JOINT ATTENTION IN EARLY SOCIOEMOTIONAL DEVELOPMENT

JOINT ATTENTION IN MOTHER-CHILD DYADS INVOLVING DEAF AND HEARING TODDLERS: IMPLICATIONS FOR SOCIOEMOTIONAL DEVELOPMENT

By

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Doctor of Philosophy

McMaster University

DOCTOR OF PHILOSOPHY (2005) McMASTER UNIVERSITY
(Psychology) Hamilton, Ontario

TITLE: Joint Attention in Mother-Child Dyads Involving Deaf and Hearing Toddlers: Implications for Socioemotional Development

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NUMBER OF PAGES: xii, 267

Abstract

Ninety percent of deaf infants are born to hearing parents, and socioemotional development is compromised in a substantial subset of these children. While deafness itself does not *cause* socioemotional and behavioural dysfunction, its influence on socioemotional development is profuse and complex. It was proposed that early problems in mother-child joint attention would explain some of the socioemotional development that lags chronological development in deaf children with hearing mothers. Fifty six 18- to 36-month old children and their mothers were recruited to the study; n = 29 hearing mother-hearing child dyads; n = 27 hearing mother-deaf child dyads. A reconceptualized model of joint attention guided this research and joint attention was restated as a functional construct. Four questions were asked and seven hypotheses were derived from these questions. Results supported six of the seven hypotheses tested. Findings are discussed in terms of developmental relations between joint attention and early socioemotional development in hearing and deaf children. More specifically, the findings support a developmental psychopathology perspective of development that broadens the "language" argument for problems in deaf children's social development. Overall, a deliberate, rather than intuitive, model of mothering is suggested to be important in the accommodation of hearing mother-deaf child joint attention important for early socioemotional development.

Acknowledgements

In thinking about writing this acknowledgement, it struck me how ironically *developmental* my work has been. This research began with a deceptively simple question: How *do* little children come to understand and interpret their world? Much like a pre-lingual child, my ideas and thoughts were fledgling; felt, even "known" at some intuitive level, but their expression, at best, poorly articulated. With much scaffolding, my ideas and thoughts were fostered, questioned, encouraged, disparaged, revised, explored, given a voice, and then, critically thought about all over again. An irascible hunger to learn, and to know, tempered my frustration. And, now, here I am, writing the acknowledgments for this representative work. The data, of course, articulate themselves. Their understanding, interpretation, and articulation, however, are mine. For all the scaffolding, guiding, pushing, questioning, and unfaltering support that underlies my research and its articulation, my sincere thanks to Dr. Louis Schmidt, Dr. Geoff Norman, Dr. Saroj Saigal, and Dr. Laurel Trainor. My appreciation is also extended to Dr. Melissa Rutherford for igniting the idea for this work, and to Dr. Colwyn Trevarthen, whom I visited at Edinburgh University, for teaching me the difference between communication and language, and for giving me the metaphor of intersubjectivity to mentally "play" with.

Enormous gratitude goes too to the pre-school teachers and early intervention workers, regional coordinators, psychologists, and principal of the Ontario Provincial Schools Pre-School Home-Visiting Program, Ontario Ministry of Education and Training. Special thanks are extended to Sharon Ainsworth, Coordinator of Preschool Home

Visiting in Eastern Ontario and parts of Northern Ontario; thank you for your knowledge, support, and the topical and timely journal articles that found their way into my mailbox. Special thanks also to Darlene Horsley-Hurst, pre-school teacher with the Provincial Schools; thank you for your patient speech-reading through my accent, for your generous sharing of yourself, your family, and of what being deaf means and does not mean. To Marietta Colven, Coordinator of Preschool Home Visiting in Central Ontario and parts of Northern Ontario, who single-handedly made so much of this work possible for me, two words only: Thank you.

Each and every one of the fifty six little children and their mothers who participated in this work are remembered and valued as the ultimate teachers.

From the beginning, too, I have been supported by a group of undergraduate students whose commitment to me and this work has been phenomenal. Most especially, Matilda Nowakowski and Celia Hsiao: I could not have done this without both of you. Thank you from my heart. Amy Ash, Liz Bertoja, Catherine Brown, and Jenn Santo Domingo; I am not sure where I "found" you, but I did, and thank you so very much.

As a human being, I am acutely aware of the support of my colleagues, extended family and friends, too many to name, but you know who you are; some as close to me as in the lab or within distance of a coffee shop, others across the oceans.

My four beautiful sisters, Bridget, Astrid, Cathy, and Lara: Here we are ladies! My parents; thank you for allowing me to know what it is to be loved as a child, and valued as an adult. To my two children and my two greatest "works," I am deeply proud of your unselfish and mature spirits in enabling me to pursue and complete this work.

Keep growing, learning, and becoming. To my husband, Trev, what do I say? You have been, and are, nothing less than everything. Thank you for always believing in me and for always bringing perspective sharply back. On *that* day, when the slip of my foot on the car's brake left my life, let-a-lone my brain, hanging in the balance for a while, you knew something then. Thank you Trev for all you have been and are. Finally, my forever appreciation to McMaster University and all that she symbolizes for me personally. It is now time for me to give back.

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INTRODUCTION[1]

The Problem

Between four and six, of every thousand infants born each year in Ontario, are born with bilateral permanent hearing loss (BPHL) (Ministry of Health and Long-Term Care, 2002). Ninety percent of these infants are born to hearing parents (e.g., Biderman, 1998, p. 131; Elweke & Rodda, 2000; INSITE, 2003; Meadow, 1980; Sacks, 2000, p. 48). As well, the majority of hearing parents have little or no experience of deafness (Hindley, 1997). Children born with BPHL, similar to all children born with developmental and physical vulnerabilities, are at risk for social, behavioural, emotional, and mental health problems (Blackman, 2002; Jung & Short, 2002) irrespective of parental hearing status (Hindley, 1997). While a subset of deaf children do go on to achieve optimal social and cognitive developmental outcomes and personal adjustment, these children are typically from a small subset of deaf children with deaf mothers (Jamieson, 1995a; Jung & Short, 2002); the more representative population of deaf children with hearing parents has a 10 to 50 percent prevalence rate for behaviour problems (Hindley, 1997), and social and academic competence is significantly more likely to be compromised (e.g., Greenberg, 1980; Meadow, 1984; Small & Cripps, in press).

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[1] While I am aware of Deaf culture's convention and distinction between capital-*D Deaf* and small-*d deaf*, small-*d deaf* has been used in all instances other than where characterization or identity is clearly established as capital-*D Deaf*. This selection in no way reflects my bias; rather it is an attempt at consistency in linguistic style only. Similarly, for the sake of grammatical uniformity and simplicity, female pronouns are used throughout the paper for the child in mother-child delineations.

For example, preschool- and school-age deaf children with hearing parents are described in the literature as being less emotionally and socially mature (Hastings, 1979; Meadow-Orlans, 1987, p. 48, p. 96), with decreased initiative (Jamieson, 1995b), and greater dependence on adult others (personal discussion, Marietta Colven, 2003; Jamieson & Pederson, 1993; Meadow, 1980, p. 96). Deaf children are more likely to display problems in social-emotional development (Greenberg, 1980; Jung & Short, 2002; Koester & Meadow-Orlans, 1999; Meadow, 1984) and behavior regulation in early- and school-age development (personal communication, Marietta Colven and Richard Dart, 2003, E. C. Drury School for the Deaf, Milton, Ontario; Jung & Short, 2002; Smith-Gray & Koester, 1995; Thompson, McPhillips, Davis, et al., 2001). Many deaf pre- and school-age children are low in perseverance and demanding of attention and help (Meadow-Orlans, 1987, p. 47). They are also more likely to experience interpersonal/social (Becker, 1987, p. 68; personal communication, Marietta Colven, 2003) and "mental" isolation (Sacks, 2000, p.179; personal communication, Dr. Colwyn Trevarthen, 2002), loneliness (Becker, 1987, p. 68; personal communication, Marietta Colven, 2003; Meadow-Orlans, 1987, p. 45), increased levels of anxiety (Hindley, 1997), aggressive behaviour, and/or to be quick to anger (Denmark, 1994; Hastings, 1979). Deaf children have also been described as passive and shy (Sacks, 2002, p. 46), less positive in self-image (Becker, 1987, p. 67; Hindley, 1997; Meadow-Orlans, 1987, p. 50), and low in self-esteem (Beck, 1988), spontaneity, animation, confidence, playfulness, and understanding others compared with hearing children, which often results in deaf children

making incorrect attributions and inferences about others, and vice versa (Denison, 1987, p. 101; Jung & Short, 2002; Sacks, 2000, p.46).

Deafness itself does not *cause* socioemotional and behavioural dysfunction, but its influence on their development is profuse and complex. Although different theories, including the predominant "language argument," have tried to explain why so many deaf children with hearing families experience difficulties in socioemotional development, the research is sparse and the question remains largely unanswered. Despite an increasing shift from a deficit model of deafness, and the view of deafness-as-cause, to the view that ineffective patterns of interaction with hearing adults (Jamieson, 1995b) underlie difficulties in early socioemotional development, issues of *how* ineffective patterns of interactions with hearing adults translate into socioemotional and other developmental problems are primarily limited to the realm of theory. It is reasonable to suggest that early problems in engagement between prelingual deaf infants and hearing mothers explain much, if not most, of the socioemotional development that lags chronological development in deaf children with hearing mothers (Greenberg, 1980; Watkins, 2004, p. 1685). In addition, this ontological argument is supported by a substantial literature documenting comparable outcomes, across all developmental domains, in deaf children with deaf parents and hearing children with hearing parents. To the best of my knowledge, however, early *prelingual* precursors or mechanisms through which these ineffective patterns of interactions between deaf children and hearing mothers might influence development, have not been made explicit or empirically tested.

Literature Review and Theoretical Background

Four distinct, yet converging, lines of developmental theory and research might contribute to our understanding of *how* hearing mother-deaf toddler interactions affect difficulties in socioemotional development in early childhood. They are: (a) interpersonal relations, (b) mother-child interaction, (c) hearing status of mother-child dyad, and (d) joint attention. Conceptually, and in the order presented above, these four lines of theory and research can be considered as hierarchical in nature; the first line of research overarches the second, third, and fourth, and each of these, in turn, is distilled from the one above. The theoretical and research domains of *interpersonal relations* and *mother-child interaction* will be first described only to the extent that their overarching theoretical foundations underpin the latter two lines of developmental research (i.e., *hearing status of mother-child dyad* and *joint attention*) from which the working rationale, questions, and hypotheses of the present thesis were derived.

Interpersonal Relations

Interpersonal relations theory speaks to the developmental role of interpersonal relations experienced by the developing child beginning from birth, and falls within the *contextual* perspective of human development. The contextual perspective of development recognizes that individual development does not occur in isolation but rather through "negotiation" with another (Vygotsky, 1933, p. 102) in conjunction with the transactions (Jamieson, 1995; Jung & Short, 2002; Koester, 1994) of broad uncontrollable factors (e.g., wars, famines) as well as those of the more immediate context of the family – "the institution of infant development" (Kreppner, 2003, p.196) - (e.g., single parent

households, interpersonal relations), and the greater context of the child's social and physical environments (e.g., access to schools, resources) (Bukatko & Daehler, 1998, p. 25). The caregiver-infant relationship is typically the infant's first interpersonal relationship, and I argue that, for deaf infants born to hearing mothers, congenital deafness can be viewed as an "uncontrollable factor," and hearing status of the mother as both a "family factor" and "environmental factor." Together, these contextual/transactional factors influence the socioemotional developmental trajectory of the child, starting from the first day of life (Sacks, 2000, p. 50), through this first interpersonal relationship.

The human ability for social engagement is an inborn predisposition, a predictor and marker of developmental outcome, and an expression of psychological well-being and adjustment in development across the human lifespan. Human infants are born with a social engagement system (Porges, colloquium address, McMaster University, Ontario, Canada, October 5, 2000) or disposition that directs, and enables, infants to look at faces, to direct gaze, and to engage intersubjectively and affectively with their caregivers (Nichols, Gergely & Fonagy, 2001; Hobson, 1993b, p.204; Porges, 2000; Trevarthen & Aitken, 2001). Accordingly, opportunities for *developmental contact* with primary caregivers are initiated and facilitated from the beginning of life. Toward the end of the first year of post-natal life, natural curiosity (Locke, 1693 cited in Crain, 2004, p. 9; Sacks, 2000, p. 52) inclines the infant toward more active interaction with the physical environment (e.g., infant-object engagement) and, from the second year of life, the child becomes interested and involved in an expanded social environment and begins to

experience and establish interpersonal relations with, for example, other adults, siblings, and peers (Preisler & Ahlström, 1997; Vygotsky, 1933, p. 102). From a contextual perspective then, *developmental contact* with primary caregivers functions to first initialize, activate, and organize socioemotional development, and then, in parallel with the developing infant's tendencies toward engagement with the social and physical environments, to recursively organize and shape socioemotional development.

Mechanisms Underlying Interpersonal Relations

Theoretically suggested and empirically demonstrated mechanisms through which interpersonal relations establish and mediate early socioemotional development's goals of social connectedness and object exploration (Weinberg & Tronick, 1998a, 1998b) include, but are not limited to the following: experiences of frequent and positive episodes of caregiver-infant interaction and social exchange (Jung & Short, 2002) that support and regulate infant affect and distress (Greenspan, 1990; Jung & Short, 2002; Papoušek & Papoušek, 1977; Stern, 1974; Trevarthen & Hubley, 1978; Tronick, & Gianino, 1986; Weinberg & Tronick, 1998a, 1998b), enabling development of secure attachment (Koester, 1994), self-regulation, and attention to the environment (Jung & Short, 2002). These experiences afford the development and expansion of a self-other perspective (Koester, 1994), and the provision of opportunities for the child to share experiences, feelings, thoughts, reactions, and opinions with others (Becker, 1987, p. 68) that allow the child to become aware that other people think and feel in ways that might be different from how she thinks or feels (Courtin & Melot, 1998; Woolfe, Want, & Siegal, 2002) or acts (Schieffelin & Ochs, 1986, p.3). The child's emerging cognitions

and emotions are continually and recursively shaped (Jung & Short, 2002); the experience of intimacy and affective contact critical to both the development of interpersonal skills and personal development (Becker, 1987, p. 65); opportunities for mutual cooperation, resolving disagreements and problem-solving with others (Becker, 1987, p. 65), learning to understand context, the ways of her world, and generally, to interpret "what is going on" (Ochs, 1986, p. 1) enables the learning of rules and behaviour appropriate to the immediate situation (Ochs, 1986, p. 1; Preisler & Ahlström, 1997), and the need for flexibility in relation to others (Becker, 1987, p. 65). The child develops a sense of agency, learning that she can affect the world and influence others (Watkins, 2004, p. 69).

In sum, the "building blocks" for social development, agency, and competence (Peters & Boggs, 1986, p. 86; Preisler & Ahlström, 1997; Schieffelin & Ochs, 1986, p.3; Watkins, 2004, p. 69) are provided through interpersonal relationships and interaction in infancy and early childhood; the first and earliest of which occur in the context of mother-infant interaction (Becker, 1987, p. 65; Jamieson, 1995b; Sacks, 2000, pp. 52 – 53; Weinberg & Tronick, 1998a, 1998b).

Mother-Infant Interaction

Mother-infant interactions are the primary social unit of communication (Fraser, 1990) and foundational for cognitive, communicative, linguistic, socioemotional, and personality development (Becker, 1987, p. 61; Bruner, 1975; Greenspan, 1990; Hughes, 1996, p. 62; Koester, 1994; Magnuson, 2000; Newland, Roggman, & Boyce, 2001; NICHD Early Childcare Research Network, 1999; Prizant & Wetherby, 1990; Richter, 2004, p. 28; Rodda & Grove, 1987; Waxman, Spencer, & Poisson, 1996). Mother-infant

interactions facilitate the development of social skills (Prizant & Wetherby, 1996; Schloss, 1984), and, more particularly, the quality of mother-infant interactions affects children's socioemotional development (Marschark, 1997, p. 82; Mundy & Willoughby, 1996). Disturbed affective contact between mothers and typically developing children can have far-reaching negative effects on social communication, social processing, and social behaviour (Greenspan, 1990; Hobson, 1993b, p. 204). Mothers' affective responsiveness is positively associated with children's socioemotional development (Grolnick, 1990).

What Goes Wrong?

Socioemotional development is a continuous (Marschark, 1997, p. 72), lifelong process (e.g., Becker, 1987, p. 65; Erikson, 1963) beginning with and directed, although not determined by, patterns of interaction between the mother and infant that are well entrenched by preschool-age (Jamieson, 1995b) in terms of stable and characteristic ways of relating (Weinberg & Tronick, 1998a, 1998b). Disruption in this process can have profound effects on the developing child. This idea has a long history in the child development literature.

