93	.02	.88
	Deaf/hearing	1.00		
	Total	.97		
Reposition	Deaf/deaf	1.20	.71	.41
	Deaf/hearing	2.07		
	Total	1.63		
Total	Deaf/deaf	28.07	.00	.98
	Deaf/hearing	27.87		
	Total	27.97		

Emotional Availability & Touch

EA & Touch Correlations for All Groups. A bivariate correlation was conducted between scores on each EA scale (parent and child) and frequencies of each touch category to examine the relationship between these two constructs among all four groups (D/d, H/d, D/h, H/h). The resulting 6 x 7 correlation matrix can be seen in Table 8. Further correlations were conducted for these relationships within each group separately, as will be discussed after Table 8.

Significant correlations were found for maternal **sensitivity** and the following frequencies of touch: sensitivity and attentional touch (r = .26, p = .044); sensitivity and instructive touch (r = .22, p = .086); sensitivity and prohibitive touch (r = -.22, p = .091); sensitivity and total touch (r = .26, p = .049). Note that due to the negative correlations, low sensitivity is related to higher frequency of prohibitive touch, and vice versa.

A significant positive correlation was found for maternal **structuring** and frequency of attentional touch (r = .29, p = .025).

In addition, significant correlations were found for **child responsiveness** and the following frequencies of touch for all groups combined: child responsiveness and attentional touch (r = .29, p = .025); child responsiveness and prohibitive touch (r = -.26, p = .048); child responsiveness and total touch (r = .23, p = .074). Again, note the inverse relationship between child responsiveness and mothers' use of prohibitive touch.

Finally, significant correlations were found for **child involvement** and the following frequencies of touch used by the sample as a whole: child involvement and affectionate touch (r = .24, p = .067); child involvement and attentional touch (r = .26, p = .044); child involvement and prohibitive touch (r = -.24, p = .064); child involvement and total touch (r = .23, p = .081).

Table 8

Correlation Matrix for Emotional Availability and Functions of Touch (Four Groups Combined).

		Functions of Touch						
		Affection	*Play-Directed*	*Attentional*	*Instructive*	*Prohibitive*	*Reposition*	*Total*
EA	*Sensitivity*	.15	.05	.26**	.22*	-.22*	-.10	.26**
	Nonhostility	.21	-.07	.18	.06	-.07	-.06	.12
	Nonintrusiveness	.18	-.05	-.03	.13	-.14	-.14	-.02
	Structuring	.12	.04	.24*	.08	-.15	-.10	.20
	Child Responsiveness	.14	.00	.29**	.17	-.26**	-.08	.23*
	Child Involvement	.24*	-.03	.26**	.21	-.24*	-.07	.23*

* $p < .10$ (2-tailed); ** $p < .05$ (2-tailed)

Correlations for Group 1 (Deaf/deaf). For the group in which both partners are deaf, significant correlations were found for **sensitivity** and two frequencies of touch: sensitivity and attentional touch ($r = .45$, $p = .094$); sensitivity and prohibitive touch ($r = -.57$, $p = .026$) (see Table 9). Significant correlations were found for **structuring** and two frequencies of touch: structuring and attentional touch ($r = .60$, $p = .019$); structuring and total touch ($r = .49$, $p = .066$). **Child responsiveness** was also significantly correlated with two frequencies of touch: child responsiveness and attentional touch ($r = .52$, $p = .047$); child responsiveness and prohibitive touch ($r = -.62$, $p = .014$). In addition, **child involvement** and two frequencies of touch were significantly correlated for group 1 (D/d dyads): child involvement and attentional touch ($r = .49$, $p = .063$); child involvement and prohibitive touch ($r = -.56$, $p = .030$). In each case in which prohibitive touch shows a significant relationship with some aspect of EA, it is important to remember that the correlation was negative for this group.

Table 9

Correlation Matrix for Emotional Availability and Functions of Touch (Deaf/deaf).

		Functions of Touch						
		Affection	*Play-Directed*	*Attentional*	*Instructive*	*Prohibitive*	*Reposition*	*Total*
EA	*Sensitivity*	.00	.24	.45*	.22	-.57*	-.19	.39
	Nonhostility	---	---	---	---	---	---	---
	Nonintrusiveness	-.22	.09	-.05	.06	-.02	-.35	-.02
	Structuring	-.08	.21	.60**	.25	-.33	-.03	.49*
	Child Responsiveness	-.20	.25	.52**	.22	-62**	-.15	.41
	Child Involvement	-.03	.26	.49*	.22	-.56**	-.07	.42

* p < .10 (2-tailed); ** p < .05 (2-tailed)

Correlations for Group 2 (Hearing/deaf). For the group in which mothers are hearing and infants are deaf, the only significant correlation was between child involvement and affectionate touch (r = .47, p = .079) (see Table 10).

Table 10

Correlation Matrix for Emotional Availability and Functions of Touch (Hearing/deaf).

		Functions of Touch						
		Affection	*Play-Directed*	*Attentional*	*Instructive*	*Prohibitive*	*Reposition*	*Total*
EA	*Sensitivity*	.27	.09	.23	.07	-.13	-.09	.13
	Nonhostility	.36	.05	.02	.03	-.12	-.16	.05
	Nonintrusiveness	.17	.01	.38	.11	-.41	-.14	.06
	Structuring	.11	-.06	.04	-.19	-.09	.12	-.06
	Child Responsiveness	.33	.17	.26	-.07	-.13	.15	.20
	Child Involvement	.47**	.18	.23	.05	-.24	.14	.24

* p < .10 (2-tailed); ** p < .05 (2-tailed)

Correlations for Group 3 (Deaf/hearing). For the group in which mothers are Deaf and infants are hearing, the only significant correlation was between sensitivity and play-directed touch (r = .44, p = .098) (see Table 11).

Table 11

Correlation Matrix for Emotional Availability and Functions of Touch (Deaf/hearing).

		Functions of Touch						
		Affection	*Play-Directed*	*Attentional*	*Instructive*	*Prohibitive*	*Reposition*	*Total*
EA	*Sensitivity*	.29	.44*	-.01	.41	.04	.19	.35
	Nonhostility	---	---	---	---	---	---	---
	Nonintrusiveness	.43	.29	-.35	.38	-.07	.24	.05
	Structuring	.16	.27	.00	-.01	-.20	-.18	.03
	Child Responsiveness	.23	.41	.02	.38	-.10	.15	.33
	Child Involvement	.18	.10	-.05	.37	-.15	.12	.25

* p < .10 (2-tailed)

Correlations for Group 4 (Hearing/hearing). For the group in which both partners are hearing (Table 12), significant correlations were found between **child responsiveness** and affectionate touch (r = .48, p = .073); **child involvement** and affectionate touch (r = .48, p = .072); **nonintrusiveness** and repositioning touch (r = -.58, p = .025). To restate these relationships: child responsiveness and affectionate touch are positively related, as are child involvement and affectionate touch. However, nonintrusiveness and the use of touch for repositioning the child are negatively related. This means that when the mother is *less* intrusive, then her tendency to frequently reposition the infant *decreases.* In other words, intrusive mothers in this group (H/h) reposition their infants more, whereas nonintrusive mothers reposition their infants less.

Table 12

Correlation Matrix for Emotional Availability and Functions of Touch (Hearing/hearing).

		Functions of Touch						
		Affection	*Play-Directed*	*Attentional*	*Instructive*	*Prohibitive*	*Reposition*	*Total*
EA	*Sensitivity*	.38*	-.15	-.11	.30	-.02	-.21	-.06
	Nonhostility	.36	-.04	.11	.04	.18	.29	.18
	Nonintrusiveness	.27	-.28	.10	-.28	.04	-.58*	-.34
	Structuring	.42	.05	-.03	.18	.05	-.14	.15
	Child Responsiveness	.48*	-.30	-.09	.16	-.04	-.37	-.24
	Child Involvement	.48	-.35	-.07	.31	.03	-.30	-.24

* $p < .10$ (2-tailed); ** $p < .05$ (2-tailed)

Discussion

The purpose of this study was intended as a constructive replication and expansion of Pipp-Siegel et al.'s (1998) investigation of the relationship between maternal Emotional Availability and the use of touch by hearing mothers with their deaf or hearing infant. While some findings from the current study are similar to those found by the previous authors, others go beyond the results reported by Pipp-Siegel et al. (1998) and will therefore be discussed in greater detail. However, it is important to first acknowledge the hypotheses tested in this study that were derived directly from Pipp-Siegel et al.'s findings. Thus, this discussion will be broken up into the following sections. The first section will discuss the hypotheses and results derived from Pipp-Siegel et al.'s (1998) findings. The second section will present the results from the current expansion of that study and interpretations based on a sample in which Deaf mothers were also included. Finally, long-term outcomes for deaf children that may be relevant to the current findings will be considered, along with implications and limitations of this research.