For example, the idea that the mother-child interaction was a conduit for something more than infant survival through routine caregiving and physical attendance became apparent in the 1940s when the devastating effects of the lack of emotional contact with a significant caregiver were first documented by Renee Spitz (1943, 1947) in his seminal work. Still other studies involving nonhuman primates further supported the importance of the early mother-infant relationship. Harry Harlow's seminal work in the

"science of affection" (see Blum, 2002, for a review) in the 1950s and 1960s at the University of Wisconsin, demonstrated how *social attachment* in nonhuman primates (i.e., mother-infant contact and affective connection) was crucial for optimal child development. More recent examinations of the effect of chronic maternal depression on infant/child development serve as yet another "model" of the "maternal deprivation syndrome." Identified in the 1940s, mothers suffering from chronic depression are typically emotionally and socially unavailable to their children (Weinberg & Tronick, 1998a, 1998b), and depressed/mother-infant interaction is reliably associated with compromised cognitive and socioemotional developmental outcomes (e.g., Field, 1995; Gelfand & Teti, 1990; Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Richter, 2004, p. 29; Weinberg & Tronick, 1998a, 1998b) such as disruptive behaviour and poor social skills in toddlers and preschool-age children (see Goodman, Radke-Yarrow, & Teti, 1996, for a review). Striking is how remarkably similar in quality and tone depressed/mother-child interactions are to those of hearing mother-deaf child interactions.

The maternal depression model is described in detail below.

Disruptions in Mother-Infant Interactions: Maternal Depression Model

Observational studies of depressed/mother-infant interaction have revealed several factors that put the infant at developmental risk for problems in self-regulation (Cummings, 1995) and socioemotional development (see Campbell, Cohn & Meyers, 1995; Field, 1995; Murray et al., 1996; Teti, Gelfand, & Messinger, 1995; Weinberg & Tronick, 1997 for reviews). For example, when the mother-infant dyad is the unit of analysis, depressed mother-infant interactions are low in energy and positive affect

(Goodman, Radke-Yarrow, & Teti,1996; Kochanska, 1991; Richter, 2004, p. 29), lack spontaneity and activity (Cohn & Tronick, 1983), and are characterized by a lack of coordination, reciprocity, and contingent responsiveness (Cummings & Cicchetti, 1990; Shaffer, Wood, & Willoughby, 2002, pp.416-418; Tronick & Gianino, 1986). As a group, depressed mothers engage in significantly fewer episodes of communicative exchange and social play (Cohn & Tronick, 1989; Kochanska, 1991), and are less likely to share in the child's focus of attention to objects or activities in a play interaction (Weinberg & Tronick, 1998b); possibly because depressed mothers are typically less likely to notice and to consistently respond to their child's communicative bids (Goodman et al., 1996), and/or because they appear to have difficulty in gaining, focusing, and maintaining the child's attention (Clark, Keller, Fedderly, & Paulson, 1996). Related to, and possibly contributing to depressed mothers' difficulty in gaining, focusing, and maintaining the child's attention, are the findings that mothers who are depressed seldom touch and look at their infants (Cohn, Campbell, Matias, & Hopkins, 1990) and also speak less to their infants (Cohn, Campbell, Matias, & Hopkins, 1990; Goodman et al., 1996). Depressed mothers are less affectively engaged with their infants (Campbell, Cohn, & Meyers, 1995) than mothers who are not depressed; by 10 months-of-age, the organization of emotional responses in infants of depressed mothers is different from that of infants of non-depressed mothers (Dawson, 1992a, 1992b). Finally, while some depressed mothers are more disengaged, detached, withdrawn or under-involved with their infants, other depressed mothers excessively stimulate or are more intrusive in their

interactions with their infants, for example, interrupting the infant's focus of attention or current activity (Cohn & Tronick, 1989; Goodman et al., 1996; Richter, 2004, p. 29).

Maternal depression affects maternal behaviour and communication, and thereby, the emotional quality of mother-infant interactions; depressed mothers are affectively less responsive to their children (Cummings, 1995). The "impoverished environment thesis" (e.g., Weinberg & Tronick, 1998b) is one explanation of mechanism. For example, empathy and social understanding unfolds within and out of early affective interaction and "cooperative understanding" (Trevarthen, 1979) with an "attuned" (Schore, 1996) caregiver (e.g., Hobson, 1993b, p.204; personal communication, Dr. Colwyn Trevarthen, 2002). Affective signals and response to these signals are primary in maintaining mother-infant interaction (Barratt, Roach, & Leavitt, 1992) and are instrumental in the development of close interpersonal relationships (Rogers & Lewis, 1989) beyond that of the mother-infant relationship, for example, early peer relations.

It is important to point out however, that depression and a mother's perception of her competence as a mother are noted in the literature to have similar effects on mother-infant interaction and child developmental outcome. A further confound is the interaction effect: the more poor the depressed mothers' perceptions of their competence as mothers are, the more poor their interactions with their infants (Gelfand & Teti, 1990; Teti & Gelfand, 1991). Broadly stated, the two areas in which disruption in depressed/mother-infant interactions occurs appear to be best represented as those of what we might consider to be two primary *channels of developmental contact*: communication and shared attention. Mothers engage and interact with their infants and children through

visual (i.e., eye gaze), vocal, facial, tactile (Barratt, Roach, & Leavitt, 1992; Koester, 1994; Satir, 1976; Weinberg & Tronick, 1998b), affective (Hobson, 1993a, 1993b; Satir, 1976), gestural, bodily, motor (Satir, 1976), and "energy" channels of communication, each of which is affected by maternal depression (Weinberg & Tronick, 1998a, 1998b). For example, depressed mothers gaze avert or inappropriately hold mutual eye gaze, speak in a monotone, hold a neutral facial expression or one of sad and flat affect, are posturally unavailable and often slouch, and appear lethargic (e.g., see Cohn & Tronick's 1983 instructions to mothers of 3-month old infants in how to simulate depression as called for by the *still-face* procedure).

Hearing Status of Mother-Child Dyad

The quality of hearing mother-deaf child interactions is typically depressed, difficult, or disrupted (e.g., Hindley, 1997; Jamieson, 1995b; Linder, 1993, p.315; Marschark, Lang, & Albertini, 2002, p. 64; Meadow-Orlans & Spencer, 1996; Sacks, 2000, p. 53; Waxman, Spencer, & Poisson, 1996), resulting in greater risk for the establishment of maladaptive mother-infant interaction patterns (e.g., Jamieson, 1995b; Meadow-Orlans & Spencer, 1996). Indeed, it can be argued that many, if not most, hearing mother-deaf child (HD) interactions, compared with hearing mother-hearing child (HH) and deaf mother-deaf child (DD) interactions, "look" depressed in quality or tone, and that this is the case whether the hearing mother is in fact depressed or not.

Hearing Mother-Deaf Child Interaction

Similar to depressed/mother-infant interactions described above, when the HD-dyad is the unit of analysis, interactions are also low in energy and positive affect

(Meadow-Orlans & Spencer, 1996) [compared with HH- and DD-dyads (Meadow-Orlans, 1997)], lack spontaneity and activity (Prendergast & McCollum, 1996), and are characterized by a lack of coordination, reciprocity, and contingent responsiveness (Loots & Devisé, 2003; Jamieson, 1995b; Spencer, Bodner-Johnson, & Gutfreund, 1992; Watkins, 2004, Vol. I, p. 740; Webster, 1986, p. 87). As a group, hearing mothers are less playful with their deaf infants (Nienhuys & Tikotin, 1983). For example, 18-month old deaf toddlers with hearing mothers were significantly more likely to engage in solitary play than playful interaction with their mothers compared with same-age toddlers in HH- and DD-dyads (Spencer, 2000). Hearing mothers are less likely to share in the child's focus of attention to objects or activities (Lederberg & Mobley, 1990; Webster, 1986, p. 80), possibly because hearing mothers struggle to actively engage their deaf infants (Jung & Short, 2002) and/or because responding to child initiations is limited (Spencer et al., 1992). It is important to note that Lederberg and Mobley's (1990) finding was established despite no differences between the HH- and HD-groups in quality of attachment; 22-month old deaf and hearing toddlers were similarly attached to their mothers. Related to, and possibly contributing to the difficulty that hearing mothers experience in eliciting and engaging their deaf child's attention, are the findings that, relative to deaf mothers of deaf children, hearing mothers touch their deaf children less. It should be noted however, that, relative to hearing mothers of hearing children and children not yet identified as deaf, hearing mothers of deaf children actually touch their deaf children more (e.g., Jung & Short, 2002; Marschark, 1997, p. 75; Waxman, Spencer, & Poisson, 1996). Clinical/early intervention work (Watkins, 2004, p. 335) and anecdotal

evidence gathered during data collection suggest hearing mothers vocalize and talk less to their deaf children compared with hearing children. Also, the experience of emotional bonding, important in early socialization processes, is impoverished and less accessible to deaf children with hearing mothers than it is to deaf children with deaf mothers and hearing children with hearing mothers (Becker, 1987, p. 61). Finally, compared with mothers of hearing preschool-age children, hearing mothers of deaf preschool-age children are significantly less permissive, creative, flexible, and approving, and more intrusive, didactic, directive, and controlling (Meadow, 1980, p. 80; Sacks, 2000, p. 53; Watkins, 2004, p. 740).

Taken together, whether or not hearing mothers of deaf children are depressed, their interactions with their deaf infants/toddlers are similarly as disrupted and 'look' similarly depressed in quality and tone to those described earlier between (hearing) mothers who *are* depressed and their (hearing) infants/toddlers. Furthermore, it is well established in the clinical and educational fields that hearing loss in infants and children disrupts the quantity and quality of interactions with hearing caregivers and that, over time, this results in "ever-widening consequences for development over the first months and years of life" (Marschark, Lang, & Albertini, 2002, p. 64). In other words, the hearing status of a deaf child's mother does matter in terms of the significant impact that disrupted mother-child interactions have on the deaf child's early socioemotional development. *What* accounts for the disrupted or *depressed* quality of hearing mother-deaf child interactions? More importantly, *what* mediates the relationship between

disrupted mother-child interactions and maladaptive socioemotional development in early childhood?

What accounts for the disrupted or depressed quality of hearing mother-deaf child interactions? The extant literature proffers two maternal factors that contribute to the degraded quality of hearing mother-deaf child interactions: (a) maternal response and adjustment to the identification of deafness in children, and (b) fewer maternal communicative skills. Both explanations are well represented within the literature, but the second explanation is theoretically likely to be the more parsimonious of the two.

The argument of parsimony, notwithstanding, the literature explaining disrupted mother-child interactions as a product of hearing mothers' responses and adjustment to the identification of deafness in their young children is substantial. Models of crisis/adaptation (Hindley, 1997) and grief (e.g., Biderman, 1998, p. 73; Hastings, 1979; Meadow-Orlans, 1987, p. 32) have been employed and mediating factors delineated and proposed such as guilt (Biderman, 1998, p. 73, Levine, 1981), panic, blame, despair (Levine, 1981), anxiety (Meadow-Orlans, 1987, p. 42), shock (Meadow-Orlans, 1987, p. 30), personal adjustment, stress, and coping (Calderon & Greenberg, 1999). In general, mothers of children born with disabilities experience depression (Floyd, Singer, Powers, & Costigan, 1997), disappointment, and the loss of hopes and expectations for a typically developing (Barnett, Clements, Kaplan-Estrin, & Fialka, 2003) "perfect" child (Seligman, 1991). Also, hearing mothers' perceived loss of a "normal" life for both the child and the family is described by Marschark (1997, p. 78). Doka (1995) refers to these experiences of loss as "disenfranchised grief," and Grollman (1995) categorizes this experience of

loss as "nondeath related loss" (together with divorce, imprisonment, and adoption). That is, while the identification of deafness sets up a grief experience for the mother, her grief experience may not always be recognized by others resulting in outcomes of isolation, self-blame, guilt, anger, diminished self-worth and self-efficacy, sadness (personal communication, Marietta Colven, 2002; Hastings, 1979; Jung & Short, 2002; Maarschark, 1997, p.78; Meadow-Orlans, 1987, p. 33), distrust, and resentment (Doka, 1995). Hearing mothers of deaf children self-report feeling guilty about giving birth to a "less than perfect child" (Becker, 1987, p. 62), a sense of powerlessness (Schlesinger, 1985) to change or alter the child's developmental progression (Schlesinger, 1987) low confidence and low sense of competence in their role as a mother (Jung & Short, 2002).

Ironically, it is not only hearing parents who have to cope with the shock of unexpected identification of deafness (Meadow-Orlans, 1987, p. 30); deaf parents who do not attribute their deafness to genetic causes (e.g., both deaf parents come from hearing families), report equivalent shock and distress on the news of deafness in their children (Meadow-Orlans, 1987, pp. 32 - 34). That being said, most deaf parents welcome and celebrate the news of a deaf child (anecdotal field accounts; Biderman, 1998, p. 117; personal communication, Richard Dart, Psychologist, E. C. Drury School for the Deaf, Milton, Ontario, 2002; Meadow-Orlans, 1987, pp. 32 – 34).

A second and more parsimonious explanation for the disrupted quality of hearing mother-deaf child interactions is that hearing mothers have fewer communicative skills with which to actively engage the child than hearing mothers of hearing children and deaf mothers of deaf children. Deafness in young children creates significant barriers for

communication (e.g., Hastings, 1979), particularly social and pragmatic communication (Hindley, 1997), and affects the mother-child relationship in significant ways (Rainer, 1967 cited in Hastings, 1979). The form of, and requirements for, interaction with deaf children are markedly different from those of interactions with hearing children; simply stated, deaf-visual/gestural communication and interaction strategies are different from hearing-listening/speaking communication and interaction strategies (Marschark, 1997).

At this point, a discussion of what deaf mother-deaf child interactions 'look' like will help acquaint the reader with the not so subtle differences in the communication and interaction strategies between deaf mothers and deaf children compared with hearing mothers and hearing children. Thus, the reader will be better able to appreciate why, as described earlier, hearing mother-deaf child interactions are disrupted and qualitatively depressed.

Deaf Mother-Deaf Child Interaction

In the absence of hearing listening/speaking communication, how do deaf mothers make contact and communicate with their deaf infants? Given deaf infants' increased reliance on visual and tactile channels (Jamieson, 1995b; Koester, 1994; Prendergast & McCollum, 1996), deaf mothers not only gesture and sign in the young infant's line of sight (Maestas y Moores, 1980), or, from about 18 months of age, in the 'signing space' (i.e., central and peripheral visual fields) (Harris, 2001), but deaf mothers keep themselves and referent objects within the child's line of vision (Marschark, 1997, pp. 75 – 76). Deaf mothers also use more exaggerated and positive facial expressions (personal communication, Darlene Horsley-Hurst, E. C. Drury School for the Deaf, Milton,

Ontario, 2004; Marschark, 1997, pp. 75 – 76), physical strategies such as touch (Koester, 1995; Marschark, 1997, p. 75; Smith-Gray & Koester, 1995; Spencer 2000; Waxman, Spencer, & Poisson, 1996), hand and arm waving, body language, gesture, and signing on the child's body to attract, direct, regain, entrain, and reinforce the child's visual attention (Marschark, Lang, & Albertini, 2002, p. 70; Meadow-Orlans, 1987, pp. 36 - 37; Spencer et al., 1992) and "looking" behaviour (Marschark, Lang, & Albertini, 2002, p. 70), as well as to reassure the child of their presence when out of the child's line of sight (Koester et al., 2000b). Deaf mothers do not solely *direct* the deaf child's attention, but will *notice* and *follow into* the deaf child's current or established focus of attention or activity; what this means is that deaf mothers give the deaf child autonomy in selecting the "topic" for shared attention and interaction (Jamieson, 1995; Watkins, 2004, p. 1194). Often, after following into the child's interest, deaf mothers will sign on the object itself so that both the object and sign are visible to the deaf child simultaneously (Watkins, 2004, pp. 1194 - 1195). Deaf mothers also "visually point" (also referred to as "body pointing") by turning or directing their bodies ventrally toward the referent object or activity both *before* and *after* gesturing and signing slowly (Kyle & Ackerman, 1990) to label and expand upon the object or activity (Spencer et al., 1992). Importantly, because simultaneous communicative acts (i.e., the mother vocalizes, gestures, or signs while the child's visual attention is on the object or activity of shared focus) are not accessible to deaf chidren, deaf mothers coordinate and time the delivery of their communicative acts (verbal, nonverbal) such that these are coordinated with the child's shifting of her visual focus from the object or activity on which she is currently focused or engaged, to the

mother. In other words, deaf mothers patiently *wait* for the child to look at them before responding (Kyle & Ackerman, 1990) rather than interrupting the child's focus of attention or current activity, or physically forcing the child to look at her. That is, deaf mother-deaf child interactions are sequential and not simultaneous (Jamieson, 1995b; Spencer et al., 1992). Lastly, as the deaf child grows and develops, and becomes more mobile, deaf mothers "work (even) harder" (Harris, 2001) to elicit the deaf child's attention by increasing the frequency of their initiatory bids: for the same 'gain' in attention from their child, deaf mothers of deaf children had to put in four times the effort of hearing mothers with hearing children (Harris & Mohay, 1997). Overall, deaf mothers' communicative strategies allow for levels of maternal responsiveness and mother-child contingency necessary, and foundational for, early socioemotional development. It can certainly be argued that, just as hearing mothers' communication with hearing children is 'native,' intuitive, or "taken for granted" (Meadow-Orlans, 1987, p. 30), so too is deaf mothers' communication with deaf children 'native' and intuitive. In contrast, while it is important to reassure hearing mothers of deaf children of their intuitive communicative abilities and style, it is also important to provide hearing mothers with explicit support and guidance in how to adjust their communication patterns to best accommodate the communicative needs of their deaf children.

Underlying the hearing mother-deaf child interactive "mismatch" (Jamieson, 1995) then, is that hearing mothers, clearly, and understandably so, have difficulty in adjusting their intuitive interaction patterns (Jung & Short, 2002) to accommodate deaf children's visual and tactile channels of communication so that the absence of a hearing-

listening/speaking channel of relationship is compensated. Simply stated, hearing mothers of deaf children, compared with hearing mothers of hearing children and deaf mothers of deaf children, have fewer communicative skills naturally available to them with which to initiate and mediate reciprocal interactions with their children (Linder, 1993, p.315; Meadow-Orlans, 1987, p. 30; Sacks, 2000, p. 157).

On the other hand, it is important to keep in mind two issues: (1) deaf infants' communicative signals are stylistically different from hearing infants (e.g., Jung & Short, 2002; Smith-Gray & Koester, 1995; Wood, 1982), and (2) findings showing the strengths of many hearing mothers who indeed accommodate and adjust to the visual modality of the deaf child (e.g., Jamieson, 1995; Spencer, 1993; Lederberg & Everhart, 1998). For example, Spencer (1993) reported that, despite hearing mothers of 12- to 18-month old deaf children continuing to vocalize and verbalize equivalent to hearing mothers of same-age hearing children, the hearing mothers of deaf children were more likely to supplement these with the greater use of tactile and gestural communication. Lederberg and Everhart (1998) reported similar findings in terms of maternal vocalization/verbalization frequency in their sample of mothers and 22-month to 3-year-old children, noting that hearing mothers of deaf children used more body movement and gesture compared to hearing mothers of hearing children. It is not clear from either Spencer's (1993), or Lederberg and Everhart's (1998) work, whether this accommodation on the part of hearing mothers of deaf children was 'intuitive' or 'learned' either through trial and error or didactically through enrolment in an early intervention parent-training program. It is equally important to keep in mind, however, that, in the absence of visual attention to the mother,

maternal vocalizations/verbalizations are not readily accessible to deaf children. Also, despite deaf infants' stylistically different communicative signals noted above, an earlier study conducted by Spencer and her colleagues (1992) showed that while 12-month-old hearing and deaf infants provided equal opportunities for mothers to be responsive, HD-dyads were significantly less responsive in interactive quality than were HH- and DD-dyads. Spencer and her colleagues suggested that findings of "comparative non-responsiveness" in HD-dyads relative to HH- and DD-dyads are likely "due primarily to mothers' attitudes and behaviors rather than to real differences in behaviors of infants with and without hearing loss" (p. 75). In sum, it appears that a deliberately adjusted rather than intuitive model of mothering is required by hearing mothers to accommodate and adjust to interaction with deaf children for adaptive patterns of interaction to ensue. *What* mediates the relation between disrupted mother-child interactions and maladaptive socioemotional development in early childhood? The working hypothesis of this research is that episodes of mother-child *joint attention* are an important avenue for socioemotional development in the second and third years of postnatal life, and that this is particularly the case when the child is deaf and does not have the same access as the hearing child to auditory attentional cues from the environment or to incidental and observational/vicarious social learning opportunities.

Joint Attention

Conceptualizing and Defining Joint Attention

Joint attention, as a psychological construct, first appeared in the literature in the early 1960s when Werner and Kaplan (1963) described episodes of joint attention as "the

primordial sharing situation" likely to underpin the development of symbolic thinking. In the 1970s, joint attention was synonymous with a functionalist view of behaviour and early social development (Bruner, 1981). More recently, joint attention has been viewed within social-cognitive and social-emotional perspectives of development (Ingsholt, 2002).

Declarative joint attention (i.e., eliciting and directing another person's attention to an object for the purpose of mutual engagement with the object) emerges towards the end of the first year of postnatal life. There is, however, debate as to when exactly it emerges; some have found it at 6- (Bakeman & Adamson, 1984), 8- (Mundy & Gomes, 1998; Mundy, Sigman, & Kasari, 1990; Mundy & Willoughby, 1996;), 9- (Dube, MacDonald, Mansfield, Holcomb, & Ahearn, 2004; Tomasello, 1999; Trevarthen & Aitken, 2001; Vaughan, Mundy, Block, Burnette et al., 2003), 10- (Rocissiano & Yatchmink, 1984; Wetherby & Prizant, 2002), or 12-months of age (Bruner, 1981; Charman, Baron-Cohen, Swettenham, Baird, Cox, & Drew, 2000; Ingsholt, 2002; Sheinkopf, Mundy, Claussen, & Willoughby, 2004; Tomasello & Farrar, 1986; Tomasello & Todd, 1983; Trevarthen, 1999; Trevarthen & Aitken, 2001; Vaughan, Mundy, Block, Burnette et al., 2003). However, we know that joint attention is fully established by 15 to 24 months of age in typically developing children (Bakeman & Adamson, 1984; Charman et al., 2000; Greenspan, 1990; Ingsholt, 2002; Mundy & Gomes, 1998; Mundy & Willoughby, 1996; Wetherby & Prizant, 2002).

Joint attention has many definitions in the extant literature. It has been defined and characterized as: a "complex psychological phenomenon" (Peacocke, 2002); a

"complex behavioural phenomenon" (Dube et al., 2004); an inborn capacity for affective relatedness (Hobson, 1990, 1993b; Trevarthen & Hubley; 1978); an inborn "mechanism" supporting recurring social-communicative routines and underlying "the growth of reference" (Bruner, 1981); a social-interactional variable influenced by maternal interactional style (Tomasello & Todd, 1983); an important developmental milestone allowing the child to engage nonverbally with a social partner about an object or event in the here-and-now (Bakeman & Adamson, 1984); a sequence of "matched" turns between the mother and child (Rocissano & Yatchmink, 1984); an "essential process" within mother-child interaction (Greenspan, 1990); a prelinguistic behaviour (Wetherby & Prizant, 2002); a nonverbal communication skill and aspect of early social behaviour (Mundy & Gomes, 1998; Mundy, Hogan, & Doehring, 1996; Mundy, Sigman, & Kasari, 1990; Ingsholt, 2002); an early social-communicative skill (Hwang & Hughes, 2000); "secondary intersubjectivity" (Trevarthen, 1999); a social-communicative behaviour and precursor of theory of mind ability (Charman et al., 2000); a theory of mind skill (Malle, 2001); a voluntary and intentional social behaviour (Trevarthen & Aitken, 2001) of "cooperative understanding" (Trevarthen, 1979); the capacity underlying children's abilities to coordinate and share attention and emotions and engage in reciprocal social interactions (Prizant, Wetherby, Rubin, & Laurent, 2003); and lastly, as a classical "reference triangle" (Ogden & Richards, 1923 cited in Bruner, 1981, p. 68; Tomasello, 1999).

Formally, joint attention is defined as the use of communicative acts such as eye contact, person-object-person gaze shift, affect, and gesture, to draw and direct a social

partner's attention to an object or event with the communicative intent (Tomasello, 1995) of sharing the experience (e.g., Bates, Camioni, & Volterra, 1975; Mundy, Kasari, & Sigman, 1992; Mundy & Neal, 2001, p. 142; Peacocke, 2002; Wetherby & Prizant, 2002, p. 50) affiliatively (Green, Gustafson, & West, 1980) or for the purpose of explanation, information, and clarification (e.g., Wetherby & Prizant, 2002, p. 50), or affective contact (Hobson, 1993a, 1993b), in a spirit of mutual awareness and "cooperative understanding" (Trevarthen, 1979). Note, that by definition then, joint attention refers neither to dyadic joint activities (e.g., face-to-face interaction, peek-a-boo games) nor to imperative (instrumental) joint attention bids.

Developmental Relationships

Links between joint attention and the following areas of development are theoretically described and empirically well-replicated and documented in the literature: the development of early communication (Bakeman & Adamson, 1984; Rocissano & Yatchmink, 1984) including gestural, verbal (Namy, Acredolo, & Goodwyn, 2000), and social communication (Wetherby & Prizant, 2002) and conversational skills (Prizant, Wetherby, Rubin, & Laurent, 2003); symbolic development (Werner & Kaplan, 1963; Wetherby & Prizant, 2002) and referential understanding (Bruner, 1981); early language development (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Mundy & Gomes, 1998; Mundy & Neal, 2001; Mundy, Sigman, & Kasari, 1990; Jamieson, 1995; Prizant et al., 2003; Tomasello & Farrar, 1986; Vaughan, Mundy, Block, Burnette et al., 2003; Wetherby & Prizant, 2002) incorporating syntactic, semantic, pragmatic (Bruner, 1981), and early vocabulary development (Tomasello & Todd, 1983); and early cognitive

development (Claussen, Mundy, Mallik & Willoughby, 2002; Ingsholt, 2002; Jamieson, 1995; Mundy & Neal, 2001; Tomasello, 1995; Vaughan et al, 2003).

Relevant to the present research, however, are the associations between joint attention and early socioemotional and behavioral functioning (Claussen, Mundy, Mallik & Willoughby, 2002; Greenspan, 1990; Ingsholt, 2002; Mundy & Gomes, 1998; Mundy & Neal, 2001; Mundy & Willoughby, 1996; Scheinkopf et al., 2004; Tomasello, 1995; Trevarthen & Aitken, 2001; Vaughan et al., 2003), "psychosocial" development (Trevarthen & Aitken, 2001), and adaptive development (Dube et al., 2004; Sheinkopf et al, 2004). Mediating the relation between joint attention and socioemotional development are the following variables that have been suggested and empirically tested: the development of social and interpersonal competence (Prizant et al., 2003; Stern, 1985; Vaughan et al., 2003), social reciprocity (Hwang & Hughes, 2000), and social cognitive development (Claussen et al., 2002; Mundy & Neal, 2001; Scheinkopf et al., 2004; Tomasello, 1999). Whether 'social cognitive development' is viewed as the acquisition of a "theory of mind" (Baron-Cohen, 1987; Charman et al., 2000; Frith & Frith, 2001; Ingsholt, 2002; Malle, 2001; Rochat, 1999; Rogers & Pennington, 1991; Scrambler, Rogers, Rutherford, Hepburn, & Wenner, 2003) or as the development of social intelligence, or, the "learning of a communicated *how* (to act) or *what* (a thing is)" (Trevarthen, 1990, p. 730), is not germane to this research. (Emphases not in the original.)

Joint Attention in Deaf Infants and Toddlers

Are deaf infants capable of joint attention? Do deaf infants engage in joint attention? Do deaf infants have the necessary "skills" to engage in joint attention? And, if deaf infants are capable of joint attention, then at what age does this ability emerge? The answers to the first three questions all appear to be yes. Deaf children *do* engage in triadic joint attention (person-person-object) with their caregivers, and there is no evidence to suggest that deaf children have difficulty in understanding the function of, for example, referential or declarative pointing (Figueras-Costa & Harris, 2001). Deaf infants display a repertoire of joint attention initiation and response behaviours including pointing, gaze, and other "instinctive" (Watkins, 2004, p. 729) social signaling behaviours such as repetitious physical activity (Smith-Gray & Koester, 1995). Declarative pointing begins around 9- to 14-months of age and *show*, *offer*, and *give* gestures, around 14- to 16-months of age in deaf infants (Watson, 2004, p. 322). The ability to shift visual attention from a focus of attention to the mother for information, conversation, and interaction (i.e., to engage in joint attention), develops in the deaf child around 12- to 18-months of age (Spencer, 2000; Spencer et al., 1992; Watkins, 2004, p. 1201). Thus, there is no difference in the age at which the ability for joint attention emerges and develops in deaf children from that in typically developing hearing children.

Joint attention between deaf mothers and deaf children. Deaf mothers actively watch and "look for" what the deaf child is visually interested in, and then they will work to follow into the child's focus of attention (Jamieson, 1995; Watkins, 2004, p. 1202). To achieve this, deaf mothers will move to the focal object or activity and will then display

enthusiasm around the object by looking at the object *with* the deaf child and perhaps even playing with the object with the child; but, at the same time, deaf mothers remain alert to shifts in the child's visual attention (Watkins, 2004, p. 1202). Beginning when the deaf child is around 18-months of age, deaf mothers actively begin to entrain, expect, and rely on the deaf child to spontaneously turn to look at her in order to see what she is gesturing or signing to the child (Harris, 2001).

Joint attention between hearing mothers and deaf children. Deafness interferes with the experience of joint attention between hearing mothers and deaf children (Webster, 1986, p.80; Wood, 1982; Wood & Wood, 1997). As stated earlier, hearing mothers of deaf infants find it more difficult to actively engage the deaf infant. Recall too, how mothers of hearing children follow into their child's line of visual attention and attempt to share in the experience (i.e., to elicit joint attention) by beginning to vocalize or talk about the shared focus (Tomasello, 1988). But, hearing children are able to remain visually attentive to the object or event at the same time that the mother offers and directs a vocalization or verbalization to the child in terms of an acknowledgement, commentary, or elaboration, and which serves first to reassure the child of the mother's attention, and second, to encourage further turn-taking such that joint attention is sustained. Deaf children, on the other hand, by definition, cannot process information or language through audition alone (Schein & Delk, 1974) and must visually attend to the mother at the same time that she offers spoken or signed commentary (Collis, 1977) or some other bodily acknowledgment of her attention and/or continued engagement with the deaf child. So, while hearing children are capable of receiving both commentary around the shared focus

of attention and knowledge of the mother's continued engagement and involvement in the topic of shared attention without having to shift their visual attention from the object to the mother, deaf children have to hold the representation of the shared object or event in mind at the same time that they actively shift (or return) their visual attention (back) to the mother for her commentary or affective response. Indeed, visual attention to the mother "is the sine qua non of communication" in young deaf children (Prendergast & McCollum, 1996), and joint attention between mothers and deaf children clearly requires a "divided attention" (Wood & Wood, 1997); in other words, particularly fine coordination between the shared focus of attention and one another. However, this is not easy for hearing mothers and deaf children to achieve. Evidence for this is borne out in the finding by Spencer, Bodner-Johnson and Guttfreund (1992) that hearing mothers were less responsive to what deaf children were focusing on than either deaf mothers of deaf children or hearing mothers of hearing children. Research investigating joint attention as a variable in the development of deaf children is sparse but two studies in particular, both by Spencer and her colleagues (1992, 2000), are informative.

Spencer, Bodner-Johnson, and Guttrfreund (1992) conducted a study assessing mother-infant interaction at 12-months of age to address two questions: (a) Do hearing mothers follow into 12-month old children's focus of attention in an effort to elicit joint attention? (b) Compared with hearing mothers of hearing and deaf 12-month old children, do deaf mothers of same-age children use different response strategies such that the deaf child's ability to establish visual attention to objects is not compromised? The sample comprised hearing mother-hearing child (n = 7), hearing mother-deaf child (n =

3), and deaf mother-deaf child (n = 4) dyads. Spoken English was the native language for all hearing mothers (and therefore native for the seven hearing children but not the three deaf children), and American Sign Language (ASL)[2] was native for the four deaf mothers and their deaf children. The seven mothers and their deaf children attended early intervention programs using Total Communication (TC). None of the children included in the sample had any other identified cognitive, physical, or motor delays. On both maternal-report and an independent observational measure, age-appropriate expressive communication and the display of communicative intent through pointing and gesture, was demonstrated by all children. Toddlers were seated in a highchair and mothers were asked to engage in three minutes of natural face-to-face interaction which was videotaped.

For their first question, Spencer's group looked at the proportion of time (seconds) that mothers spent in each of four types of responses *during* infant-object gaze (emphasis in the original): (1) *respond* (mothers displayed a semantically contingent verbal or gestural behaviour); (2) *direct* (mothers displayed a non-contingent, topic-changing, verbal or gestural behaviour); (3) *continue* (mothers ignored or did not notice the focus of infant-object gaze); (4) *wait* (mothers waited quietly for at least 1s while infant looked at object). Overall, mothers in the HD-group were the most directive; compared with HH- and DD-mothers, HD-mothers spent a significantly greater proportion of time in the *direct* response category ($p < .01$ and $p < .05$, respectively). Mothers in the HH-group were the most responsive; HH-group mothers spent a significantly greater proportion of

[2] See Appendix 9 (pp. 257 – 258) for explanations of communication options and approaches in deaf communication.

time in the *respond* response category than HD-group mothers ($p < .05$) and DD-group mothers ($p < .01$); that is, the smallest proportion of time spent in the *response* category was observed in the DD-group of mothers. The difference between the HD- and DD-group of mothers was also significant at the .05 level. As we would expect, the data showed the DD-group of mothers to spend the most time using the *wait* response; DD-group mothers waited significantly more often to achieve mutual eye-gaze with their children before responding than the HH- and HD-groups of mothers ($p < .05$ for comparisons between HH- vs. DD-group, and HD- vs. DD-group). The three groups of mothers did not differ on the proportion of time spent in the *continue* response category.