The following table summarizes the hypotheses derived from Pipp-Siegel et al. (1998), indicating whether or not the current findings were similar to those in the original comparison study:

Pipp-Siegel et al. (1998) Findings	**Current Study's Findings**
1. Hearing mothers of deaf infants (H/d) will be more structuring according to the EA scales than the other hearing mothers or Deaf mothers during interactions with their infants.	• No significant difference between groups on structuring. • According to means, H/d mothers were lower in structuring than H/h mothers, and lower than Deaf mothers of both deaf and hearing infants.
2. There will be a negative relationship between maternal sensitivity and overall total quantity of touch for H/h dyads.	• No significant relationship for H/h dyads. • For all four groups combined, sensitivity was positively correlated with total touch.
3. There will be a negative relationship between nonhostility and quantity of touch in H/h dyads.	• No significant correlation. • Positive correlation rather than negative for H /h dyads.

	• Even when examining all four groups, this was still not a significant finding or negative relationship.
4. There will be a positive relationship between nonhostility and total quantity of touch in H/d dyads.	• No significant relationship for H/d dyads. • When all four groups were examined, there was still no significant correlation.
5. There will be a negative relationship between maternal hostility and child responsiveness.	• The same findings were replicated in the current study for all four groups and for the two hearing mother groups.
6. There will be a negative relationship between overall quantity of touch and child responsiveness.	• Significant positive, not a negative, relationship for all four groups. • When looking at just the two hearing mother groups, the relationship is negative but not significant.
7. According to Pipp-Siegel et al. (1998), 58.3% of children who were deaf showed hostility toward their mothers, compared with 25% of hearing children. In this study, it is expected that this child hostility will be shown as decreased child responsiveness and involvement.	• Significant: Deaf children of hearing mothers were less responsive and involved than their counterparts with Deaf mothers, or hearing children of hearing mothers.

Elaboration of Hypotheses and Findings Derived from Pipp-Siegel et al. (1998)

1. Hearing mothers of deaf infants (H/d) will be more structuring according to the EA scales than the other hearing mothers or Deaf mothers during interactions with their infants. This was not found to be the case in the current study. Not only was there was not a significant difference between groups on structuring, but according to the means, H/d mothers were *lower* in structuring than H/h mothers, and *lower* than Deaf mothers of both deaf and hearing infants.

The EA scale of structuring fundamentally assesses whether or not an interaction was successful. On the 5-point scale, scores of 4 or 5 indicate that an interaction was successful; conversely, scores of 3 or lower indicate that an interaction was not successful. A score of 3 indicates limited success during the interaction. Scores under 3, so a 1 or 2, indicate that the parent was passive during the interaction. The mean scores of 3.67 from H/d mothers found in

the current study indicate that these dyads were having limited success during their interactions. This makes sense insofar as a hearing mother may be less able to optimally structure interactions with an 18-month-old deaf child due to communication barriers and the lack of an effective joint communication system with a child that age. Although the lower scores do not specify whether H/d mothers were over- or under-structuring (since a score of 4 or lower on structuring may be due to either, and sometimes both), it does imply that they were not properly scaffolding the interaction, setting appropriate limits/guides, keeping the child's attention, or following the child's lead in play. Based on literature discussed previously about H/d mothers, this seems unsurprising. In general, the H/d mothers may not yet possess the skills necessary to provide an optimally structured interaction with their 18-month-old child.

As others have reported, hearing parents often go through periods of shock, grief, readjusting their expectations, and finally coming to terms with a diagnosis of hearing loss in their child (Koester & Meadow-Orlans, 1990). During this time, the day-to-day care of and responsiveness to the newborn and developing infant must continue, with the additional stress on parents of having to make crucial decisions about which mode of communication to use with their deaf child – oral/auditory, visual/gestural, or a combination of both. For hearing parents who choose to learn sign language, this will take time. In the early stages of their child's development, they may not have the depth or proficiency in sign that most Deaf parents have. In the best case scenario, a hearing parent who is quickly picking up on sign language is still likely to have only mastered a basic vocabulary. Although this is an important and impressive accomplishment, it is unlikely they will be able to have continuous communication with their deaf infant the way a Deaf parent would, or even a hearing parent speaking to their hearing child. During this adjustment period in which the hearing parent is learning sign, they will also need to

learn effective ways of eliciting and maintaining their child's visual attention as needed to follow signed communication. As previously discussed in the literature review, this is not intuitive for hearing parents and may take a considerable amount of deliberate effort to accomplish or to incorporate easily into their interactions with an infant. Even for hearing parents who choose to have their deaf child get a cochlear implant and/or learn to speak (in conjunction with having a hearing aid), there will still be a "catch-up" period as the child will need to learn how to use their vocal cords. In sum, the H/d dyads typically start out behind and, even with the most committed and motivated of parents, are likely to experience a lag or delay in establishing smooth communication as compared to their other dyadic counterparts.

2. There will be a negative relationship between maternal sensitivity and overall total quantity of touch for H/h dyads. Despite congruency with the negative correlation, this was not found to be a significant relationship in the current study for H/h dyads. However, for all four groups, sensitivity was *positively* correlated with total touch. The implications of this finding will be addressed in the second section of this discussion.

Because of the categories observed in the Touch Coding System, it is unlikely that they would contribute to a finding of low sensitivity. High frequencies of touch typically include many incidents of attention, affection, and play/engagement. These are all factors that contribute to a highly sensitive mother. The only category of touch that would potentially convey any kind of insensitivity would be prohibitive touch, which was found to be negatively correlated with sensitivity (for all four groups); this will be elaborated upon in the second section of this discussion. Because Pipp-Siegel et al. did not categorize touch according to function (and only coded overall frequencies), it is difficult to understand how or why they found a negative relationship between sensitivity and total touch, or under what context it occurred.

3. There will be a negative relationship between nonhostility and quantity of touch in H/h dyads. That is, hearing mothers who exhibit hostility will also have high frequency scores for overall use of touch with their hearing children (H/d dyads will be discussed in point 4). This was not found in the current study. Not only was the correlation not significant, but it was positive rather than negative for H /h dyads. Even when examining all four groups, this was still not a significant finding or negative relationship. Because of the inverse wording, it is important to clarify that the positive correlations here (although not significant) indicate that as nonhostility increases (meaning a mother is *less* hostile), total touch also increases. Simply put, more touch coincides with less hostility; or, less touch coincides with more hostility.

As stated above, because of the way the frequencies of touch are categorized in the present study, there is no conceptual reason for frequent maternal touch being related to more hostility. The only touch category that can potentially be interpreted as hostile would be prohibitive touch. Again, the inclusion of Deaf mothers in the current study changes the interpretations and expected findings from Pipp-Siegel et al.'s (1998) study. Most categories of touch developed for the current coding system reflect tactile contact that is used in nonhostile ways. The only potential interpretation of a hostile use of touch in this study would be that of prohibitive touch, in which the mother seeks to control her child's behavior by preventing him/her from doing something. Conceptually, prohibitive touch is thought of as a conflict of wills between what the mother and child want or how they aim to behave. However, this is hardly characteristics of the EA conceptualization of hostile behaviors such as impatience, resentment, discontent, threats, or physical harshness. Thus, it is unsurprising that tactile contact was not found to be related to maternal hostility in the current study.

4. There will be a positive relationship between nonhostility and total quantity of touch in H/d dyads. That is, hearing mothers who exhibit hostility are expected to have low scores for overall frequency of touch with their deaf children. This relationship was not found to be significant in the current study, despite the positive correlation for H/d dyads. Again, when all four groups were examined, there was still no significant correlation. The EA scale of nonhostility appears to be capturing a different dimension of the parent-child interaction, not the physical/tactile element which is of primary interest in these analyses of tactile contact.

5. There will be a negative relationship between maternal hostility and child responsiveness. That is, the more hostile a mother is, the less responsive a child will be. According to Pipp-Siegel et al. (1998), this was true across groups. The same findings were replicated in the current study for all four groups and for the two hearing mother groups. (The two groups comprised only of hearing mothers are mentioned here because they are the equivalent of the Pipp-Siegel et al. groups.)

It is unlikely that a hostile mother would be optimally sensitive, creating an interaction in which the child would also respond optimally. The hostility would most likely decrease the child's willingness to engage with the mother, display positive affect, or respond appropriately to maternal cues/bids for interactions, as verified by the current findings.

6. There will be a negative relationship between overall quantity of touch and child responsiveness. That is, the more parents touch their children, the less responsive the child will be. Pipp-Siegel et al. (1998) found this to be true across their groups with hearing mothers. This was found to be a significant result in the current study for all four groups, however it was not a negative relationship. When looking at just the two hearing mother groups, the relationship *is*

negative but *not* significant. Therefore, this finding from the Pipp-Siegel et al. study was not confirmed by the current results.

With the addition of Deaf mothers in our replication sample, it follows that the more touch is used during interactions the more one would expect to see an increase in child responsiveness (that is, in dyads in which deafness is involved). Even within H/d dyads , it would make sense that more touch – be it for the purpose of attention, affection, play, or instruction – would foster more child responsiveness due to the active engagement of the mother. Again, aside from prohibitive touch, the categories used in this study involve different ways of interacting with the child and an additional sensory experience, thus expanding the opportunities for communication with a deaf infant.

For hearing infants at 18-months-old, when the desire to express independence is emerging, touch is likely to be seen as intrusive and "reflect a lack of appreciation for children's developing autonomy" (Pipp-Siegel et al., 1998, no page numbers available). Therefore, a negative relationship would be expected: more touch would be associated with less child responsiveness. However, this should be different for deaf children with hearing mothers. As Pipp-Siegel et al. (1998, no page numbers available) state, "Touch may serve to communicate the mother's presence… [it] communicates presence even when visual contact is not maintained". One possible reason that the correlation is negative here may be that hearing mothers of deaf infants have not yet learned to use touch for communicative purposes. Rather, they are using it in a manner akin to their hearing counterparts with hearing infants and so it is perceived by the infant as impeding their sense of autonomy instead of as maintaining a connection with the caregiver.

7. According to Pipp-Siegel et al. (1998), 58.3% of children who were deaf showed hostility toward their mothers, compared with 25% of hearing children. In this study, it would be expected that this child hostility (which is not being coded per se) will be shown as decreased child responsiveness and decreased involvement during interactions. This was also found to be significant in the current study. Deaf children of hearing mothers were less responsive and involved than their counterparts with Deaf mothers, or hearing children of hearing mothers.

In fact, deaf infants of hearing mothers had the lowest mean scores for child responsiveness and involvement in the current study. As mentioned above, the paucity of appropriate communicative skills to support the relationship (as well as language development) on the part of hearing mothers may hinder interactions with a deaf child. With limited communication, it is unlikely that deaf children of hearing mothers will be able to be very responsive to their mother's prompts; these children may respond inappropriately (e.g., not playing the game in the way that Mom was prompting) or miss social bids entirely (i.e., not hearing/seeing the bid to engage). With limited responsiveness, deaf children may also be less likely to take the initiative to involve the mother during free play if they are used to a dynamic in which the two partners have minimal, if any, interaction. In other words, the child may be very accustomed to and content with playing on his/her own, having developed a heightened sense of self-sufficiency out of necessity. One speculation is that these infant behaviors may be sending the wrong message to hearing parents, who may assume that their child does not *need* guidance or scaffolding during play explorations.

Findings from the Current Expanded Study

Emotional Availability & Hearing Status (All Groups). There was a significant difference between the four groups in this study for child responsiveness. In order from lowest to

highest means for child responsiveness, the following pattern emerged: H/d < H/h < D/h = D/d. Upon further investigation, it was found that the group differences lie between D/d & H/d, D/h & H/d, and H/h & H/d. As can be seen, the common pattern here is that scores for the H/d group are the lowest in each case.

Based on previous literature, it is unsurprising that the H/d group is lowest among the groups for child responsiveness means and differs significantly from the other three groups. Historically, this group has been the one that presents with the most difficulties in the mismatched hearing status and so is the target of intervention. Although sensitivity was not found to be significant after conducting post hoc tests, it is important to understand that it is related to child responsiveness. Consider the following.

Hearing mothers of deaf infants are less likely to be picking up on their infants' signals – a key part of sensitivity – at least in the early stages of the child's development. This is mainly due to the hearing mother still learning to adjust her attention-getting strategies to her deaf infant. Without recognizing these signals, parents may have difficulty accommodating their own behavior accordingly to suit the needs of their child and to tune in to the emotional aspects of the interaction. As such, the deaf child is unlikely to be fully engaged with his/her mother, not understanding bids for potential interaction. Overall, the atmosphere may appear dull and unengaging (although not negative or hostile), with neither side really knowing how to interact with the other. This is not to say that sensitivity *causes* child responsiveness but rather that the two are tied together. So, in terms of H/d dyads, the child is not responsive because they are unlikely to be aware of any prompts for interaction. This makes an emotional exchange difficult and affects the positive connectedness that the child needs in relation to the parent.

Emotional Availability & Hearing Status (Hearing Mothers). Hearing mothers of deaf infants were found to have lower sensitivity scores than hearing mothers of hearing infants. It is likely that this is due to hearing mothers of deaf infants not being as adept at engaging and creating bids for interaction as hearing mothers of hearing infants. The potential language barrier makes it difficult for H/d mothers to maintain attention and pick up on the child's emotional cues. This lowered sensitivity would in turn create lowered child responsiveness as the deaf child has less to respond to than its hearing counterparts. The deaf infant is less able to answer spoken questions, follow oral cues, or accept language-based bids for interaction. Because sensitivity and child responsiveness are interrelated – essentially functioning as two sides of the same coin – it is understandable that both would be found to have lower scores together.

It is not conceptually possible on the EA scales for a mother to be optimally sensitive and her child to be unresponsive. Conversely, it is not conceptually possible for a mother to be non-optimally sensitive and her child to be responsive. Part of sensitivity captures the amount of interaction or accessibility from parent to child. The flipside to this is then seen in the child's responsiveness, or his/her eagerness and willingness to engage with the parent, following a suggestion or bid for interaction. For example, an optimally sensitive mother may pick up on her child's interest in the wooden blocks. Noticing this, she begins to stack the blocks, demonstrating what can be done with them, and then offering a block to her child so he/she can join the building. This sensitive parenting is responded to by the child watching his/her mother building with the blocks, then accepting them from her, joining her in stacking the blocks on top of one another and building a tower. Combined is a balanced interaction, made up of the mother cueing in to her child's signals and the child engaging with his/her mother.

Emotional Availability & Hearing Status (Deaf Mothers). It is important to note that the nonsignificant findings between Deaf mothers is unsurprising as there is little reason to expect that Deaf mothers of deaf infants would treat their children any differently than Deaf mothers of hearing infants in terms of the behaviors being measured in this research.

Functions of Touch & Hearing Status (All Groups). There were significant differences among groups for both attentional touch and total touch. As emphasized previously, the use of tactile contact for purposes of eliciting a child's attention is especially important when the child is deaf. This was found in the current results as Deaf mothers used attentional touch significantly more than hearing mothers. Obviously then, the amount of touch they use for attention is part of the cumulative amount found in total touch, which is also higher for Deaf mothers as compared to hearing mothers of hearing infants. Therefore, the ease and frequency with which Deaf parents incorporate this into their interactions is a very important finding, and one with implications for those who work with families of deaf children.

These findings are interesting in that the H/d group was not the lowest group for attentional or total touch, nor the one for which any significant differences were found between it and other groups for total touch. Although hearing mothers of deaf infants have not yet adapted to using attentional touch as intuitively as Deaf parents, these results seem to indicate that hearing mothers of deaf infants *are* in fact starting to use touch, *in general*, during interactions as a means of communication. This extra communication path is not necessary in H/h dyads since communication apparently relies primarily on modalities other than tactile ones, presumably those of oral speaking and auditory reception.