For their second question, Spencer and her colleagues looked at the timing and coordination of mothers' responses *after* the child had disengaged from the object to shift visual attention to the mother. That is, the criterion maternal behaviour here was the maternal response following child-gaze shift from the object to the mother. To simplify: first, the mother followed into the child's focus of visual attention and produced one of four responses (*respond, direct, continue, wait;* these data were used to answer Question 1 above). (Theoretically, a maternal follow-in to infant-object gaze such as this *but* which is accompanied by a maternal communicative act directed toward the child, is defined as a maternal initiation act or bid for joint attention.) Second, children were required to respond to mothers' follow-in responses by shifting gaze from the object to the mother. Third, mothers produced a response to the child's shift in gaze from the object to the mother. The variable of interest for data analysis was this third order response just outlined above. More specifically, Spencer's group recorded the timing and coordination

of mothers' responses with respect to children's visual attention; that is, did mothers respond while children were in the process of shifting gaze from the object to the mother, or did mothers respond after children had shifted gaze from the object to the mother (i.e., when mutual eye gaze or face-to-face orientation had been achieved). Results showed that the DD-group mothers responded after the child had disengaged from the object and was looking at the mother in contrast to the HH- and HD-group mothers ($p < .05$ for both comparisons) who both produced a greater proportion of responses in the course of the child shifting gaze from the object to the mother. Highlighted by these findings is the difference in intuitive timing and coordination of hearing mothers interactive behaviour with and responses to hearing children from deaf mothers with deaf children; a corollary to this is the importance of distinguishing between sequential and simultaneous modes of communication within both aural/oral and visual/gestural communication.

There are, however, limitations to be noted. The strength of the study's design in terms of concurrent comparison of HH- , HD-, and DD-groups is unfortunately weakened by the small and unbalanced sample size. Issues of heterogeneity within the HD-group compared with the DD-group makes it difficult to truly interpret the within- and between-group differences reported. Whereas all four children in the DD-group were severely to profoundly deaf, one child in the HD-group had a mild to moderate hearing loss in the right ear and a severe loss in the left ear, and the other two children in the HD-group were both in the moderate to severe range. That is, HD-children had greater residual hearing. None of the four DD-children wore hearing aids, whereas all of the HD-children had hearing aids despite inconsistent use. It is not clear whether the HD-children were aided

during the behavioural observation data collection. Taken together, the HD-children were more likely to have had access to some degree of auditory input if only sufficient to cue their awareness of, and attention to, maternal vocalizations. Another problem is the issue of language: HD-group children were the only children not sharing a native language with their mothers. Of course, it is important to keep in mind that *mothers* were the unit of analysis for this study; nonetheless, the degree of deafness and amplification available to the deaf child remains a major confound. Finally, information regarding age of identification of deafness and whether deaf children (in the HD-group presumably) were born deaf, is not provided in the report.

As part of a more recent longitudinal study investigating the role of auditory experience in the typical development of engagement and attention states between 9- and 18-months of age, Spencer (2000) examined the duration of coordinated joint attention in hearing mother-hearing infant (HH), deaf mother-deaf infant (DD), hearing mother-deaf infant (HD), and deaf mother-hearing infant (DH) groups (HH-dyads: $n = 21$, DD-dyads: $n = 20$, HD-dyads: $n = 19$, DH-dyads: $n = 20$). Mother-infant dyads were assessed at 9-, 12-, and 18-months of age. All 80 dyads participated in all three visits and infants were similar across groups for birth weight and sex and on measures of physical and cognitive development. Deafness was bilateral and had been identified in all the deaf infants before 9-months of age. Deaf children with hearing mothers made consistent use of hearing aids and were aided during the behavioural data collection sessions. It is not clear from the report how many of the deaf infants with deaf mothers used hearing aids; however, it seems that none of these children wore hearing aids during the collection of behavioural

data. Fifteen minutes of unstructured free play in the laboratory setting was recorded at the first two visits and 20 minutes at the third visit; 10 minutes of each visit's videotaped free play interaction was coded and subjected to data analysis (the report does not indicate which 10 minute segment of the free play sessions were used for analysis and whether this was kept standard across the data reduction process). Measures used to assess mothers' ability to "scaffold" joint attention were based on the protocols of Bakeman and Adamson (1984) and Tomasello and Farrar (1986). Joint attention was operationalized as an episode of shared attention that the mother initiated by following into the child's focus of visual attention by joining in or talking (or signing) about the object of attention and followed by at least three seconds of active coordination of the mother and child's visual attention to the object and one another by shifting the direction of their eye-gaze from the object to one another.

There was no main effect of infant-hearing status on the development of engagement and attention states. When the data were collapsed across age, episodes of coordinated joint attention in the DD-group were reliably longer in duration (seconds) than in the HD- and DH-groups, but not the HH-group. In fact, the HH-group was not significantly different from any of the other groups in terms of duration of coordinated joint attention episodes. Developmentally, episodes of coordinated joint attention showed a significant linear increase across time in each of the four groups. Finally, when the duration of episodes of coordinated joint attention between mothers and 18-month old children was examined, there were no significant differences among the four groups.

It might be that, when the data were collapsed across age, the significant finding of longer duration of coordinated joint attention between deaf mothers and deaf infants reflects an artifact of deliberate entraining, on the part of the deaf mother, of younger deaf infants' visual communicative skills and coordination necessary for interpersonal engagement. That is, the longer duration of coordinated joint attention is confounded with the qualitative difference between simultaneous and sequential modes of interaction. As was described earlier, deaf mothers actively entrain the child's visual attention to her before producing a response around a shared object of focus, and this is likely to have been the case at the 9- and 12-month old visits. That is, the extra time required for the deaf child to shift attention from the object to the mother stands in contrast to hearing mothers who intuitively respond while the child continues to be visually focused on the object or during the course of the child's shifting attention from the object to the mother. Recall too that by 18-months of age, deaf mothers begin to *expect* deaf children to direct gaze toward her, implying therefore, that "looking" behaviour is automatic and more fluid by around 18-months of age in deaf children with deaf mothers; accordingly, deaf mothers *wait* times in the course of contingent-response turn-taking are decreased. Nonetheless, by 18 months-of-age, Spencer (2000) reported no significant differences among the four groups in terms of time spent in episodes of coordinated joint attention. This finding stands in slight contradiction of a summary of findings reviewed by Koester (1994) who concluded that HD-dyads spend less time in joint attention compared with both HH- and DD-groups. Spencer concluded that coordination between visual and auditory modalities is not a prerequisite for the development of joint attention. In other

words, even in the absence of auditory sensory abilities, but with timing, coordination, and effort, joint attention between mothers and deaf children is possible irrespective of maternal hearing status.

Despite some of the same limitations of the Spencer et al. (1992) study, the strengths of this study are evident and include: (a) analysis of joint attention in terms of both maternal- and child-variables; (b) the employment of four comparison groups each with a larger sample size; (c) longitudinal design; (d) equal numbers of infants enrolled in ASL and Oral intervention programs; and (e) control for cognitive ability in children and other demographic variables.

It is evident that deafness interferes with and qualitatively disrupts hearing mother-deaf child interactions from birth and, beginning towards the end of the first year of post-natal life, with the process and experience of joint attention. The most salient area of difficulty that hearing mothers of deaf infants appear to experience seems to lie in their abilities to elicit, direct, follow, maintain, regain, and entrain the deaf infant's visual attention; and to time and coordinate the production of communicative acts in the course of joint attention such that these are accessible to the deaf child. These differences possibly underlie the generally limited interaction between deaf children and hearing mothers (e.g., de Villiers & de Villiers, 2000, p. 206). As a result, deaf children with hearing mothers are likely to grow up with inadequate exposure to not just communication and language, but also to joint attention experiences with the mother as preemptive interpersonal and social opportunities.

If we conceptualize the mother in terms of her being the infant's first and most immediate "social environment," then, theoretically, the "poverty of the stimulus" (de Villiers & de Villiers, 2000, p. 219), "impoverished environment thesis" (e.g., personal communication, Dr. Joel Hundert, 2003; Weinberg & Tronick, 1998a, 1998b), and "affective contact" (e.g., Greenspan, 1990; Hobson, 1993b, p.204; personal communication, Dr. Colwyn Trevarthen, 2002; Stern, 1974) models of developmental psychopathology each fit the working thesis of this research: specifically, decreased opportunities for joint attention with mothers in early childhood decreases the opportunities for infants and toddlers to learn developmentally appropriate skills, strategies, and ways of being, resulting in delayed, diminished, and/or maladaptive early socioemotional development.

Re-conceptualizing and Measuring Joint Attention: The Model Guiding the Research

Experimental Procedure

The experimental procedure used in the present study was developed by drawing from and modifying four well-established experimental protocols (two of which are also well-established joint attention assessment methods) used in empirical studies of early nonverbal communication development and in the assessment of joint attention. In particular, the abridged version of Seibert and Hogan's *Early Social-Communication Scales* (*ESCS*; Mundy, Sigman, & Kasari, 1990); the *Communication and Symbolic Behavior Scales* (*CSBS*; Wetherby & Prizant, 1993); and the unstructured free-play

protocols used by Bakeman and Adamson (1984) and Tomasello and Farrar (1986) to assess joint attention in the context of naturalistic mother-child interaction.

Two reasons lie behind the need to modify existing experimental procedures. The first concerns the inconsistent and rather confusing theoretical and operational definitions, and use, of the term *joint attention* in the extant literature. The second reason was related to logistics: given the nature and location of the study's population, observational data were collected in the homes of children as opposed to the laboratory.

First Reason for Modification of Existing Experimental Protocols: Definition, Use, and Operational Definition of the Term "Joint Attention" in the Extant Literature

The present study's proposed theoretical terms of *established joint attention* (EJA) and *consummative joint attention* (CJA) result from first, the inconsistent employment of the term *joint attention*, and second, the lack of operational consensus in the extant literature. It is evident that the existing literature on joint attention suffers a definitional problem similar to what Patterson (1982) described as the "dual usage" problem in the study of behaviour. Specifically, whereas some authors use the term "joint attention" as an adjective to describe a set of behaviours (e.g., "joint attention behaviours") or skills (e.g., "joint attention skills"), others use the term "joint attention" as a noun and nominal outcome of dyadic or mother-child interaction. Simply stated, the dual usage problem manifests when the behaviours of interest are used interchangeably with the function served by those behaviours. Likewise, joint attention behaviours are not distinguished from, and/or are used interchangeably with, the functional construct of joint attention. The dual usage problem, thus, introduces ambiguity, and in some cases, circularity, to the

literature. It is this that makes it difficult not only to evaluate findings reported in the literature, but also to interpret these findings in terms of their measurement and their implications for theory building, child development, and clinical intervention.

A concise discussion of this problem, and a sample of examples drawn from the established literature, will reveal the identified gap and illustrate this definitional problem for the reader. It will also provide a rationale for: (a) my conceptualization of *established joint attention* (EJA) as a *function* served by a set of joint attention behaviours or "skills;" (b) my conceptualization of *consummative joint attention* (CJA) as the *function* served by the exchange of temporally constrained, on-topic behaviours and communicative acts during a period of sustained joint attention that may ensue from the eventuality of EJA, and (c) the modification of four existing joint attention experimental protocols to form the experimental protocol used in this study.

Addressing the gap in the literature and extending traditional conceptualizations of joint attention. It is my opinion that "joint attention behaviours" or "joint attention skills," categorized, for example, by Mundy, Hogan, and Doehring (1996) as *initiates joint attention* (IJA) and *responds to joint attention* (RJA), and which comprise behaviours such as eye-gaze, smiling, *show* gestures, the production of a spoken or signed utterance (in the line of vision), proximal and distal pointing, or head shakes and nods (e.g., Bates et al., 1987; Green, Gustafson, & West; 1980; Greenspan, 1990; Marschark, Lang, & Albertini, 2002, pp. 69 – 73; Meadow-Orlans, Smith-Gray, & Dyssegaard, 1995; Mundy et al., 1996; Prizant & Wetherby, 1990, 2002; Spencer, 2000), are distinct from joint attention as a functional construct. That is, joint attention

behaviours are necessary, but not sufficient, for the manifest outcome of joint attention. But, as noted above, the existing literature uses the term "joint attention" interchangeably to describe a set of behaviours or skills (i.e., joint attention is used as an adjective) and to name the function they serve (i.e., joint attention is used as a noun/nominal variable). A recent (2004) abstract of a paper published in the journal *Development and Psychopathology* will help to make this definitional and dual usage problem plain (emphases and parenthetical numbering not in the original):

> This study examined whether infant [1] **joint attention (JA) skills** … [2] **JA behaviours** were assessed with … [3]**Three classes of JA** were measured: Initiating JA (IJA), Responding to JA (RJA), and Requests. Behavioral outcomes … social competence. [2] **JA behaviours** were … cognitive ability. The functionally distinct uses of [4] **JA** were differentially … variability in the expression of [1] **JA skills** in the second year of life (Sheinkopf, Mundy, Claussen, & Willoughby, 2004).

Four characterizations of joint attention appear within the abstract alone. "Joint attention" is used by the authors both as an adjective, or set of behaviours (1 & 2), and as a noun, or outcome (3 & 4). Especially problematic is the categorization or labeling of two of the "three classes of JA:" implicit in the *Initiating JA* and *Responding to JA* "classes of JA" is that both are conceptualized as "JA skills" or "JA behaviors" at one and the same time that the former results in joint attention as an outcome, and the latter is a response to the presence of joint attention.

What follows is a brief exposé of the dual usage problem in the literature. Thereafter, the problem of circularity will be illustrated using examples from the literature. The reader is reminded that while dual usage is a problem within the overall body of the extant literature, some, but not all, authors are guilty of the dual usage problem or circular argument.

The view of joint attention as a set of skills. Attention-directing behaviour is one of two broad categories of joint attention behaviour or skill sets described in the literature. For example, Mundy et al. (1996) described the joint attention skill set as involving acts displayed to elicit the attention of a social partner (i.e., *Initiation Joint Attention* acts) and Wetherby and Prizant (1993) speak of the child "direct(ing) the attention of the partner to the object or event." Hwang and Hughes (2000) draw from both Wetherby and Prizant (1993) and Mundy, Sigman, and Kasari's (1990) work to arrive at their operational definition of joint attention as the display of "participant behaviours" including: (a) referential looking at the interactive partner and an object at the same time; (b) pointing to an object within reach; (c) showing objects to the interactive partner. Charman, Baron-Cohen, Swettenham, Baird, Cox, and Drew (2000) coded joint attention when the child displayed a gaze shift between the active toy and adult (tester or parent).

Attention-tracking behaviour is the second broad category or class of joint attention skills described in the literature in general, and referred to by Mundy et al. (1996) as *Responding to Joint Attention* acts. Frith and Frith (2001) employ attention-tracking behaviour to define joint attention; specifically, Frith and Frith define joint

attention as the ability to notice and then to follow or track another person's line of visual regard such that the object of the person's attentional focus can be determined. Clearly, Frith and Frith view joint attention as an ability "in" the individual and not as a product of interaction. That is, joint attention ability is manifest in the display of attention-tracking or gaze-following behaviours to locate (and share) the object or event of another person's visual attention. This conceptualization of joint attention is also reflected in Spencer and colleagues (1992) study of joint attention between mothers and hearing and deaf toddlers. Recall earlier that the first question addressed by Spencer's group was whether mothers follow into the focus of children's visual attention as a way to elicit joint attention. From this, it appears as if Spencer et al. understand joint attention as an interactional outcome. However, this is not the case. Rather, Spencer et al. write: "Joint attention was usually demonstrated by the hearing mother and infant by the mother's labeling or discussing the object while the infant looked at the object ..." (p. 74). Translated, the mother's "labeling or discussing the object" is nothing more than the mother displaying an *initiation act* (i.e., a joint attention behaviour) by following into and labeling or commenting on the child's focus of attention. Once again then, joint attention is defined in terms of attention-tracking behaviour.

Lastly, Malle (2001) theoretically defined joint attention as the (unobservable) "ability" to understand that "self and other" are both attending to the same object or event of interest.