Functions of Touch & Hearing Status (Hearing Mothers). In contrast, there were significant differences between Hearing mothers of deaf infants and Hearing mothers of hearing

infants for attentional touch. This is an interesting finding in that again, it appears that hearing mothers of deaf infants are learning to adjust their communication strategies in a beneficial way to meet the needs of their child. Their ease or intuitive use of touch, according to these results, may not be quite as fluid or frequent as that of Deaf mothers; however, it is evident that they are trying and more aware of the necessity of using touch for communication and interaction as compared to hearing mothers of hearing infants. This is a hopeful finding in that it indicates a level of adaptation that may still be emerging, but that is nevertheless necessary and appropriate when interacting with a deaf child. It would be easy to conclude from some findings reported in this study that these mothers (H/d) were experiencing some kind of "deficit" in their interactions, as their scores were in fact the lowest on a number of variables compared to other groups. However, in the case of attentional touch, this conclusion would be wrong. Rather, hearing mothers with deaf infants *do* seem to be learning to use various modalities in their interactions that may be compensating quite effectively for their child's hearing loss.

Functions of Touch & Hearing Status (Deaf Mothers). There were no significant differences in the way that Deaf mothers used touch in any category with hearing or deaf infants. This result is to be expected as Deaf mothers are likely to treat their child the same (in terms of tactile contact) regardless of hearing status. The hearing child of a Deaf parent will in most cases be brought up in the Deaf world, using and understanding signed communication. The auditory deficit of a Deaf parent is of no direct consequence to the hearing child, who is raised just like a deaf child but with the added modality of hearing; this may be considered a "mismatch" of hearing status, but in reality has little bearing on Deaf parent-child communication. Although this finding might change if Deaf parents were studied in a rural area such as Montana, the

participants in the Gallaudet Infancy Study all resided near large metropolitan cities where Deaf communities were more readily found.

Correlations between EA & Touch (All Groups)

Sensitivity & Attentional Touch. Part of sensitive parenting, especially for Deaf parents, is the use of attention-gaining techniques as indicated by the positive correlation found between these two behaviors. Attentional touch signals to the child that information is forthcoming and that they should pay attention. This kind of reciprocity is an important aspect of sensitivity as well. It makes sense that these two variables would be positively related, and this finding adds support to the importance of the tactile modality in interactions with a deaf child.

Sensitivity & Instructive Touch. Although upon first thought, it would seem that instructive touch should be correlated with structuring, it is necessary to consider that part of sensitivity is variety and creativity in the modes of play. Instructive touch is used by the mother to teach her child how to do something, typically by putting her own hands on the child's and moving them about, directing the child's actions and demonstrating how a task is performed. For children at 18 months of age, every interaction provides a learning opportunity. Sensitive parenting of 18-month-olds recognizes this developmental level and engages the child in interactions that provide teachable, as well as fun and positive, moments. This would then be seen in the use of instructive touch, which emerged as an important component of sensitivity in the present study when all groups were combined. Thus, the positive correlation found between sensitivity and instructive touch is indeed conceptually sound.

Sensitivity & Prohibitive Touch. Sensitivity was negatively correlated with prohibitive touch for the sample as a whole. In other words, either higher sensitivity is associated with less frequent use of prohibitive touch, or lower sensitivity is correlated with greater reliance on this

form of touch. This finding is particularly understandable given the age of the children observed in this study. As toddlers increasingly assert their independence and test the limits of the social and physical environment, occasional restrictions may be needed on the part of caregivers. Within moderation this is appropriate, but sensitive parenting should include less reliance on prohibitive touch than on other forms of communicating these limits to a toddler.

Sensitivity & Total Touch. Sensitivity was also positively correlated with the mothers' overall frequency of touch for all groups. This finding was not surprising and is consistent with other literature related to infant deafness. For Deaf mothers, using touch is a way of gaining attention, conveying information, and creating communicative opportunities. These are all characteristics of sensitive mothers. Thus, to be a sensitive Deaf mother, it would be expected that touch would be used because it is so fundamentally important during those interactions. High quantities of touch may be considered insensitive or intrusive in other populations because the mother seems to impose herself into the child's personal space too much. However, with the inclusion of the Deaf mothers in this current study, it seems apparent as to why the findings contradict those of Pipp-Siegel et al. (1998).

Structuring & Attentional Touch. In this expanded study, structuring was positively correlated with mothers' use of touch for attentional purposes. Optimal structuring would provide the framework for keeping the child's attention during the interaction, helping and redirecting him/her when necessary. It would thus be expected that the use of attentional touch would coincide with optimal scaffolding in the interaction, as was verified by these findings.

Child Responsiveness & Attentional Touch. Child responsiveness was positively correlated with both Deaf and hearing mothers' use of attentional touch when all groups were examined together. The implication here is that a child who is well-engaged during the

interaction would most likely be responding to bids and prompts from his/her mother who is using attentional touch to obtain this responsiveness. Although attentional touch has been discussed as most often used by Deaf parents, this reiterates the point that it is not exclusive to those mothers. Certainly a hearing child who is tapped will have the natural inclination to turn and pay attention to the source of that tap, just as a deaf child would.

Child Responsiveness & Prohibitive Touch. The greater the use of prohibitive touch, the more likely there is a conflict of wills between parent and child, as indicated by the negative correlation between these two behaviors in the present study. When there is an obvious difference between the aims or goals of each partner's behavior, it is likely that the dyad is not having an optimal interaction, or one that is characterized at that moment by warmth and engagement. Thus, as the child is being "reined in" by the parent's use of prohibitive touch, he/she is less likely to respond optimally to the parent's bids or prompts for engagement and may display less positive affect during the interaction as well.

Child Responsiveness & Total Touch. Child responsiveness was also positively correlated with the total frequency of touch used by mothers during the interactions. It appears that, in general, children who are willing to engage with and respond appropriately to their parents most likely have parents who are typically using touch as an effective means of communication regardless of the specific function of that tactile contact.

Child Involvement & Affectionate Touch. Parents who frequently use touch to express affection for their child are likely to have children who respond to that kind of warmth, as seen in the positive correlation between child involvement and affectionate touch. These children seek to engage their parents in play, attend to what the parent is doing, and participate as a partner in a well-balanced, reciprocal, and positive social interaction.

Child Involvement & Attentional Touch. Child involvement also appears to be positively associated with attentional touch. Children are more likely to involve their parents in play when they know that their parents are attending to their needs and trying to elicit an exchange, as seen through the use of attentional touch. Again, this finding holds true regardless of parent or infant hearing status according to this investigation.

Child Involvement & Prohibitive Touch. Child involvement was negatively correlated with prohibitive touch for the sample as a whole. Because prohibitive touch is used to restrict the child, it is likely that the child will be less inclined to engage his/her parent or make initiations to draw the parent into play when the parent tends to use touch as a way to prevent the child from doing what he/she desires. This finding parallels that between child responsiveness and prohibitive touch, as would be expected.

Child Involvement & Total Touch. Child involvement was positively correlated with the mothers' overall use of touch during interactions with 18-month-olds. Because touch is used as a mode of communication and often conveys positive affect, using more touch appears to foster engagement from the child, regardless of hearing status.

Correlations between EA & Touch for Group 1 (Deaf/deaf)

For this group, sensitivity was positively correlated with attentional touch, but negatively correlated with prohibitive touch. Mothers' structuring of the interaction was associated with a greater tendency to use touch for attention-getting purposes, and with an increase in overall reliance on touch during interactions. For deaf children, responsiveness was positively correlated with attentional touch by a Deaf mother, but negatively correlated with prohibitive touch. Child involvement in these dyads was also positively correlated with attentional touch, but negatively

correlated with prohibitive touch, as would be expected. The interpretation of this finding parallels that discussed previously for the sample as a whole.

Deaf mothers use touch as an important means of communication with their deaf infants. Engaging the deaf infant requires attentional touch, but prohibitive touch appears not to be part of sensitive parenting by Deaf mothers. Touch should be used primarily to communicate or share messages and affect, not to prevent, reprimand, or discipline. Setting appropriate limits and having successful interactions involves using attentional touch, and may include a high amount of touch overall particularly with children of the age observed in this study. Deaf children seem to respond well to attentional touch, as evidenced by the fact that they engage with parents who use a high frequency of attentional touch; conversely, they do not engage or respond as optimally when Deaf mothers use prohibitive touch. If prohibitive touch is negatively correlated with sensitivity, then it logically follows that it is negatively correlated with child responsiveness since child responsiveness and sensitivity are conceptually interrelated, as previously discussed. Deaf children involve their Deaf mothers more when attentional touch is used frequently, showing that the parents are interested in their child's play and are responding to bids for interaction. Again, prohibitive touch hinders this communicative interaction and overall emotional availability. Deaf children in this group are less likely to try to involve their caregivers if they are being overly constrained or frequently repositioned.