The view of joint attention as an interactional outcome. Joint attention was first characterized as a functional construct or outcome by Werner and Kaplan (1963) who

described joint attention as "primordial sharing situations." Bruner (1981) discussed the "management of joint attention" as a "division of labour" between the social partners, but, more particularly, Bruner characterized joint attention as the "state" of joint attention arising from and out of antecedent and joint attention-maintaining "social procedure behaviours." In their seminal work, Tomasello and Todd (1983) also described joint attention as a sustained "state" of joint attention that begins with and emerges from the following sequence of "discrete social events:" (a) in the course of mother-child interaction (such as free-play) either the mother or child directs an initiation act toward the other; (b) both the mother and child then visually focus on the referent object or activity for a minimum of 3 seconds, and (c) to preclude onlooking, at some point during the joint focus (possibly at initiation), the child directs some overt behaviour toward the mother (especially gaze to face) as evidence that the child is aware of their joint attention. Of conceptual value, is the implication that initiation acts are insufficient for "successful initiation of joint attention" (premised on at least 3 seconds of mother-child interaction following the initiation act). In what was also to become seminal work, Bakeman and Adamson (1984) described joint attention as a type of "engagement state" that was the manifestation of coordinated acts of attention between two social partners and an object of mutual interest. Bakeman and Adamson spoke of "extended durations of coordinated joint engagement" which they operationalized as "the average number of seconds" these episodes of joint attention "engagement states" lasted between the mother and child. The criteria set by Rocissano and Yatchmink (1984) for the event of joint attention to be considered to have occurred required the display of an initiation act by one partner to be

followed by a *series* of three or more contingent mother-child communicative exchanges or "matched turns" around the mutual focus of attention. Joint attention was considered over when either the mother or child "broke" joint attention through the display of a noncontingent or "asynchronous" act. When Rocissano and Yatchmink's operational definition of joint attention is unpacked, the series, or sequence of interpersonal exchanges, looks as follows: initiation act → first contingent response → second contingent response → third contingent response. Implicit here is that the eventuality of joint attention is confirmed with the production of the third contingent response. Despite the lack of explicitness, Rocissano and Yatchmink's depiction of joint attention as a sequence of "synchronous turns" (i.e., turn-taking that was contingent and coordinated) and non-joint attention as a series of one or more "asynchronous responses" is synonymous with Tomasello and Farrar's (1986) discernment of communicative and behavioral acts as occuring either "inside" or "outside" of joint attention episodes. Also, Tomasello (1995) recognized that the display of an initiation act was necessary, but not sufficient, for joint attention to be considered as a demonstrated, and therefore, measurable and observable, event. Accordingly, Tomasello suggested that, for a communicative act or behaviour to be classified as a representative *joint attention behaviour*, the behaviour (e.g., gaze) was to meet the criterion of "intent to communicate" for the purpose of instrumental or declarative joint attention. Nammy, Acredolo and Goodwyn (2000) considered joint attention to be observed when the caregiver and child's gaze were directed toward the same object (in this case, a shared book), and Ingsholt (2002) is more specific in her definiton of joint attention: joint attention is defined as an

interpersonal "episode" that is maintained for at least two seconds. Wetherby and Prizant (2002, p. 48) and Spencer (2000) determined the event of joint attention to have occurred when an initiation act directed toward the social partner was followed with a response from the recipient partner within three seconds. Nadel and Camaioni (1993, p. 194) refer to a more liberal five seconds as the suggested criterion response time. Trevarthen and Hubley (1978) introduced the term "cooperative intersubjectivity" to the joint attention literature. That is, joint attention is more than just converging lines of sight (personal communication, Dr. Colwyn Trevarthen, 2002). Rather, joint attention is a relationship variable manifest in responsive and attentive "experiencing together" (personal communication, Dr. Colwyn Trevarthen, 2002). Swisher (1991) concurrs with Trevarthen (personal communication, 2002), noting that although visual attention to the social partner suggests that the message being communicated is being received, the absence of visual attention does not necessarily mean that the recipient has not received the message. More recently - but again employing visual behaviour as criteria and evidence for empirically assessed joint attention - Vaughan, Mundy, Block, Burnette et al. (2003) discussed joint attention in terms of "bouts" and "active bouts." A bout of joint attention was the observable event of the mother and child both being visually focused on the same object or activity for at least three consecutive seconds, and which ended when either the mother or child looked away from the interaction for more than three seconds or when a new activity was initiated with a different toy and lasted more than three seconds. Active bouts of joint attention were distinguished from bouts of joint attention as a function of child behaviour: active bouts were recorded where the child switched eye

gaze between the mother and the toy at least once "within the episode." Dube, Macdonald, Mansfield, Holcomb, and Ahearn (2004), using a behavioural analytic approach, completed a functional analysis of joint attention *initiation* to identify the contingencies of an "extended joint attention episode." First, the child actively looks to the caregiver at the onset of some interesting event [Dube et al. refer to the interesting event/object as the "motivating operation" (MO)], and the caregiver responds immediately through some verbal or nonverbal act so that the child recognizes that the caregiver is attending. This response from the caregiver functions as a discriminative stimulus signaling an increased probability of further adult-mediated consequences contingent upon a prior child-reciprocated act. To the extent that a learning history is established, the child responds to this caregiver-response and joint attention with the caregiver continues as a function of the next caregiver-mediated consequence. That is, Dube and colleagues conceptualizate joint attention to emerge through and from a behavioural chaining process that operates to first *establish* joint attention and which they delineate formally as:

MO
↓ (R) (SR+) (SD) (R) (SR+) (SD)
Gaze shift → Adult-attending behaviour → Event-related behaviour → Adult-attending behaviour

Dube's group acknowledge that the limitation of their functional analysis of joint attention initiation is that the child was required to display an initiation act in response to the presentation or occurrence of a novel toy or event (MO). Also, no attempt was made to advance an understanding of the interactive process facilitating "extended JA episodes"

consequent to the initiation (and implicit establishing) of joint attention between the child and caregiver. Of relevance and speaking to Trevarthen's (personal communication, 2002) criticism that joint attention is more than the convergence of the mother and child's lines of sight, Dube et al. recognize that acts other than gaze are used to initiate joint attention with a partner, but state that because gaze is the most frequently displayed initiation act they selected to constrain their functional analysis of joint attention to gaze as the criterion initiation act (i.e., the child actively looks to the parent at the onset of an interesting event).

Ambiguity and circularity. Two final examples follow to demonstrate the problems of ambiguity and circularity that appear in the literature in conjunction with the dual usage problem.

In their *Early Social Communication Scales* (ESCS) assessment tool, Mundy, Hogan, and Doehring (1996) stated that "Joint attention behaviours refer to the child's skill in using nonverbal behaviours to share the experience of objects or events with others" (Preliminary Manual, p. 3). There is nothing wrong with this definition; joint attention behaviours are distinguished from their functional purpose. However, when we look at the authors' coding protocol, "joint attention" (and not "joint attention behaviour") is operationalized as the frequency with which a child uses behaviours such as eye contact, pointing, and showing gestures, or follows an adult tester's line of visual regard and pointing gestures, to "initiate shared attention" or "respond to joint attention," respectively. Of note too, is that the class of *Initiation JA* acts is implicitly operationalized as the display of a "joint attention behaviour" independent

of the social partner. That is, joint attention (or joint attention behaviour?) is implicitly viewed to be "in" the child and not as a co-created outcome. Also, joint attention (or joint attention behaviour?) is defined and operationalized as the display of any one of a set of nonverbal behaviours **whether or not** the display of the behavior results in an observable event of shared attention between the social partners to objects or events.

The second example comes from Wetherby and Prizant's 2002 revised edition of the *Communication and Symbolic Behavior Scale* (i.e., the *CSBS Developmental Profile*) where joint attention is defined as a set of "intentional communicative acts" used to direct the social partner's attention to an object or event such that the social partner responds to the communicative act by directing gaze towards or acknowledging in some other way, the referent. Here now we see the tighter definition of a joint attention initiation act requiring a response from the social partner. Nonetheless, the dual usage problem persists. On page 68 of their manual, Wetherby and Prizant provide a vignette of an interaction between a 21-month-old toddler (Camille) and her mother to illustrate the procedural coding of "joint attention" (parenthetical wording in the original):

> After putting the lid on the bowl, she said, "Hot hot." (Notice that the first time Camille said, "Hot hot," it was not counted as a communicative act because it was not directed.) Then, her mom said, "Hot dogs." Camille clarified what she was saying by repeating "hot hot" while looking at her mom. This second production of "hot hot" was a nice example of joint attention.

That is, the child's first communicative act (the undirected "Hot hot") was not considered a "communicative act" (i.e., a joint attention behaviour), but the child's second communicative act (the directed "hot hot") was coded as joint attention (i.e., a functional construct).

Why is the narrow view of joint attention as a skill-set particularly bothersome? Quite simply, because this view cannot explain *how* joint attention skills, ability, or behaviour, by themselves and, in some cases, the display of initiation acts independent of the social partner's response, can mediate child development. In contrast, the view of joint attention as a functional outcome supports the generation of multiple hypotheses about early social development drawing from a broad array of developmental theories and perspectives of child development. But, the broader view of joint attention as a functional construct is limited too. *What* processes lead up to and *how* is the "state" of joint attention achieved? Empirical operationalizations of joint attention are generally incomplete (criteria for one or more of the initiation, establishing, sustaining, and terminating of a joint attention episode/bout/state are not provided) and/or too liberal (e.g., the operational definition of joint attention as the outcome of an initiation act-contingent response pairing occurring within a prescribed time period ranging between two and five seconds). Incomplete, and too liberal, operationalizations of joint attention are the two most costly issues of the otherwise insightful view of joint attention as the function served by antecedent- and joint attention-maintaining joint attention behaviours.

In summary, joint attention's definitional problem in the literature is one of dual usage and, in some cases, ambiguity and circularity. Joint attention is viewed as a set of

behaviours or skills by some authors, and as the function served by a set of behaviours and/or communicative acts by others. Still other authors use the terms "joint attention behaviours" and "joint attention" interchangeably.

To address this definitional problem and resulting gap identified in the literature, I have worked to integrate both characterizations of joint attention reflected in the dual usage problem such that joint attention might be operationally restated. Guiding my restating and operationalizing of joint attention as a theoretical developmental construct are the following: (a) by definition, initiation acts cannot occur independently of the social partner; (b) a contingent response to an initiation act is a necessary, but not sufficient, condition for joint attention to be established between partners; (c) if joint attention is to continue once it has been established (i.e., a sustained episode of joint attention), then, and again by definition, both partners must actively contribute to the maintenance of joint attention; (d) consequently, joint attention is lost when one or both partners disengage from the interact; and finally, (e) if joint attention, viewed as a functional construct, plays a role in early social development, then *sustained* episodes of joint attention, compared with *empty* episodes of joint attention (i.e., episodes of joint attention that come to an end immediately after joint attention is established between the partners), are likely to be more optimal for the progression of early development. I, therefore, explicitly characterize joint attention as the **function of** discrete and observable interpersonal or "joint attention behaviours." Furthermore, I distinguish and operationalize two subtypes of joint attention: (1) *Established Joint Attention* (EJA); and (2) *Consummative Joint Attention* (CJA) (i.e., a sustained episode of joint attention).

Restating the Operational Definition of Joint Attention as a Functional Construct

The operational definition (see below), behaviour chains (see Figures 1A & 1B), and model (see Figures 2A & 2B) of joint attention are the result of an extensive review of the literature and represent my attempt to make sense of the multiple lines of joint research appearing across numerous literatures including attachment theory, developmental psychology, social learning theory, social-cognitive theory, social constructivist theory, symbolic interactionist theory, linguistics and philosophy of language, socio-communicative development, functional and pragmatic language development, developmental delay, and deafness.

Operational definition of joint attention. (1) Once the child or mother initiates engagement with the other for the purpose of attaining and then directing the other's attention to an object, event, or activity; (2) the recipient responds behaviorally (e.g., through an orienting or alerting response such as behavioural stilling) or communicatively (verbally or nonverbally) within 5 s of the initiation act in hearing mother-hearing child dyads (HH) or 15 s in hearing mother-deaf child dyads (HD), and the duration of this response is at least 3 s in order to establish evidence that the partner's attention has been captured; (3)the initiating partner then directs a communicative act or behaviour toward the recipient (especially but not necessarily a look to the recipient's face) as evidence that the initiating partner is aware of the recipient partner's shared attention, and therefore, that the recipient partner's response is not rather on-looking behaviour or "passive joint attention" (Bakeman & Adamson, 1984); (4) the mother and child now visually focus on the object/event of shared attention or communicatively engage one another and the

object through, for example, the exchange of smiles, vocalizations, verbalizations or "eye talk" (Peackocke, 2002) for a minimum of 3 s. At this point, joint attention is considered to have been *established* and *Established Joint Attention* (EJA) is recorded. If joint attention is lost, or if the episode of joint attention is actively terminated, by one or both the mother and child within or less than one communicative exchange after joint attention is established, this is considered an *empty* episode of joint attention. In contrast, joint attention that is sustained through a sequence of two or more contingent and coordinated on-topic exchanges after joint attention is established and which are displayed by the mother and child within 3 s (HH) or 15 s (HD) of one another's preceding response, then an episode of *Consummative Joint Attention* (CJA) is recorded.

The termination of a joint attention episode is marked by the display of a *termination act* produced by either one of the mother or child and which results in the loss of one of the social partner's attention for more than 3 s (HH) or 15 s (HD). Termination acts include: (a) physical movement away from the object, event, or activity of joint attention focus; (b) greetings or other signals of leave taking, termination, or cutoff (e.g., rubbing, licking lips, covering or rubbing eyes, scratching); (c) statements and other acts that attempt to change the topic to another topic (e.g., *Let's do this now)*, and other attention-directing behaviours that interrupt an established topic (e.g., *show/offer*-gestures; child takes a toy); (d) gaze aversion or looking away from the interaction or social partner and other active attempts by the child to distance herself or physically disengage from the mother such as arching of her back, squirming, turning, or looking

away toward surroundings (e.g., saying *hello* to the video-camera or observer) or part of her own body, for example, her fingers or belly-button as an alternate focus.

In summary, I have adopted a process model of joint attention. Specifically, I have operationalized joint attention in terms of a sequence of three antecedent communicative acts that may or may not result in *established joint attention* (EJA). The event of EJA may terminate at this point in an *empty* episode of joint attention. Alternatively, the event of EJA may mark the onset of an episode of "extended" (Tomasello & Farrar, 1986) or sustained joint attention. With respect to the latter, the initiation of joint attention is said to be *consummated* or, as expressed by Bakeman and Adamson (1984), joint attention behaviours come together in "a relatively extended bout of joint attention with an object." That is, "inside" (Tomasello & Farrar, 1986) joint attention, the social partners engage in mutual activity or the exchange of on-topic communicative acts or behaviour around the shared focus or topic of attention for some undefined duration. Accordingly, episodes of *consummated joint attention* (CJA) range in, and are measured in terms of, *span* (i.e., a frequency count of on-topic communicative exchanges between the mother and child) and not temporal duration (s, min). Episodes of CJA are considered terminated following the loss of one social partner's on-topic attention for more than three seconds (HH) or fifteen seconds (HD).

By way of demonstrating how this model of joint attention compares with some of the existing traditional models of joint attention, the reader is directed to Appendix 1. Note: Although Vandel and George (1981) employed a 5 s response time between deaf and hearing preschool social partners, the response time parameters for hearing mother-

deaf child exchanges for this research were clinimetrically established; experts in the field of early intervention were consulted, and the longer time parameters were considered appropriate given the qualitatively different nature of the negotiation of joint attention between hearing mothers and deaf children. In addition, the literature describes deaf mothers intuitively understanding this as demonstrated through their provision of longer "wait times" for the deaf child to respond (Spencer et al., 1992; Watkins, 2004, p. 1220).

Second Reason for Modification of Existing Experimental Protocols: Home-visit Data Collection

The second reason for the modification of existing joint attention protocols was, as stated earlier, logistical. Because the sample of deaf children were recruited from the three early intervention home-visiting preschool programs offered by the Ministries of Health and Long-Term Care in conjunction with the Ontario Ministry of Education and Training's three Provincial Schools for the Deaf, participants lived throughout the province of Ontario making it necessary for all hearing mother-deaf child behavioural data to be collected in the children's homes. Accordingly, behavioural data for the hearing mother-hearing child dyads were also collected within the home setting. Indeed, the home setting is likely to have increased the ecological validity of this work.

The validity of developmental competency assessments of infants and toddlers is increased when these are conducted in the child's home and within the context of spontaneous play (Linder, 1990) and motivated interactions between the child and caregiver (Watkins, 2004, p. 60). Playful interactions most characterize naturally occurring interactions between mothers and children (Stern, 1974), and naturally

occurring interaction between mothers and children are the *de facto* context for the development of social skills (Landry et al., 1998). From an empirical point of view, having the mother and child play together on the floor in immediate range of the toys also helped ensure the maintenance of close proximity between the mother and child (Prendergast & McCollum, 1996). Close proximity was especially crucial for this research to give hearing mother-deaf child dyads equivalent opportunity for joint attention engagement: close proximity allows visual access to gesture, touch, and signing important for getting, maintaining, and regaining one another's attention.

Modification of Existing Experimental Joint Attention Protocols

The modified experimental procedure for the home setting was designed to be non-stressful and non-intrusive and to recreate, as far as possible, a natural and playful context for mother-child interaction. The investigator provided a range of communicative temptations in the form of novel and attractive toys and objects described in the literature as reliable elicitors of spontaneous joint attention between mothers and young children. Four empirically documented joint attention probes were also unobtrusively introduced during the course of mother-child play by the investigator. The naturalistic mother-child context and first unstructured free play task were based on the designs described and used by Bakeman and Adamson (1984) and Tomasello and Farrar (1986) to spontaneously elicit joint attention between mothers and young children. The semi-structured joint attention eliciting probes were derived from two well-established joint attention assessment methods both of which use a structured, video-recorded sampling of adult tester-child interaction with the child in the respondent position. These were, the

abridged version of the *Early Social Communication Scales* (ESCS) (see Peter Mundy, Anne Hogan, & Peter Doehring, 1996); and (b) The *Communication and Symbolic Behavior Scales: Developmental Profile* (CSBS DP; First Normed Edition) (see Ann Wetherby & Barry Prizant, 2002).

Bakeman and Adamson's (1984) and Tomassello and Farrar's (1986) Naturalistic Free Play Mother-Child Interaction Designs

Bakeman and Adamson (1984) and Tomasello and Farrar (1986) both adopted naturalistic, unstructured designs requiring the mother and child to sit on a play mat on the floor of the laboratory playroom with toys that were arranged in front of them. Toys included toy play dishes, a baby doll, doll's bottle, and a set of blocks. Mothers were asked to "play as you normally would at home" with their children, and the play interactions were video-recorded for later transcribing and coding. Other studies of joint attention employing designs drawing from the work of Bakeman and Adamson, and Tomasello and Farrar, include Spencer (2000) and Vaughan et al. (2003).