Correlations between EA & Touch for Group 2 (Hearing/deaf)

Child involvement was positively correlated with affectionate touch for this group. What this indicates is that hearing mothers are using touch for purposes of expressing love and care, rather than for communicative purposes, as is often seen with Deaf mothers. However, this affectionate touch does convey warmth and nurturance, which is related to the child wanting to

involve his/her caregiver in play. In a way, this displays a rudimentary means of communication between mother and child. In other words, although there is still a language barrier between the two, the dyad is able to find a way to send and receive messages, through maternal affectionate touch and the child's involving behaviors.

Correlations between EA & Touch for Group 3 (Deaf/hearing)

Sensitivity was positively correlated with play-directed touch for this group. This is an unexpected finding since previous research has found that hearing mothers with deaf infants tend to use object-related gestures more than hearing mothers with hearing infants. Little has been discussed in regard to Deaf mothers using object-oriented gestures, which are closely related to the concept of play-directed touch. In the Touch Coding System, play-directed touch involves using a toy to touch the child and facilitate play, but not with the intent to instruct or teach the child about the toy. Although object-related gestures may not directly support infant language acquisition, they "may support joint attention, effectively serving attention-getting and attention-maintaining purposes" (Spencer, 1993, no page numbers available). Supporting joint attention as well as eliciting and maintaining attention can also be seen as functions of play-directed touch. For Deaf mothers, they may be using this type of touch as a means in which to teach their hearing infant sign language by first getting their attention with a toy. Unfortunately, it is beyond the scope of this study to know whether or not these sequences of play-directed touch were followed by signs or any piece of linguistic information.

Correlations between EA & Touch for Group 4 (Hearing/hearing)

In dyads comprised of two hearing partners, child responsiveness was positively correlated with affectionate touch. Affectionate touch has a gentle, nurturing quality, but can also include playful prods, pokes or tickling. This kind of warmth is something a child would respond

to with a positive affect, creating a desire to interact with his/her mother and respond predictably to social bids or prompts for engagement.

Child involvement was also positively correlated with affectionate touch for this group. The warm nature of affectionate touch that is related to child responsiveness would also manifest itself in the child's attempts to engage his/her parent in play; this might be observed in the child making visual, physical, or verbal connections during the interactions and showing an eagerness to interact and involve the parent in his/her play in a balanced way.

Nonintrusiveness was negatively correlated with repositioning touch used by hearing mothers with hearing babies. To elucidate this correlation for H/h dyads: child responsiveness and affectionate touch are *positively* related, both increasing/decreasing together, and a similar pattern is seen for child involvement and affectionate touch; nonintrusiveness and repositioning touch are *negatively* related, so when nonintrusiveness increases (i.e., the mother is *less* intrusive) then the mother uses touch to reposition her infant less often, and vice versa. In other words, for this group intrusive mothers reposition their infants more; nonintrusive mothers reposition their infants less.

Hearing parents do not use touch as a means of communication to the same extent that Deaf parents do, even with a preverbal child. Hearing parents use touch as a way of displaying affection or engaging their child in play (as evidence by child responsiveness) or engaging *with* their child in play (as seen in child involvement).

Moving the child about (i.e., repositioning) is seen as intrusive or unnecessary at this age, given the toddlers' increasing autonomy/independence and ability to hear oral commands and prompts. A mother who frequently moves her toddler around unnecessarily is typically viewed as being intrusive, although such physical manipulation is sometimes simply an effort to stabilize or

help the child to sit in mother's lap. Therefore, caution should be taken in interpreting repositioning as indicative of the general emotional environment.

Conclusions Specific to Hearing Status Groups

The results from the present study highlight much of what previous research has discussed in terms of how Deaf mothers and hearing mothers interact with their infants. The above findings have been well-detailed, so it is pertinent to look at the broader picture of these results and the general stories that they tell.

Deaf mothers of deaf infants are raising their children in the world that they know. There is not much for these parents to consider, as they are well-versed in what it is like to grow up Deaf. The intuitive parenting behaviors that they display are automatic and natural for these mothers. They need not think about when or how to use touch as a communicative device in interacting with their children. The bias from hearing individuals, in general, is that Deaf parents (and children) are living in a deficient world – a world without hearing. However, this bias is just that. It is unfair to ascribe such a judgment as they are simply communicating in a *different* way, with the addition of touch – an interactive behavior which might be considered "deficient" or intrusive in most hearing individuals.

Deaf parents with hearing children are raising their children bilingually. There is no need to adjust any kind of parenting strategies as they are providing their child with all the linguistic input and communicative information that is necessary during interactions. An interesting note however is that Deaf parents do acknowledge and are aware of their hearing child's additional sensory input as they have been found to vocalize more than their D/d dyad counterparts (Traci & Koester, 1998). (A specific example was observed during coding of one D/h interaction in

which the mother would hit the floor, creating a banging noise to capture the attention of her child, who was turned away from her, facing the opposite direction.)

Hearing parents with hearing children are similar to Deaf parents with deaf children in that they raise their children in the same world and with the sensory modalities that they know. Just like D/d dyads, H/h dyads have nothing to adjust for, no accommodations to make during interactions. Their intuitive parenting skills are allowed to be expressed in the means that are likely most appropriate for interaction and helping their children develop early language.

Hearing parents with deaf children are, by far, the most interesting and unique group among these four dyads. These parents have an added challenge in raising their child. They must adjust their parenting strategies to suit the needs of their child who is living in a world different from theirs. Hearing parents must learn new ways of interacting with their child that may not come naturally to them (e.g., attentional touch) and understand that there are different ways in which to communicate. A take-home message from this study is that these parents are certainly trying, as they have already, after only 18 months, started to use touch as a mode of communication and they do look different than mothers in the H/h dyads. Hearing mothers are not blithely living in their own world, unaware of their child's different sensory needs. It may not be intuitive for them to use touch, but they are displaying inklings of its benefits, likely due to a process of reinforcement as they use touch and gain their child's response to it. Thus, these parents are not deficient, but rather just "not quite there yet," which is where early intervention can play an important role in shaping and scaffolding the *parents'* behavior, and "finding the most appropriate and support context for a deaf child ([and] facilitating this particularly within the family during the early years)" (Traci & Koester, 2010, p. 209). Interventionists could help parents see that touch creates more opportunities for joint attention, which makes interactions

more successful and satisfying, thereby leading to better social, emotional, linguistic, and overall developmental outcomes. (These and other implications of the current study will be discussed in further detail in a subsequent section.)

Social and Cognitive Outcomes of Older Deaf Children

It is important to take a step back from discussing the deaf infant's development and the Deaf parent's interactions with their infants during the first year or two of their development, and to look at the larger picture in regard to deaf children's development. In other words, what do these children look like across their development, into early and middle childhood and then on to adolescence? These outcomes will be discussed based on the existing literature in the two areas of social and cognitive development. Although these longer-term outcomes may not become evident until middle childhood or even into adolescence, their roots may be found in the early interactions and communication patterns experienced during infancy. They are therefore discussed here in terms of their potential relationship to some of the co-regulatory strategies observed in this investigation.

Social Outcomes. In addition to the communicative function that intuitive parenting serves, it is also seen in parents guiding their infants in regulating emotion (Koester & Lahti-Harper, 2010). From an attachment perspective, parents teach their children to regulate their own emotions by first co-regulating them until the child is mature and capable enough to do so on their own (at least in secure attachment relationships). Part of this relies on explicit communication between the parent and child. Deaf infants with Deaf parents may learn to regulate their emotions sooner than deaf infants with hearing parents due to the shared communication and/or parents' proficiency in communication (Koester & McCray, 2011). Results from the current study suggest that aspects of Emotional Availability such as maternal

sensitivity are particularly related to the child's own responsiveness during play interactions, thus contributing to satisfying and reciprocal early relationships.

Although it may seem likely that deaf children would have lower self-esteem (as compared to their hearing counterparts) due to being part of a minority or group with disabilities, Jambor and Elliott (2005) found this not to be the case. They found that Deaf college students' identification with the deaf community had a positive relationship with their self-esteem. In other words, higher identification was related to higher self-esteem. This underscores the importance of identity (a major task of adolescence) as well as bicultural identity. Deaf children (and adults) who can function comfortably in both the deaf and hearing worlds have higher self-esteem because of the emotional and social support they receive from the Deaf community as well as being able to achieve in the dominant society or with the majority group (Jambor & Elliott, 2005). The positive relationship between coping strategies and self-esteem is analogous to that seen in ethnic minority groups, especially during adolescence in which they have the extra challenge of incorporating their bicultural status into their identity and recognizing the importance of their culture. The formation of healthy early attachments, good communication skills, and a positive sense of self are all related to interactions with caregivers in the first few years. This study highlights the role of mothers' emotional availability and interactive behaviors in laying the foundation for these later developments.

Cognitive Outcomes. It is not surprising that the issue of a deaf child's cognitive development has been examined and compared to his/her hearing counterparts, especially since language and thought are so intimately entwined. In general, deaf children of Deaf parents develop language and other cognitive abilities according to the "normal" or expected trajectories. These children also tend to outperform their deaf peers who have hearing parents, thus calling to

mind the importance of intervention and early support with this particular group. For the D/d group, these children are learning language just as their hearing counterparts are, through exposure, practice, and feedback in their environments. Even for hearing parents who are learning sign language, they may not have the fluency or comfort level that Deaf parents have with it and so their deaf children may not experience the same richness in their language environments (Koester & McCray, 2011) to which the H/h, D/d, or even D/h children are exposed.

Arguably one of the most important cognitive abilities is theory of mind. (In fact, it is so important that those without this, children and adults alike, are said to have mind-blindedness – something often seen in Autistic individuals, who are characterized by deficits in language development and social interactions.) Developing in the preschool years, theory of mind allows individuals to think about someone else's thinking, which results in many different kinds of cognitive complexities. When theory of mind is assessed with the common false-belief tasks, deaf children of deaf parents perform slightly better than deaf children of hearing parents. This latter group is often delayed when compared to their hearing peers, and these children may not demonstrate understanding of false-belief tasks until adolescence. However, the same is not true of deaf children of deaf parents (Schick, de Villiers, de Villiers, & Hoffmeister, 2007). This illustrates that theory of mind does not rely on the modality of language being used, but rather on the child's cognitive development level and language environment, which are so intimately connected. Thus, without the availability of a rich and accessible language environment, the child's understanding of their world (and subsequently their cognitive development) will be hindered. However, with early language acquisition (be it spoken or signed), the child should be on a normal developmental trajectory regardless of hearing status.

This speaks to the importance of fluency in a language. Even for hearing parents who are learning sign language, they may not be proficient enough to engage in mental state talk with their child, akin to a hearing child in an environment that lacks these same conversations (Koester & McCray, 2011). As Vaccari and Marschark (1997) assert, hearing children learn to interpret their parents' emotional states from observing them in conjunction with certain verbal and nonverbal behaviors. They go on to say, "for most deaf children with hearing parents, explanations concerning the reasons for actions, expectations, and emotional situations experienced by both parties will be less frequent and less competent due to the communication barrier" (p. 795). Again, the point is not that there is a *lack* of information being communicated, but rather that minimal information is being *received* during these exchanges (Vaccari & Marschark, 1997). Of course, this has implications beyond just the early years of cognitive development, since the mother-child communication system will affect later social development and how the child learns to act with others in the social world. The results of the current study draw attention to the importance of the tactile modality when communicating with a deaf child; this is seen as being related to language development in that touch is often used to establish joint attention during interactions with an infant.

Although they may demonstrate comparable levels of cognitive development, one area that deaf children often have difficulty in is that of reading/literacy. This issue is best summed up by Goldin-Meadow and Mayberry (2001): "Unfortunately for the potential deaf reader, ASL is not English… The bottom line for many deaf children born to deaf parents is that, although they are native (and fluent) users of a language (sign language), that language is not the language they are learning to read" (p. 223). For deaf children of hearing parents, there is an additional task. In some cases, they will first learn ASL and then learn English through print, sign, or sound as their

second language so as to become bilingual. Children cannot learn to read without knowing a language and simply knowing a language helps children to learn to read, even if it is not their language in print. However, despite ASL being structurally different from English, deaf children who are proficient in ASL are often better English readers than deaf children who are not proficient in ASL (Jambor & Elliott, 2005). Yet again, this underscores the importance of language acquisition as a critical developmental foundation for all children, regardless of hearing status.

In this study, language itself was not assessed; however, it was conceptualized as a vehicle by which interactions take place. Language is ultimately social in nature and part of learning to communicate in any modality requires learning to be a social partner, being aware of both sending and receiving messages, understanding turn-taking, and the dance-like qualities of good interactions. For deaf children, this may be an inherently more complex task and so the supportive behaviors of parents become even more important than they already are for hearing children. Therefore, effective interactions with and emotional support from parents are crucial not only in terms of early social and communicative development, but also in relation to potential long-term outcomes such as those just described.

Implications & Applications

It has been well established that the communication style between hearing parents and their deaf infants often differs from that of Deaf parents and deaf infants; it is important to look toward the latter as a model for successful communication interactions so as to incorporate some of their subtle behaviors in intervention efforts. Koester and Lahti-Harper (2010) emphasize documenting these subtle communication strategies used by Deaf parents with their deaf child as examples for hearing parents with deaf children as well as for professionals working with this

population. Without intervention, it is unlikely that hearing parents will successfully develop the important verbal and nonverbal child-directed language strategies that support language acquisition for a deaf child. Rather than relying on vocalizations, hearing parents can learn communication strategies that involve "physical contact, gestures, eye contact, and facial expressions similar to those seen in deaf dyads" (Vaccari & Marschark, 1997, p. 795).

Again, hearing parents are not deficient in their parenting skills but rather interactions with deaf infants may differ from those with hearing infants; these behaviors are not as automatic for hearing parents as they are for Deaf parents. For example, when a deaf infant is responding to a hearing parent's visual or vibratory event that co-occurs with child-directed vocalizations, the parent may think that the child is actually responding to the vocalizations, not the other simultaneous stimuli. In addition to the possibility that this could delay diagnosis of hearing loss (Vaccari & Marschark, 1997), it also means that hearing parents need to become more consciously aware of certain behaviors, both from themselves and their infants. Moreover, that which is extraneous stimuli to hearing children (e.g., vibrations and vestibular activities) becomes a primary means of accessing the physical and social environment for deaf children. Thus, maternal touch serves a more communicative function to the deaf child than the hearing child, and is therefore a more important component of early interactions for these infants. For example, when a parent is talking to his/her hearing child with a hand on the shoulder, the touch is auxiliary to the vocalizations, which serve as the primary source of information in this situation. For the deaf child, when auditory stimuli are absent, touch rises in its importance in communication. It is clear from the results of this research that Deaf parents incorporate this modality easily and frequently, but that hearing parents of deaf infants are beginning to do so as well. It is not possible to ascertain from these data whether this is a positive outcome of early

intervention (in which all of these H/d families were participating), or whether the parents have learned by interacting with their deaf child that tactile contact seems to be necessary and effective. In either case, professionals working with hearing parents of deaf children would be well advised to emphasize and reinforce this pattern which appears to contribute so positively to parent-child interactions at this age.

In regard to intervention, some general strategies that convey the importance of touch to hearing mothers of deaf infants could easily be discussed with parents early on, after the initial diagnosis and confirmation of hearing loss. This information could be given in a pamphlet handed to hearing parents of deaf infants shortly after their stay at the hospital. More direct interventions could consist of meetings with hearing parents, guiding them in interacting with their deaf infant, pointing out opportunities to use touch and showing them how the child responds. Interventionists could also videotape interactions to use as feedback via guided viewing with the parents. There are many levels at which intervention could occur, easily and likely with minimal cost, depending on both the parents' willingness as well as the child's severity of hearing loss. Again, it is important to note that according to the current investigation, hearing mothers of deaf infants are already making adaptations in their interactions, incorporating touch more than hearing mothers of hearing infants yet not quite to the extent that Deaf mothers are doing so. Thus, intervention would be beneficial to help support these emerging, almost intuitive, parenting behaviors and to help hearing parents see the importance of using touch more effectively for communicative purposes.