The Early Social Communication Scales (ESCS)

The ESCS is designed to elicit child joint attention initiation acts and child responses to social and communicative bids directed to the child from an adult tester. The ESCS is specifically designed to measure nonverbal communication skills, including "joint attention skills," in typically developing children between the ages of 8- and 30-months, or in chronologically older children who function verbally within this age range. The roughly twenty minute long structured adult tester-child interaction is video-recorded, observed, and coded later. The ESCS procedure has been used by the following

groups in various studies examining aspects and developmental implications of joint attention. Mundy and Gomes (1998) examined the longitudinal association of 14- to 17-month old children's ($N = 24$) ability to respond to joint attention bids of a tester and their receptive language development 16 weeks later when the children were between 18- and 21-months of age. Claussen and colleagues (2002) recruited a convenience sample ($N = 56$, 26 boys) of high-risk 12-month old toddlers prenatally exposed to cocaine and who were involved in either a centre-based ($n = 46$) or home-based ($n = 10$) early intervention program to assess the effect of disorganized attachment on the development of joint attention skills at 18-months of age. Vaughan et al. (2003) conducted a longitudinal cohort study using a subset of 9-month old children ($N = 57$) from a larger study in the development of joint attention. Children were assessed at 9-months and followed up at 12-months of age to determine whether individual differences in the development of joint attention are attributable to child, caregiver, and/or child-temperament variables. Most recently, and of much relevance to the present research, Sheinkopf, Mundy, Claussen and Willoughby (2004) reported findings from their longitudinal cohort study using a convenience sample ($N = 30$, 13 boys) of high-risk infants with prenatal cocaine exposure enrolled in a birth to 3-year old centre-based program; children were assessed using the ESCS at 12-, 15-, 18-, and 36-months corrected age. More specifically, the study addressed the relations between joint attention behaviours and later social-behavioural development in the children as measured by the *Adaptive Social Behaviour Inventory* (ASBI; Hogan, Scott, & Bauer, 1992).

The Communication and Symbolic Behavior Scales: Developmental Profile

Similar to the ESCS, the CSBS-DP is a structured adult tester-child interaction conducted in the laboratory setting and comprises communicative temptations (e.g., bubbles, wind-up toy, books, and play toys) designed to elicit joint attention presented by the tester to the child. The CSBS-DP assesses the *functional* communication age of typically developing children between the ages of 6 months to 2 years and of children with a chronological age of up to 6 years with a developmental level of functioning that is less than 24 months. Flanagan, Coppa, Riggs and Alario (1994) used an earlier edition of the *CSBS* to investigate longitudinal differences in children's communication skills as a function of the quality of mother-child interactions in earlier development.. Flanagan's group used a single sample cohort design involving a high-risk sample of 9- to 12-month old fullterm, appropriate birth weight, and healthy children (N = 130) and their teenage mothers.

Research Objectives, Rationale, Questions, and Hypotheses

Objectives

Two primary objectives guided the present study. One was to move research in deaf children's socioemotional development beyond the "language argument" by examining ontologically earlier processes of *prelingual* socioemotional development. The second objective was to extend our theoretical understanding of how processes thought to underlie typical development are used to explain atypical development, and similarly, how the study of atypical development informs and advances our understanding of typical development.

Rationale

Because the mother-child dyad is the primary social unit of communication, interpersonal developmental contact, and the avenue for the development of early socioemotional competence and social skills in infants and toddlers; and because joint attention is (a) well-established as an early prelinguistic behavior appearing in the second half of the first year of postnatal life, and established by the end of the second year of postnatal life in both hearing children and deaf children, (b) qualitatively different from joint attention shared between a hearing infant and a hearing mother, and (c) theoretically and empirically linked to socioemotional development and child behaviour outcomes, disrupted and impoverished episodes of mother-child joint attention in early development might contribute to the secondary features of social and behavioral difficulties associated with congenital bilateral hearing loss in children. Accordingly, I undertook a micro-analytic investigation of spontaneous and elicited episodes of joint attention between hearing mothers and their 18- to 36-month-old hearing and deaf toddlers in a natural setting.

Questions

Using a social-learning/exposure and orienting model of early development, I examined mother-child joint attention processes and asked four questions: (1) Do deaf children and hearing mothers differ from hearing children and hearing mothers on measures of joint attention? (2) Do the two groups differ on a contemporaneous measure of adaptive social behaviour? (3) Are measures of joint attention contemporaneously related to adaptive social behaviour? (4) If sustained joint attention is important for

socioemotional development in early child development, then what role do hearing mothers of deaf children play in sustaining episodes of joint attention when we know that joint attention processes are disrupted between hearing mothers and deaf children?

Hypotheses

I derived and tested four hypotheses for Question 1:

Hypothesis 1A: Hearing mother-hearing child dyads will be significantly more competent compared to hearing mother-deaf child dyads in initiating and establishing joint attention reflected by more initiation acts [both maternal (MIA) and child (CIA) initiation acts] that are responded to by the recipient and, consequently therefore, more instances of established joint attention (EJA).

Hypothesis 1B: Hearing mother-hearing child dyads will be significantly more proficient than hearing mother-deaf child dyads in sustaining joint attention reflected by a significantly greater frequency and rate of verbal and nonverbal exchanges inside episodes of joint attention.

Hypothesis 1C: Mothers in the hearing mother-deaf child dyads will terminate episodes of joint attention significantly more frequently relative to mothers in the hearing mother-hearing child dyads.

Hypothesis 1D: Independently trained observer global ratings of the quality of joint attention in hearing mother-hearing child dyads will be significantly greater than those of hearing mother-deaf child dyads.

From Question 2, I derived and tested the following hypothesis:

Hypothesis 2: Hearing children would be rated as significantly more socially and behaviourally competent by their mothers compared with deaf children.

From Question 3, I derived and tested the following hypothesis:

Hypothesis 3: The quality of joint attention indexed by a *consummative joint attention* (CJA) score[3] would be positively correlated with maternal ratings of children' adaptive social competence and behaviour.

From Question 4, I derived and tested the following hypothesis:

Hypothesis 4: *Inside* episodes of joint attention, the behavioural and response acts of hearing mothers of deaf children would not differ significantly from that of hearing mothers of hearing children. That is, hearing mothers of deaf children, as a group, would not show the quantitative and qualitative accommodations described in the literature and as necessary for the sustaining of joint attention with severely/profoundly deaf children.

It is also important to note that, I have chosen to constrain my research and hypothesis testing to the mother-child dyad as the unit of analysis. This is not to minimize the role that fathers and grandparents, for example, play in the daily life and development of the child. Rather, this reflects an attempt to increase scientific control of data collection. In addition, the inclusion of mothers (as opposed to other caregivers) increases the validity of comparison across studies: the vast majority of studies report

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[3] *Consummative joint attention* is operationally defined as an episode of joint attention that is sustained through a sequence of two or more contingent and coordinated on-topic responses between the mother and child after joint attention was established and which are displayed within three seconds (HH-dyads) or fifteen seconds (HD-dyads) of the prior response.)

mother-infant/child interaction (e.g., Harris, 2001; Smith-Gray & Koester, 1995; Spencer, 2000). In addition, the influence of the mother in early childhood (Luman, McCauley, Chu et al., 2003) in general is well-established. Mothers tend to take a greater share in the responsibility of caring for their deaf infants and children (Denison, 1987; p. 78; Marschark, 1997, p.15) and in the communication of concerns to therapists, teachers, and other support-service providers (Fewell & Vadasy, 1986 cited in Marschark, 1997, pp. x - xi). Also, hearing mothers of young deaf children being trained in Total Communication (TC) are significantly more likely to be the one family member with whom deaf children communicate through sign (Mayberry, 2003, p. 499) and Sheridan (2001, p. 217) found that mothers and sisters were most likely to serve as interpreters in social situations for the children she interviewed.

Chapter Two

METHOD

Sample Overview and Participant Characteristics

Fifty six 18- to 36-month old children and their mothers were enrolled in the study; $n = 29$ (16 boys, 13 girls) hearing mother-hearing child (HH) dyads; $n = 27$ (13 boys, 14 girls) hearing mother-deaf child (HD) dyads.

The comparison HH-dyads were recruited at birth from the McMaster Psychology Department's child data base of families previously recruited through the McMaster University Medical Centre (MUMC) and St. Joseph's Hospital, Hamilton, Ontario. Mothers and their deaf children were recruited from one of the Ministry of Education and Training (Ontario) Preschool Home Visiting Programs (see below). The Ministry's three Provincial Preschool Coordinators identified deaf children eligible for participation in the study and provided the parents with an information letter (Appendix 2) outlining the purpose of the research. All parents of children identified by preschool teachers indicated their willingness for the investigator to phone to arrange participation in the study. All but one of the parents phoned by the investigator participated in the study (the mother in this case had recently returned to fulltime work after maternity leave and was unable to coordinate her schedule to accommodate participation in the study).

Mean age of the hearing children was 26.04 months ($SD = 5.2$; range = 18 - 36 months), and mean age of the deaf children was 26.85 months ($SD = 6.2$; range = 18 - 41 months). Mothers' mean age in the HH-dyads was 33.38 ($SD = 4.59$) years and in the HD-dyads, 31.61 ($SD = 4.07$) years. All HH-dyads mothers with the exception of one

were married, and four HD-dyads mothers were not married. College or university education was the mean level of education for both groups of mothers. All children in both groups were born healthy at term (i.e., ≥ 36 gestation weeks), and no child had been admitted to neonatal intensive care unit for more than 2 days. Deafness was not the result of prenatal maternal/congenital *TORCH* infections (i.e., Toxoplasmosis infection, Rubella, Cytomegalovirus, Herpes) or substance abuse (alcohol, cocaine etc.), or perinatal birth trauma, postpartum infection (e.g., bacterial meningitis, jaundice), or accident. No children displayed craniofacial anomalies including structural abnormalities of the pinna and ear canal and, in the HH-dyads, family history of hereditary childhood sensorineural hearing loss was an additional exclusion criteria. An additional inclusion criterion for the HD-dyads was severe (70 – 89 dB in the better ear) to profound (>90 dB) deafness.

Mean age of confirmation of deafness in the HD-dyads was 11.67 months-of-age (*SD* = 6.45, range = 1 – 23 months). Mean age when mothers knew that "something was wrong" was 8.13 months-of-age (*SD* =5.24, range = 1 – 18 months). At the time of participation in the study, mean number of months from confirmation of deafness was 14.69 months (*SD* = 7.06, range = 4 – 35). The mean age of the children when families began using the communication option of their choice was 14.13 (*SD* = 7.64, range = birth – 28 months). Communication options chosen by families of deaf children were the following: ASL (*n* = 2), Auditory Verbal (AV; *n* = 9), Oral (*n* = 5), Total Communication (TC; *n* = 3), and a combination of AV, Oral, and gesture (*n* = 8). Language development of the deaf children was assessed using the *SKI HI* Language Development measure from the SKI HI curriculum used by the Ontario Provincial Schools' Preschool Home-Visiting

Program. This assessment is normed on deaf and hearing children from birth to six years of age (chronological age). Results showed a mean Listening Age (aided, except for children not fitted with hearing aids or cochlear implants) of 10.81 months (SD = 6.07, range = 4 – 26 months, n = 16), mean Expressive Age was 8.94 (SD = 3.63, range = 3 - 14 months, n = 17), and Receptive Age was 9.59 months (SD = 4.02, range = 3 - 16 months, n = 17). (See Table 1.)

Children with cochlear implants were included in the sample (n = 16). Four of these children had been implanted less than two weeks before participation in the study and their cochlear implants were therefore not yet activated. Another two of the children's cochlear implants had been activated for a week only at the time of participation in the study. For the purpose of data analysis, these six children were therefore considered to have no cochlear implant aiding. Thus, children with cochlear implants comprised 10 of the 27 deaf children.

Eight children were not aided during the collection of mother-child interaction data; three children were neither implanted nor fitted with hearing aids; one child was fitted with hearing aids but used them inconsistently and was not aided for data collection; and four of the children were those who were newly implanted and whose cochlear implants had not yet been activated.

Given the nature of the population, differences within the HD-dyads in terms of how many home-visits mothers and children had received from early intervention preschool teachers were unavoidable for the following reasons: (a) variability in age of identification, (b) whether or not children were on a waiting list for a cochlear implant,

(c) variability in the number of scheduled early intervention home-visits that parents cancelled. It is important to point out that the number of home-visits received by mothers and children is a more accurate index of early intervention enrollment than is the number of months or years since enrollment in a program (personal communication, Marietta Colven, E. C. Drury School for the Deaf, Milton, Ontario, 2005; personal communication, Sharon Ainsworth, Sir James Whitney School for the Deaf, Belleville, Ontario, 2005). Nonetheless, the differences within the HD-dyads in terms of number of home-visits completed, is recognized as a limitation of the study. However, in an attempt to counter this limitation, data on daycare/preschool attendance in both groups were collected, and no significant differences were found; 16 (55%) of the HH-dyads and 14 (52%) of the HD-dyads children attended day/care or preschool for an average of 19.8 (SD = 13.47) and 15.9 (SD = 14.60) hours per week, respectively.

Experimental Procedures and Research Design

Ethics for the research were approved by the Medical Research Ethics Board of McMaster University and by the three Provincial Schools for the Deaf in the province of Ontario, Canada: The Ernest C. Drury School for the Deaf, Milton, Ontario; Sir James Whitney School for the Deaf, Belleville, Ontario; and, The Robarts School for the Deaf, London, Ontario. Informed consent (Appendix 3A & 3B) was signed by mothers in both the groups of dyads at the time of the home-visit prior to data collection and after receiving briefing from the investigator. Demographic data (Appendix 4A & 4B) were collected from mothers after consent was signed. Age-appropriate toys were given to the

children to thank them for their participation. Parents of the children had the right to withdraw at any point during or after the study.

The experimental procedure was designed to elicit mother-child interaction and joint attention in the context of naturalistic dyadic play in the home environment. One spontaneous, naturalistic free-play episode and four joint attention-eliciting stimuli, presented sequentially but independent of one another, were incorporated into the play-based procedure: (1) Free Play; (2) Bubbles; (3) Laser Pointer; (4) Bumble Ball; and (5) Book Sharing. A selection of toys known to elicit joint attention between adult social partners and children was provided and included a baby doll (Bakeman & Adamson, 1984; Charman, Baron-Cohen, Swettenham, Baird, Cox, & Drew, 2000; Flanagan, Coppa, Riggs, & Alario, 1994; Prendergast & McCollum, 1996; Tomasello & Farrar, 1986; Vaughan, Mundy, Block, Burnette et al., 2003), a teaset (Charman et al., 2000; Prendergast & McCollum, 1996; Wetherby & Prizant, 1993, 2002), a kitchen stove with miniature pots and pans and cutlery (Charman et al., 2000; Namy, Acredolo, & Goodwyn, 2000; Vaughan et al., 2003), blocks and/or a wooden puzzle (Bakeman & Adamson, 1984; Tomasello & Farrar, 1986; Vaughan et al., 2003; Wetherby & Prizant, 1993, 2002), pieces of sponge (Charman et al., 2000), and other conventional toys including farm animals, cars (Charman et al., 2000; Namy, Acredolo, & Goodwyn, 2000) and familiar cartoon character figurines. Selection of the four semi-structured joint attention-eliciting probes (Bubbles, Laser Pointer, Mechanical Toy, and Books) was based on well-described instances of their use in studies examining joint attention between children and an adult social partner (e.g., Bakeman & Adamson, 1984; Bruner, 1981, p. 77; Charman

et al., 2000; Flannagan et al., 1994; Hwang & Hughes, 2000; Justice & Pullen, 2003; Mundy et al., 1996; Namy et al., 2000; Wetherby & Prizant, 1993, 2002).

Mothers and children were seen in their homes and provided with a standard set of toys and novel objects. When the investigator arrived at the family home, she unpacked the hand-held video camera (FUJIX-8, Model # F122SW, Super Wide), and briefed the mother about consent and procedures. During this time, the toddler was present but the investigator made no attempt to actively engage the child; the video was casually placed such that the child was able to accustom herself to the presence of the camera prior to the behaviour sample. This introductory and familiarizing period lasted between 10 and 15 minutes. The investigator then unpacked the toys and arranged them in a roughly 1.5m x 1.5m area, and mothers were reminded to interact with their children as they typically would when they had the time to play with their children on the floor with toys. The mother and child were seated and made comfortable on the floor amongst the toys, and the investigator surreptitiously pointed out the bubbles that were positioned to the left of the mother and out of the child's line of sight. The investigator positioned herself and the hand-held video camera unobtrusively at some distance away from, but in front of, the mother and child. The child was seated to the right of the camera and the mother to the left of the camera, both facing toward the camera. Five minutes of Unstructured Free Play was followed by four semi-structured joint attention-eliciting conditions: Bubbles (3 min), Laser Pointer (1 min), Bumble Ball (1 min), and Book Sharing (3 min). Thus, the total duration of the behaviour sample was 13 minutes.

Unstructured Free Play Task. The mother and child were allowed to become accustomed to the environment through warm-up free play for no more than 1-minute before the five minute Free Play Task was recorded. After five minutes of Free Play, the investigator signaled to the mother using a waving gesture to begin the Bubble Task. (The waving gesture was used to signal the mother so that hearing children would not have the advantage of an auditory cue potentially signaling a change in the environment.)

Bubble Task. The mother had been instructed to begin the bubble session by blowing bubbles up in the air and away from the child's face. The mother had also been told that while there were three minutes assigned for bubble play, she and the child could use all or as much of this time as they wanted. After three minutes had elapsed, the investigator again waved her arm in front of the camera to signal the mother that it was time to close up and put aside the bubbles. The mother then placed the bubbles behind her back. Mothers had been instructed that if the child was upset by the removal of the bubbles, they were to attempt to divert the child's attention to a toy on the floor. The investigator waited for 20 s to a maximum of 1 min until the child was reengaged in play or attentively distracted before beginning the Laser Pointer Task.

Laser Pointer Task. From behind the camera and out of view of the child, the investigator pointed and moved a red laser beam in an area on the floor in front of the child and within the child's sight lines. The laser pointer was switched on and off three times during the one minute interval (sub-vocalized time count). That is, the laser pointer was switched on and then off-and-on on the sub-vocalized time counts of 21 and 22 seconds and 43 and 44 seconds, respectively. When the investigator switched the laser

pointer off for the last time, she again waited between 20 s and 1 min for the child to shift her attention sufficiently from the activity around the light beam to the mother or a new toy before activating the Bumble Ball.

Bumble Ball Task. The investigator activated and released the battery operated Bumble Ball toy onto the floor area in front of the mother and child. The toy was allowed to move around, flashing its lights, for one minute. After one minute the Bumble Ball was picked up from the play area and switched off at the same time that the mother was handed three books for the Book Sharing Task.

Book Sharing Task. The mother had been instructed to show the child the three books and to allow the child to select one book for shared reading. The mother then placed the remaining two books behind her back out of view of the child, and allowed the child to examine the chosen book. If the child became disinterested in the book, the mother offered the other two books to the child for her selection, and once the child had made her new selection, the mother again placed the other two books behind her back and allowed the child to examine the selected book. The investigator timed three minutes using the stopwatch feature of the hand-held video camera and then announced the end of the floor play session.

Behavioral Coding and Reduction

Transcribing of Video-recorded Mother-Child Interaction Samples

The video-recorded mother-child interactions were observed and transcribed verbatim in real-time dyadic sequence (Prendergast & McCollum, 1996) such that the integrity of the timing and sequencing of behaviour and communicative acts was retained.

A detailed microanalysis of moment-to-moment interaction such as this records the sequence of, and relations between, prior, subsequent, cooccurring (overlapping), and interoccuring (occuring at the same time) behavioural and communicative acts [verbal and nonverbal including, for example, interruptions, hesitations, and pauses (Graesser, Gernsbacher, & Goldman, 2003, p. 12; Ochs, 1979, p. 59)] such that context is situated and topic relevance and on-topic shared attention is tracked. In this way, the interactive and interpersonal nature of the mother-child interaction is retained and allows for later coding of behaviour categories that are not independent of context or reciprocity (Rocissano & Yatchmink, 1984). Any behaviour (verbal, nonverbal) is considered to have a *salient context* (Harris, 2001), if it refers to some aspect of the topic or focus of shared attention. A *topic*, on the other hand, is the object, event, or activity of the shared focus of attention (Ochs, 1979, p. 9) and is distinguished by "the particular objects and/or actions being used" (Wetherby & Prizant, 2002, p. 48) within the interactive context.

Two senior-level undergraduate students in Developmental Psychology were trained as observers by the investigator through written documentation, modeling, feedback, and videotape practice to transcribe the video-recorded behavioural data streams verbatim. Observers understood that context is critical to an intelligible transcript and were asked to include, for example: the solitary activities in which the child and the mother were involved; where the child and mother were looking, facing, pointing, reaching, moving when the communicative act was displayed; what the child and mother touched, held, held up, manipulated etc. In particular, observers were trained to: (1) provide detailed and precise transcription of the coordination of eye gaze, eye contact,

line of visual attention and gaze following, by noting, for example, "Mother and child direct clear facial expressions of pleasure or excitement toward each other with eye gaze." "Child laughs while looking at mother and then continues laughing as he shifts gaze to look at bubbles;" (2) note careful observations of whether the mother and child's gestures, spoken utterances, and signed utterances were visible to one another (i.e., in the recipient's line of sight) centrally or at least peripherally (front and side of the recipient); (3) describe of tone of voice (e.g., impatient, frustrated, whining, sing-song, pleading, playful, coaxing, demanding) and movement (e.g., hurried, impatient, rough, apathetic, gentle); (4) indicate all facial expressions observed; (5) record the mother and child's movements, postural shifts and repositioning; (6) indicate when joint attention was established; (7) indicate the initiating act that eventuated in joint attention being established; (8) indicate when joint attention was lost; and (9) indicate the termination act likely to have initiated termination of the joint attention episode. Lastly, observers were asked to document brief comments with respect to their overall impression of the *general tone* or *mood* of the dyadic interaction, and the mood and interactive style of the mother and child individually (see Appendix 8 for abbreviated inventory of behavioural and communicative acts involved in the negotiation, maintenance, and termination of joint attention).

Coding of the Transcripts

The investigator simultaneously observed each of the video-recorded behaviour samples at the same time as she followed and coded the (checked) data stream of the transcription. Pre-identified units of behaviour (see *Behavioural Measures Coding*

below) were coded from the verbatim transcriptions of the video-recorded mother-child interactions and recorded as frequency scores. The frequency scores formed the raw quantitative data for subjection to data analyses. Two points are important to note here. First, is that the mother and child are alternatively cast in the role of sender and respondent [or initiator and recipient; or "speaker" and "hearer" (Ochs & Schieffelin, 1979, p. 2)]. Second, is that while maternal acts are of primary interest for this research, to the degree that maternal variables reflect maternal interpersonal engagement and participation, maternal variables are considered to implicitly reflect both child- and relationship variables. That is, given the verbatim nature of the transcriptions, maternal variables were neither conceptualized, nor coded in isolation from either child- or relationship variables.

Behavioural Measures Coded

The following is a list of the behaviour units and their operational definitions that were coded from the verbatim transcriptions of the video-recorded mother-child interactions and recorded as frequency scores: (1) Initiation Acts (maternal- and child variables); (2) Established Joint Attention (relationship variable); (3) Maternal Affect (maternal variable); (4) Maternal Interactive Style (maternal variable); (5) Termination Acts (maternal- and child variables); (6) Joint Attention (relationship variable); (7) Mode of Communication (maternal variable); (8) Independent observer Global Rating of Quality of Joint Attention; and (9) Independent observer Global Rating of Shared Positive Affect.

Initiating and Establishing Joint Attention

1. Initiation Acts (CIA, MIA, MIA II)

Definition: Initiation acts are spontaneous and intentional communicative acts or "contact initiatives" (Priesler & Ahlström, 1997) that direct (Newland, Roggman, & Boyce, 2001; Wetherby & Prizant, 2002), get (Ochs, Shieffelin, & Platt, 1979, pp. 256 - 257) or pull attention for the purpose of sharing the experience of the object or event (Mundy et al., 1996) or "focused action at a time when such interaction is not in progress (Corsaro, 1979, pp. 376 - 377).

Operational definition: An initiation act is any behavioural or communicative act that is clearly directed to the social partner, and which was not part of an existing interaction. Only "successful" initiation acts were coded and recorded as frequency scores. That is, initiation acts that were not responded to within five seconds or that did not result in established joint attention between the mother and child were not included in the data subjected to analysis. Three types of *initiation acts* were coded: (A) *Child Initiation Act* (CIA); (B) *Maternal Initiation Act* (MIA); (C) *Maternal Initiation Act II* (MIA II).

A. *Child Initiation Acts* (CIA) are child-initiated verbal or nonverbal behavioural "invitations" (Prendergast & McCollum, 1996) directed toward the mother in an attempt to elicit the mother's attention (Hundert, Mahoney, Mundy & Vernon, 1998). As they are coded here, *Child Initiation Acts* are synonymous with Mundy and colleagues' (1996) categorization of joint attention initiation acts or *Initiates Joint Attention* (IJA) (see Mundy et al., 1996).

B. ***Maternal Initiation Acts (*****MIA*****; Attention-Directing)*** are spontaneously occurring active attempts or "invitations" by the mother to elicit and direct the child's attention to an object or event with which the child is not currently engaged.

C. ***Maternal Initiation Acts II (*****MIA II*****; Follow In)*** occur when the mother notices or "tunes into" (Rocissano & Yatchmink, 1984) or follows into the child's focus of attention by directing a verbal or nonverbal interpersonal behaviour toward the child in an attempt to gain entry into and participate in the child's focus of attention or activity (Hundert et al., 1998; Rocissano & Yatchmink, 1984) or to get the child's attention (Bruner, 1981). For example, the mother, noticing the child playing with the teacups and plates, taps her finger on the teacup and says: "Mommy would like some tea please." MIA II acts include naming or labeling the object already in the child's attentional focus (e.g., an object that the child is holding, looking at, touching, or playing with) (Tomasello & Farrar, 1986) and maternal directives, questions, or comments that are related to the activity or object in which the child is currently involved or visually engaged (Landry et al., 1998; Prendergast & McCollum, 1996). Rocissano and Yatchmink (1984) refer to these attempts by the mother to "create a way in to" the child's focus of attention as "uninvited responses."

2. Established Joint Attention (EJA)

Definition: Established joint attention reflects a state of person-person-object engagement that is intentionally and mutually attained through communicative acts of eye contact, person-object-person gaze shift, affect, gesture, and other communicative behaviours for the purpose of joint attention around an object, event, or activity.

Operational definition: *Established joint attention* is the dyadic or interpersonal behavioural outcome of a coordinated sequence of four contingent acts between the mother and child that was initiated by one or the other in response to a motivating event or object: (1) One member of the mother-child dyad initiates engagement with the other for the purpose of attaining and then directing the other's attention to an object, event, or activity; (2) the social partner responds behaviorally (e.g., through an orienting or alerting response such as behavioural stilling) or communicatively (verbally or nonverbally) within 5 s in hearing mother-hearing child dyads (HH) or 15 s in hearing mother-deaf child dyads (HD) of the initiatory act, and the duration of this response is at least 3 s in order to establish evidence that the partner's attention has been captured; (3) the initiating partner then directs a communicative act or behaviour toward the recipient (e.g., a look to the social partner's face or other act indicating recognition and acknowledgement of response) as evidence that the initiating partner is aware of the partner's shared attention and therefore that the social partner's response did not serve the purpose of on-looking behaviour or "passive joint attention" (Bakeman & Adamson, 1984); (4) the partners now visually focus on the object/event of shared attention or communicatively engage one another and the object through, for example the exchange of smiles, vocalizations, verbalizations or "eye talk" (Peackocke, 2002) for a minimum of 3 s. At this point, joint attention is considered to have been *established* and *Established Joint Attention* is recorded.

Inside Joint Attention: Sustaining, Losing and Regaining Joint Attention

3. Maternal Affect (Affect-P, Affect-N)

Definition: Maternal expression of affect is defined as the affective state of the mother and the manner in which, or affective tone with which, she engages and is available and responsive to the child during joint attention episodes.

Operational definition: Maternal affect during episodes of joint attention is communicated through touch, gesture, vocalizations, facial expression, eye contact, and postural adjustments. Expressed ***positive affect*** **(Affect-P)** is demonstrated through a mother's smiles; approach movements; the animation and tone of her voice, gesture and posture; and positive verbal expressions of praise and laughter. Maternal eye gaze is directed toward the child and typically the mother is in close proximal and affectionate contact with the child. Positive expressions of maternal affect also include overt expressions of playfulness, teasing, praise, and enthusiasm (but not encouragement, which is an aspect of maternal interactive style rather than maternal affect).

Maternal ***negative affect*** **(Affect-N)** is expressed in the mother's tone of voice, gesture, posture, displays of displeasure, disapproval, impatience, frustration, or anger. Negative affect is indicated by, for example, the mother's facial expressions and instances of whining, complaining, flat or unemotional motor action and movement, and other affectively negative acts expressed directly or indirectly toward the child. (Indirect expressions include third-party reference to the child, for example: *Oh g-d (sigh), so now he has to knock the blocks over.*) Maternal eye gaze directed toward the child is minimal and limited eye contact is established. Overall, the mother displays a detachment and

lack of pleasure in her interaction with the child; her demeanour appears depressed, apathetic, withdrawn, too serious, anxious, impatient, angry or hostile.

4. Maternal Interactive Style

Three coding categories were recorded for *maternal interactive style*: (A) *LET ME,* (B) *LET ME-C,* (C) *DIRECTING.* The first two reflect a facilitative style and the third reflects a directive style.

A. LET ME [Leading, Expanding and Encouraging, Turn-Taking, Informal Teaching and Guidance (through suggestions, information transmission, and advice), Mirroring or Echoing]

Maternal behavioural and communicative acts that function to extend and sustain mother-child joint attention episodes after joint attention has been established are coded as *LET ME* acts. Here, the mother encourages the child's active participation and involvement in the joint-attention interact by, for example: accepting the child's lead (e.g., when the child offers a toy to the mother she acknowledges the child's bid by reaching out to accept the toy, allowing the child to put the toy in her lap, making eye contact with the child, or uttering a coordinated and contingent recognition response such as *You're giving me the cup?* or, *Thank you.*); expanding and developing an existing focus by asking topic relevant rhetorical questions [e.g., M: *Do you know what I think is in the pot?* (C: stirring pot on the stove); M: *I think there is milk in the pot for mommy's tea.*], or offering topic-relevant suggestions [e.g., M: *I think these dolls would like their tea.*]; encouraging (e.g., *Okay. Yeah. There. Right. Like this. Go on, you can do it!*); seeking clarification (e.g., *Oh, I think I understand, do you mean I must drink the tea in the cup?);*

using repetition and self-disclosure as forms of collaboration to demonstrate involvement (e.g., C: *Mommy tea.* M: *Mommy tea. Yes, mommy likes tea.);* teaching opportunities [e.g.; C: *Ball* (pointing to shape in book). M: *Circle.* C: *Circle* (still pointing on shape in book).]; inviting turn-taking (e.g., by saying *Your turn* or by asking *Do you want a turn to stir the cup now?);* echoing and confirming [e.g., C: (Looking down at plate with toy cup on it; turns the cup the right-side up) *Upside down.* M: *It was upside down.*]; and suggesting the next action (e.g., C: (Holding the teacup and looking at it intently). M: (Picks up the teapot and leans forward to put kettle on the stove in front of the child) *I'll put the kettle on the stove then we can pour tea into your cup.*].

B. LET ME Conditional (LET ME-C)

LET ME-C includes all the same maternal behaviours and communicatives included in the LET ME category above, but which are conditional upon the interact-focus being the mother's choice of topic or conditional upon the child's compliance with a maternal directive produced inside an episode of joint attention. For example, the mother ignores the child's requests to blow bubbles but continues to coax or persuade the child to catch the bubbles, and when the child concedes to chasing and catching the bubbles as directed by the mother, the mother only now sustains the shared interact by encouraging and praising the child in her catching activities. (It is often the case that when the child next asks or behaviourally indicates a desire to blow the bubbles, the mother once again ignores the child, and the interaction invariably breaks down unless the child again complies with the mother's wishes or demands.)

C. DIRECTING

A *directive* maternal interactive style is, by definition, the inverse of responsiveness (Spencer et al., 1992), and most typically described as a mother's attempts to direct or dominate joint attention interactions through topic control, response control, and turn-taking control, often in a pedagogic manner. Attempts on the part of the mother to actively control, interrupt, prohibit, or direct the child's attention and actions often appear contextually inappropriate or excessive. Alternatively, the mother is "uninvolved" (Rocissano & Yatchmink, 1984) perhaps only directing gaze toward and in response to communicatives directed to her from the child. Other types of directive behaviours include:

Control of topic

Delay in response (i.e., the mother's response is produced more than five seconds after the child's preceding act)

Diversion and shifting from topic to topic in rapid succession or distracting the child from her focus of attention through, for example, instructions or requests

Ending or terminating joint attention episodes prematurely

Goading, cajoling, persuading and other inappropriate utterances

Ignoring or avoiding or overriding, for example, the child's suggestions for next actions

Interrupting, **I**nterfering, **I**ntrusiveness, and **I**nstructing

Negative physical control that overly restricts the child's participation, attention, actions, or movement

Right-or-wrong and yes-or-no two-choice question asking

Talking excessively, talking-over the child's communicative attempts, completing the child's sentences, or monologue-like talking as if the mother is engaged in solitary play and not cooperative joint attention

Teaching (instructional, formal, pedagogic)

Note: With-in turn co-occurrences and/or inter-occurrences were coded as follows: When vocalized (or signed) and nonverbal acts were produced by the mother within the same turn or utterance and both acts clearly communicated the same message to the child, only one event of LET ME was recorded [e.g., C: Looks at the picture in the book and says *Bye Bye!* M: Also looks at the picture in the book and imitates the child saying *Bye Bye* (verbal act) at the same time that she waves her hand and turns the page (co-occurring nonverbal act)]. However, when a verbal (or signed) and nonverbal act were produced by the mother within the same turn, but which communicated different messages to the child, then each act was coded independent of the other and two events of maternal interaction style were recorded (e.g., C: *A-ooooh!* pointing to the apple on the page. M: *That's an apple* points to apple (verbal and nonverbal acts coded as one instance of LET ME) then points to the picture of the banana *What's this one? Lookit (name of child), look at this one!* (verbal and nonverbal acts coded as one instance of DIRECTING)].