A final important implication is that relating to theory and science. By examining the dyadic interactions of Deaf and hearing mothers with their deaf or hearing infants, the current research contributes to a broader understanding of the range of human development. The

inclusion of people with disabilities does not imply that this research focuses on people with deficiencies, but rather on other ways in which normative development can, and does occur for part of the human population. It is important to think of these differences as natural variations rather than a lack in some part of basic human behavior. Thus, the goal of intervention should no longer be to *rehabilitate* them, but rather to *habilitate* the child to keep him/her on a normal developmental trajectory (Koester & Traci, 2010). With a more medical approach to deafness, it is easy to succumb to the idea of "fixing" the child. This is likely even more appealing to hearing parents, or to those who do not understand their deaf infant's world and are inclined to want to make the child hearing, especially if the child is a good candidate for a cochlear implant. If parents take this message to mean that they do not need to make many communicative adaptations themselves, then valuable time will be lost in terms of the child's development across multiple domains.

Therefore, it is important to monitor the parents' expectations for intervention and for long-term outcomes and progress. For example, are they expecting their child to hear and talk like a non-deaf person? Learning that this may never occur can be a discouraging realization for hearing parents, in addition to their difficulty in adjusting to the diagnosis of their child's hearing loss. With the added stress of conflicting professional opinions regarding different intervention and communication options (Traci & Koester, 2010), new parents have limited understanding about how to interact with their deaf child without relying heavily on oral communication. Rather, they must learn to supplement their intuitive inclination to talk to their child, ideally incorporating more touch and visual stimulation as is often seen with Deaf parents.

Again, it is best not to think of deafness as a deficiency and it is unlikely that those in the Deaf community would call their hearing status anything of the sort. Perhaps to the hearing

individual, deafness may appear to be a loss, but what is not often realized is that other skills can become better honed as a result. The colloquial notion that Deaf people have heightened visual and tactile perception seems to imply they have extraordinary powers. Rather, they are adept at picking up cues in interactions that go beyond the oral and into the understanding of visual-gestural communication. This implies a different skill, without a value judgment of better or worse than hearing, but represents a valuable means of communication nonetheless.

Limitations

One of the most pertinent limitations to address in this study is the use of a dataset that began in 1987, making it over 20 years old. While this is an important limitation to address, the uniqueness of this sample nevertheless justifies the use of such data. To begin with, fewer than 10% of deaf children are born to Deaf parents, so that doing research on the D/d dyads presents a challenge from a data collection viewpoint (especially in rural locations such as Montana). Moreover, the combination of the other three hearing status groups for comparisons is another unique opportunity provided by this dataset. Regardless, the videotapes are still 20+ years old and much has changed since their original collection.

In the USA, universal hearing screening occurs at birth now, allowing deaf children to be identified much earlier than was the case at the time of the Gallaudet Infancy Study when children were often not identified with hearing loss until age 2 or 3. Instead of waiting until 9 months (as was the case for most of the Gallaudet infants) to start early intervention, parents now would have had access to and opportunities for intervention from the newborn period. Therefore, earlier interventions might mean that a new study would find H/d parents to be even more successful in their interactions now as compared to the 1980-1990's. The increased availability of cochlear implants is another issue that must be addressed, although conducting this surgery on

deaf children still does not make them identical to their hearing-born counterparts. Cochlear implants do not work the same for all who use them, nor are they equally effective for all ages, etiologies, or degrees of hearing loss. While the same might be said of hearing aids, there is an additional complication with this earlier form of assistance: if the child does not put their hearing aid in, whether due to forgetfulness or perhaps not wanting to be teased by peers, then they are not getting the benefits that the cochlear implant (which is constantly in place, once activated) may provide them.

Additionally, if the plan is to get the child a cochlear implant, it is less likely that the parent will be making the important adaptations (e.g., learning to sign) while they wait until the child is of a viable age for the surgical procedure. This has obvious implications as to the parent-child relationship during infancy. Thus, the current research unfortunately cannot be applied to the population of deaf children who are increasingly likely to be fitted with cochlear implants, as their interactive and communication needs will inevitably be quite different.

Another important technological issue that is relevant to this dataset's age is the advent of the internet. The children born in the late 1980's were born to parents who could not simply Google "deafness" and learn about possible interventions, local resources, programs for their child, tips for raising a deaf child, or even online support groups and communities of other parents sharing similar experiences, either successes or failures. However, at the center of this lies the fundamental fact that the hearing parent still has a deaf child and just because the internet exists does not mean these parents magically have skills, abilities, and knowledge that the parents in the late 1980's did not. They simply have access to more information. Although this is a significant advance and improvement, the emotional impact of having a child born with little or no hearing may still be similar today to that experienced by parents in the 1980's-1990's. It is

possible that the usefulness of internet resources is more important for parents of *older* deaf children who must make informed decisions about sign language, speech, schooling, efforts to connect with Deaf adults or other deaf children, and so forth.

Additional limitations of this study may be related to the use of particular statistical tests to examine the data from a relatively small sample. Although setting an alpha level of .10 is common for exploratory research (Sproull, 2002; Warner, 2008), the disadvantage to this is the potential of a Type I error. It is possible then that some of the results in the current study were due to false positives (failing to reject the null hypothesis when it was true). A larger sample size could have minimized the likelihood of both Type I and Type II errors. Relatedly, it is possible that Pipp-Siegel et al.'s (1998) results were due to having 24 dyads for each of their two groups and therefore being able to detect group differences more easily due to their larger sample size. Using the *G*Power* program to run a Power Analyses, it was concluded that even a sample of 64 dyads for the current EA analyses would have yielded a small effect size of .12. For analyses of touch, a sample size of 32 would have yielded a moderate effect size of .30.

A final possible limitation to this study was that not all of the coders knew sign language. However, to counter this limitation it is necessary to note that the observational coding systems used in this study were not language-based. For the Touch Coding System, the coding is based solely on seeing the touch occur and in what context. No sound or language proficiency is needed in order to categorize the functions of touch that take place. Coding EA is arguably more dependent on language, but there is no requirement to this coding to hear/understand what is being communicated as it is based on the emotional climate created during an interaction. If an interaction were to be converted into a transcript, for either hearing or Deaf dyads but purely based on what they say, it would not be possible to arrive at an accurate rating for each of the EA

scales. A transcript would lose the quality of the interaction as it cannot capture that kind of emotional exchange. Moreover, coders were able to understand the interaction by watching the exchange between mother and child, noting when signals were picked up by either partner and essentially putting oneself in the perspective of either side, thus being able to feel how it would be to be part of the interaction.

Directions for Future Research

Just as the Pipp-Siegel et al. (1998) study inspired this current investigation, it is hoped that future studies will continue this kind of research as it lends much information to the understanding of Deafness and parent-child relationships, especially regarding those dyads that include hearing mothers with deaf infants.

As noted, this study used a dataset collection from the Gallaudet Infancy Study, which was a comprehensive and groundbreaking longitudinal investigation of Deaf and hearing mothers with their deaf or hearing infants. However, other researchers should investigate the constructs in this study – emotional availability and the functions of touch – with children who are in early childhood (ideally, aged 3-5). During this early childhood period, language should be better developed and therefore more revealing of the parent-child relationship. The addition of a compliance task (e.g., clean-up) or a cooperative task (e.g., goal-oriented) would provide the opportunity to evaluate EA in terms of how both mother and child handle conflict, boundaries, and negotiation. The Strange Situation Procedure is based on evaluating the attachment relationship by observing behavior that emerges under times of stress. By escalating the demand put on the child from the parent, a similar kind of evaluation can be made during an interaction coded for EA at a later age. However, it is likely that with older children, the functions of touch may decrease or drop out altogether. Nevertheless, seeing how dyads with older deaf children

change or adapt these tactile strategies used for communication would also be very informative. Perhaps touch would be used in a way not captured in the Touch Coding System and/or not used with infants and toddlers, or perhaps new functions of touch that are more related to cognitive scaffolding would need to be added.

Another direction for future research would be to use this model of EA and touch, inspired by Pipp-Siegel et al.'s (1998) study, but with larger groups. This is difficult considering the low prevalence of deafness, but if it could be conducted on a much larger scale – even at a national level – there would be a whole wealth of information that could be gleaned from this kind of study.

Finally, future research should examine the use of language during these dyadic interactions. The dyadic parent-child interaction coding system (DPICS) is a well-established, validated, and reliable microanalytic coding system designed to assess the quality of parent–child interactions through categorizing verbalizations between the dyad (Eyberg & Robinson, 1983). Each verbalization made by the parent and child is recorded, which can be done as tallies or as sequential codes. The following is a breakdown of the verbalization categories: acknowledgement, description, reflection, praise, question, indirect or direct command, critical statements, and play talk. Ideally, coders proficient in sign language (whether deaf or not) would be used to record interactions with Deaf mothers so as to code the verbalizations as accurately as a hearing coder is able to code mothers' vocalizations. What this kind of study would do would be to give information about the *quality* of language and *types* of things being said, and whether or not there was a difference between Deaf and hearing mothers in this regard. Touch served as a complement to the interaction between mothers and infants conveyed by EA, however it was only one way of looking at the dyads. DPICS would be beneficial in providing another

perspective and further insights into the complexities of dyadic interactions. The inclusion of different types of measures can aid in the understanding of early mother-infant interactions and how all aspects of communication play a role in the developing relationship.

Future Directions

This study was an effort to add to the literature on deafness and describe differences between Deaf and hearing mothers with their deaf or hearing infants. The current investigation was modeled after Pipp-Siegel et al.'s (1998) work and took their suggestion to examine the *quality* of touch (called function or category in the present study) in addition to the quantity. This study was not a direct replication in regard to methodology, but rather a variation (constructive replication and expansion) as it incorporated Deaf mothers, making for a complete analysis of all the possible combinations of parent-child hearing status.

The results seem to substantiate the importance of looking at touch in more detail than has been done in the past. Previous studies, if they included an examination of touch at all, often did not address its communicative function. This study directly addresses this and highlights its important during early parent-child interactions. As discussed, there are many intervention possibilities that can arise from the current findings, especially in regard to the H/d dyads.

It is the hope of this researcher that this study will be used as someone else's model to create their own variation of a study that examines emotional availability and touch among Deaf and hearing mother-child (and maybe even father-child) dyads, perhaps also incorporating some of the suggestions outlined above.

Appendix A

Emotional Availability Coding Sheet.

Coder: _____ **Date: _____**
Codename: _____ **Group: _____** **Start Time: _____**

Parent Sensitivity Score (1 – 9)	
	Affect- positive, appropriate, genuine, shared, verbally & non-verbally congruent
	Sensitivity- to child's signals & willingness to respond, sensitive timing of responses
	Flexibility- of attention (shift focus easily) & behavior (rigid adherence to one way of doing things).
	Variety & creativity of play- level of engagement and ease of participation
	Acceptance of child's individuality & needs- balance in interaction, not one-sided, allows time for child to speak
	Amount of interaction- accessibility of parent to child
	Ability to resolve conflict- not threatened by defiance, comfort with negotiation
	Consistent in affect- no sudden shifts in emotional tone

Parent Non-hostility (1 – 5)	
	Tone of voice- *covert hostility*- impatient edge, irritated, boredom in voice, snappish, *overt hostility*- plainly hostile
	Type of verbalization- critical or sarcastic vs. positive and affectionate
	Facial expression
	Indirect hostility/negative climate- negative affect not directed at the child

Parent Non-Intrusiveness (1 – 5)	
	Over-directing, over-stimulating, controls interactions, didactic style
	Over-protectiveness- treating the child as younger than he or she is
	Not allowing autonomy- not giving the child the lead or allowing input into how things are done
	Interfering or interrupting, doing everything for the child
	Smoothness of transitions, appropriate discipline that doesn't disrupt relationship, can redirects inappropriate

Parent Structuring (1 – 5)	
	Provides supportive frame to help child maintain interest in task or to increase child's understanding
	Sets limits for appropriate behavior
	Consistent in ability to structure
	Breaks down or explains task/activity and makes more understandable if child does not respond/understand

Child Responsiveness to Parent (1–7)	
	Child's eagerness and willingness to engage in activity with parent
	Affect child displays in interaction with parent
	Child's responses to parent's bids for interaction
	Child's smiles or laughs are "responsive"(i.e., if directed toward parent--not toward self/own activity)
	A generally positive & happy countenance (weight as more important than the frequency of smiling or laughing

Child Involvement with Parent (1 – 7)	
	How often **child initiates interactions** with parent
	How often **child asks parent questions**

	How often **child shows things** to parent
	How often **child makes eye contact** with parent
	Balance between child's autonomous play and involvement of parent
	Child involves parent in play **anxiously**

Appendix B

Caregiver Touch Coding System Definitions.

MATERNAL TOUCH DURING FREE PLAY:
OPERATIONAL DEFINITIONS

[Note: these behaviors are meant to be mutually exclusive, i.e., only one category should be coded for each incidence of touch initiated by the Mother. Do not code those touches that are clearly initiated by the Baby. Do not code for the mother being used as a "chair" whilst the baby is sitting in her lap.]

Affection: this touch has a gentle, nurturing quality, although it can include more abrupt movements as in the case of playfulness or tickling; note that this is only coded when objects or toys are *not* involved.

Examples: stroking, patting, tickling, nuzzling, hugging, kissing, etc.

Play-Directed: touching child as part of play, but not apparently with intent to instruct or teach child about toy.

Examples: playing peek-a-boo by placing own hands over child's face; places doll in baby's lap, then points to baby's nose, doll's nose, mom's nose; using doll to nuzzle baby

Attentional: tapping on child's body prior to communicating; typically (for Deaf parents) this will be a tap/sign sequence in which the tapping might occur several times before the infant looks at caregiver, or before signing begins. (Note that taps in rapid succession are coded as one instance of touch; do not code each individual tap)

Examples: infant is examining book, and mother taps his shoulder several times to elicit eye contact or visual attention in order to sign about the pictures

Instructive: guiding child's use of toy, modeling appropriate behavior, or prompting child in relation to toy use; this is ***only*** coded if mother's behavior does not go against child's current interest or against child's will.

Examples: child is trying to use hammer, but is holding it upside down; mother helps to put hammer into child's hand in correct position; child is looking at book but has difficulty turning pages**;** mother assists by showing child how to lift one page at a time; mother moves baby's hand repeatedly over fuzzy part of "Touch Me" book, demonstrating how that particular book is to be used

Prohibitive: caregiver restricts or re-directs child, e.g. by preventing child from engaging with specific toy or behavior, or by restraining child's movement (conflict of wills)

Examples: mother holds child's hand firmly so that child cannot bang object on floor; mother removes toy from child's grasp, touching him/her in the process; mother pulls child toward her when s/he tries to walk away

Incidental: this is usually a brief contact that appears to have no particular purpose, but may occur as side-effect of child moving closer to mother, or of mother reaching for object

Examples: mother's hand brushes child's shoulder as she tries to obtain toy or change own position; mother's knee rests briefly against child's leg as they each move towards each other on blanket

Re-Position: mother picks up or holds infant in order to move him/her into better position related to toys, the camera, her vision, etc.

Examples: child is trying to sit in mother's lap, so mother assists by helping to stabilize child or settle him/her into comfortable position; infant is sitting on some of the toys, so mother lifts and moves him/her onto clear space on blanket; Infant is seated facing away from mother, who then turns him/her around for better visual contact

HINTS:

- PLAY-DIRECTED: MOM→TOY → BABY (e.g., mom takes monkey's arms, wraps them around baby in "hugging" motion)
- INSTRUCTIONAL: MOM → BABY → TOY (e.g., mom takes baby's hands, puts them on monkey's arms to open and close Velcro)

Appendix C

Caregiver Touch Coding System Sheet.

Codename: __ __ __ __ **TOUCH DURING FREE PLAY INTERACTIONS** **Coder Initials:_____**
AGE: (circle one) 9 12 18 MOS. **Date: _____**
Start time: ____:____:____

	Affection	Play-Directed	Attentional	Instructive	Prohibitive	Incidental	Re-Position	
1								1
2								2
3								3
4								4
5								5
6								6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24
25								25
26								26
27								27
28								28

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