Terminating Joint Attention: Maternal and Child Termination Acts

5.1. Maternal Termination Act (MT)

Definition and operational definition: A *maternal termination act* is any maternal act displayed after joint attention has been established (i.e., inside joint attention) and which results in the termination of the joint attention episode unless followed by a child act that

"repairs" joint attention by pulling the mother's attention back to the interaction. *Maternal termination acts* include, but are not limited to: the timing of the mother's response (Delay, Interrupt, Ignore etc.); the mother's response is not accessible to and therefore not received by the child; the mother changes the topic; the mother expresses negative affect or does something to upset the child such as taking a toy away from the child or physically repositioning the child; the mother misses a communicative cue, signal, or act produced by the child; the mother gaze averts or is distracted.

5.2. Child Termination Act (CT)

Definition and operational definition: A *child termination act* is any act or behaviour produced by the child inside joint attention and which results in the termination of the joint attention episode unless followed by a maternal act that "repairs" joint attention by pulling the child back into the shared focus of attention. Representative of *child termination acts* are the following: the child physically moves away from the object, event, activity, or mother herself; the child makes other active attempts to create distance between herself and the mother or to physically disengage from the mother through acts such as arching of her back, squirming, turning, looking away to scan the surroundings (e.g., directing gaze to the video-camera and then saying *hello* to the video-camera!); the child disengages from the interaction by looking at a part of her own body such as her fingers or belly-button as an alternate focus, rubbing her eyes, or licking her lips; the child becomes restless and fidgets; the child attempts to change the topic to another topic (e.g., *Let's do this now);* the child indicates noninvolvement in other ways such as rocking movements of her body or moving her legs or circling her feet when seated.

6. Coding of Joint Attention as an Outcome: Two subtypes

All episodes of joint attention were coded as one of two subtypes of joint attention: *Established Joint Attention* (EJA) or *Consummative Joint Attention* (CJA) (i.e., a sustained episode of joint attention). The reader is referred back to the earlier restated operational definition of joint attention (see pp. 50 - 51).

7. Coding of Mode of Communication

Each maternal turn or response was coded according to the mode of communication used by the mother in her delivery thereof. Seven modes of communication representing hearing-listening/speaking and deaf-visual/sign/gestural communication were coded: (a) *simultaneous auditory visual communication* (simAVC); (b) *sequential auditory visual communication* (seqAVC); (c) *nonverbal communication* (NVC); (d) *sequential total communication* (seqTC); (e) *sequential sign* (seqS); (f) *simultaneous total communication* (simTC); (g) *simultaneous sign* (simS).

a. *Simultaneous auditory visual communication* (simAVC). The mother produces a vocalization or verbal communicative act at the same time that the child is visually attending to the referent object, activity, or event. Maternal gestures and nonverbal acts that are outside of the child's visual field but that are accompanied by voice are also coded as simAVC acts. For example, the mother points referentially to an object and laughs at the same time, or, at the same time that she is pointing referentially to an object she says *Look!* or, *Wow! What's that?* A second example is when familiar gestures such as the raised-shoulder-hands-up shrug is displayed together with a voiced *"I don't know."* Unlike the hearing child, unless the deaf child *sees* his mother pointing, for

example, to something and *sees* his mother laughing, neither the gestural nor the vocalized communicative act will be accessible to the child. (This is one example of why the deaf child, compared with the hearing child, has unequal access to information and communication.)

b. *Sequential auditory visual communication* (seqAVC). The mother waits for the child to shift her visual gaze from the focus of attention to the mother so that the delivery of the mother's vocalization or verbal communicative act is timed to coincide with the child's eye-gaze directed to the mother's face. For example, because child *show*, *offer*, and *give* gestures directed to the mother are typically accompanied with eye-gaze also directed to the mother, maternal responses to these gestures from the child are likely to be expressed using seqAVC.

c. *Nonverbal communication* (NVC). Nonverbal communicative acts are those acts displayed by the mother that implicitly communicate to the child that the mother is available and present to the child. Nonverbal communicative acts include touch, postural shifts, gesture, attentive stillness in body orientation, facial expression, eye gaze, volume and tone of voice, movement towards the child, or an action that supports, guides, or helps a child with respect to the shared activity (e.g., the mother holds the bubble wand hand-over-hand with the child and guides the child's movement toward her mouth to blow bubbles). *Proximal* pointing (i.e., the mother's pointing <u>on</u> an object, or tapping an object) is coded as NVC as the act is within the child's visual field. In contrast, *distal* pointing is coded as NVC only if the gesture is visually accessible to the child.

d. *Sequential Total Communication* (seqTC). Maternal production of *Total Communication* communicative acts (i.e., the coordination of a vocalized utterance, word, or sentence with target home-sign or Sign words) occurs necessarily with mutual gaze. That is, the child receives the visual-gestural and/or sign communicative when she shifts her visual attention from the referent object, activity, or event to the mother. To be noted is that maternal utterances were considered *Total Communication* when the "sign" used by the mother was home-sign or formal ASL, and when an everyday/familiar gesture [e.g., the mother beckons the child by crooking her finger; or, the mother turns her palms to face up with shoulder shrugging to communicate "what?" or the mother turns her palms up and visually scans to communicate "where?" (Prendergast & McCollum, 1996)] was more exaggerated than we would expect in hearing speaking/listening interactions. That is, all other instances of non-exaggerated and visible gestures displayed by the mother were coded as NVC in both HH- and HD-dyads. Alternatively, gestures that we would expect to observe in HH-interactions were coded as NVC in HD-interactions too unless they were obviously exaggerated in terms of their expanse of movement and production.

e. *Sequential Sign* (seqS). The mother produces formal ASL utterances, words, and sentences when the child directs visual gaze toward the mother's face and/or hands and the mother signs within the child's signing space. Alternatively, the mother delivers her sign communicative in such a way that it is accessible to the child, for example, she signs in the child's signing space or on the toy the child is playing with or even on the child's body.

f. *Simultaneous Total Communication* (simTC). Recognizing that, by definition, there is no such mode of communication as *simultaneous Total Communication*, maternal total communicative acts produced in the absence of the child's visual attention (i.e., the child saw neither the sign nor the spoken word) or *during* the child's shift in gaze from the focus of attention to the mother (see Spencer et al., 1992), were coded as simTC.

g. *Simultaneous Sign* (simS). Recognizing again that, by definition, there is no such mode of communication as *simultaneous Sign*; maternal signs produced in the absence of the child's visual attention or *during* the child's shift in gaze from the focus of attention to the mother were coded as simS.

In summary, verbatim transcription of the videotapes and coding of the transcriptions involved the microscopic analysis of natural, subtle, and fast-moving mother-child communicatives (verbal, nonverbal) with particular focus on the processes of establishing, sustaining, and terminating joint attention (refer back to Figures 2A & 2B for process models). Categories of interaction units and patterns (Graesser, Gernsbacher, & Goldman, 2003, p. 13 – 14) coded from the transcriptions were recorded as frequency scores and subjected to data analyses. Two further relationship-variables were computed and subjected to data analyses: *joint attention span* (JAspan) and *consummative joint attention score* (CJA score).

The variable *JAspan* reflects the duration of joint attention episodes in terms of the total frequency of communicative exchanges inside episodes of joint attention summed across all episodes of joint attention established by the mother and child during

the five conditions of the behaviour sample and is inclusive of "empty"[4] episodes of joint attention. The variable *CJA score* is the *rate* of communicative exchanges computed by dividing the total number of on-topic communicative exchanges produced by the mother and child inside episodes of joint attention summed across the five conditions of the behaviour sample by the total time (min, s) of the behaviour sample.

8. Independent Observer Global Ratings of Quality of Joint Attention

Quality of joint attention was defined using traditional qualitative categorizations well documented in the literature. Specifically, quality of joint attention is defined as a trained observer's overall impression of the degree of shared meaning, dyadic mutuality, and shared positive affect observed between the mother and child inside and across all joint attention episodes across the five conditions of the video-recorded behaviour sample. A global rating was assigned to each dyad using a 7-point Likert scale where *1 = Poor, 3 = Average, 5 = Good, 7 = Excellent.*

Taken together, behavioural data were qualitatively analyzed within the context of mother-child interaction generally, and mother-child joint attention specifically, such that frequency scores and global ratings were derived from the observations and analyzed. Interrater reliability was assessed for all steps of the data reduction process (see below).

9. Independent Observer Global Ratings of Shared Positive Affect

Shared positive affect (a relationship variable) was assessed through direct observation of the video-recorded interactions by one of the trained observers. A single

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[4] Refer to Chapter 1, page 50. An empty episode of joint attention occurs when joint attention is lost, or if the episode of joint attention is actively terminated, by one of, or both, the mother and child within or less than one communicative exchange after joint attention is established.

global rating of *quantity* or *degree* of *shared positive affect* was observed across Free Play, Bubble, Laser Pointer, Bumble Ball, and Book Sharing tasks as a whole and recorded using a 7-point Likert scale where *1 = Absent, 4 = Moderate, 7 = High.* *Shared positive affect* was operationally defined as the display of observable acts or expressions of pleasure or excitement between the mother and child (e.g., a smile, laugh, touch, head incline) that were coordinated with directed gaze toward the partner (Wetherby & Prizant, 2002, p. 13, p. 49) or physical (postural or motor) gesture immediately before, during, or following the expression of positive affect. Individual acts of positive affect in the absence of mutual awareness were considered acts of non-shared positive affect. Examples of *shared positive affect* based on those offered by Wetherby and Prizant (2002, p. 49 & p. 78) are: (1) When the child is happy, she smiles at or laughs with the mother at the same time that the mother smiles at or laughs with the child. This display is considered shared positive affect; (2) The child pops bubbles, looks at the mother, and laughs softly. This action is considered shared positive affect; (3) The child pops bubbles and laughs softly. This action is NOT considered shared positive affect; and (4) The child displays a gaze shift when she holds the jar of bubbles toward the mother and gives the jar to the mother to open the jar. The mother opens the bubble jar and returns it to the child; the child looks down at the bubble jar and smiles. This action is NOT considered shared positive affect.

Establishing Operational Equivalency

It was important to ascertain and verify operational equivalency, given the modifications to existing empirical protocols. For example, the CSBS DP (Wetherby &

Prizant, 2002) and the ESCS (Mundy et al., 1996) were designed to elicit joint attention between children and an unfamiliar adult tester in the laboratory setting; that is, both scales are investigator-administered with the child in the respondent position. Also, each joint attention eliciting task is presented independent of the dyadic play context and in the absence of toys.

A *Playdough Task* was therefore included to control for the possibility that the array of toys available to the mother and child throughout the behaviour sample procedure and *despite* their established validity and reliability in eliciting joint attention, served as *distractors* from shared attention and eye gaze with the mother. Because playdough is a particularly potent elicitor of joint attention (Girolametto & Weitzman, 2002), playdough was used in a counter-balanced design in an attempt to address the possible design confounds of setting (laboratory vs. home) and the presence of toys. The sample comprised two groups of hearing children between the ages of 18- and 36-months and their mothers; one group was recruited to a laboratory condition ($n = 31$), and the experimental hearing mother-hearing child subset ($n = 26$) formed the home condition. *Playdough task* data from three hearing mother-hearing child dyads seen in the home setting were not available; in one case, the playdough had been left overnight in the investigator's car and had frozen in the extreme winter conditions of the time, and in the other two cases, the children became fractious during the task, and data collection was thus discontinued before three minutes had elapsed. Mothers and children were randomly assigned to either the experimental condition (toys present) or the control condition (toys absent). In the laboratory setting, the experimental condition comprised 15 dyads, and the

control condition, 16 dyads. In the home setting, 15 dyads were assigned to the experimental condition, and 11 to the control condition. Two dependent variables were assessed: (1) frequency of EJA; and (2) total number of communicative exchanges inside episodes of joint attention summed across all episodes of joint attention. The *Playdough Task* was conducted following the completion of the experimental procedure described above and was three minutes in duration.

In the experimental condition, following the completion of the *Book Sharing Task* in the experimental procedure, all the toys were left to remain on the floor play area with one difference only; unnoticed by the child and mother, the investigator placed two novel toys amongst the existing toys at the same time that she placed the playdough on the floor in-front of and within the mother and child's immediate line-of-sight and physical reach. In contrast, in the control condition, all the toys were removed from the floor play area, and the investigator placed the playdough on the floor in-front of, and within, the mother and child's immediate line-of-sight and physical reach. The mother and child were invited to play with the playdough; the task was timed for three minutes duration. The effect of the independent variable Toys was assessed by examining the frequency of established joint attention episodes across the two conditions (toys present, toys absent). Frequency of established joint attention episodes and communicative exchanges inside episodes of joint attention was recorded from verbatim transcripts of the video-recorded behavioural data.

Results of operational equivalency sub-study. As predicted, there was no significant main effect of Toys (present, absent) on the frequency of established joint

attention or on the number of communicative exchanges produced inside episodes of joint attention summed across all episodes of joint attention in either the laboratory or home setting. That is, toys did not distract the child from engaging in joint attention with mother (or vice versa). These findings demonstrate operational equivalency of the experimental procedure. In addition, these findings contribute independent support for the unstructured free play design employed by Tomasello and Todd (1983), Tomasello and Farrar (1986), and Bakeman and Adamson (1984) in their seminal studies of joint attention.

Reliability of Behavioural Coding and Global Ratings

Intra-class correlation coefficients (ICC) were computed to assess interobserver reliability on measures of transcribing and coding of the behaviour samples, and inter-rater reliability on global ratings of *joint attention quality* and *shared positive affect.*

Transcribing Reliability

Before beginning transcription of the study's behaviour samples, the observers completed a theory-based pencil and paper reliability check of observation procedures, transcription methodology and procedures, and joint attention behaviour codes; overall reliability was 88%. Each observer then transcribed three randomly selected video-recorded behaviour samples together with the investigator. To avoid observer drift during the course of transcription, the investigator joined observers from time to time. The observers independently transcribed video-recorded behaviour samples, each observer transcribing roughly the same number of HH-dyad and HD-dyad recordings. All the transcriptions were checked by one of the observers; for each transcription, the observer

observed the video-recording of the dyadic interaction at the same time as she tracked and checked the transcribed data stream of the transcription for each dyad. Although observers were not told the hearing status of the children, blind status was not possible because some of the children had cochlear implants and hearing aids; not all hearing aids were covered by children's hair. The observers timed and documented the exact duration (min, s) of each of the five joint attention-eliciting tasks. At this point, the transcription process was considered complete, and the transcriptions were qualitatively analyzed and units of behaviour coded.

Joint Attention Behavioural Coding Reliability

Interobserver reliability of the coding of mother-child joint attention behaviour and communicative exchanges was similarly assessed. Intraclass correlation coefficients are recommended for studies using continuous, behavioural observation data (Fleiss, 1986, ch. 1), and when kappas are weighted with respect to either agreement or disagreement (Streiner & Norman, 2003, p. 141) as was the case in this study. The primary investigator completed the coding of each of the mother-child behaviour samples from both groups (N =56) and a second trained observer independently coded a subset (28%) of the HH-transcripts, and a subset (26%) of the HD-transcripts. Categories of behavioural and communicative exchanges examined in the study were assessed as was the determination of *JAspan* (i.e., the total number of exchanges inside joint attention episodes for each dyad). Inter-observer reliability was good across all categories of behavioural and communicative exchanges; average ICC = .89 for the HH-dyads [ICC range was .78 (LET ME & Maternal Termination Act) to .99 (Maternal Initiation Act II)],

average ICC = .90 for the HD-dyads [ICC range was .74 (Maternal Initiation Act) to 1.00 (Child Termination Act)]. Reliability between the observers in terms of the total number of exchanges inside episodes of joint attention (JAspan) was excellent; ICC = .84 for the HH-dyads, ICC = .88 for the HD-dyads. The data were collapsed across groups to assess inter-observer reliability on the coding of maternal expressions of positive affect (Affect-P) using 29% of the data; ICC = .89 for Affect-P.

It is important to note that no inter-rater reliability analyses were completed for the coding *mode of communication* categories displayed by hearing mothers in both groups. This was due to practical reasons of time constraints and unavailability of observers proficient in all categories for which communication was coded. However, the primary investigator who completed this coding had worked closely with a group of qualified teachers of the deaf over a period of two and a half years while researching this project and during data collection. In addition, the primary investigator had participated in both informal and formal workshops for early interventionists and teachers of the deaf. Taken together, it was considered that the primary investigator had therefore been well exposed to these categories of communication forms. Nonetheless, an attempt to establish reliability of coding and categorization was made by recruiting the help of one of the teachers of the deaf with many years of experience in communication with both hearing and deaf children and adults. In addition, this teacher is bilaterally and prelingually deaf herself and proficient in ASL and Oral and Total Communication modes of deaf communication. Fifteen percent of the hearing mother-deaf child interactions

were coded and categorized collaboratively by the primary investigator and the deaf teacher. Anecdotally, reliability of the original coding was considered good.

Global Ratings of Quality of Joint Attention Reliability

An independent trained observer who was blind to the hypotheses of the study rated the quality of joint attention observed in each of the mother-child behaviour samples from both groups ($N = 56$). The primary investigator independently rated randomly selected subsets of the HH-dyads (34.5%) and the HD-dyads (55.6%). ICCs used to compute reliability were satisfactory; ICC = .77 for the HH-dyads, ICC = .94 for the HD-dyads. When collapsed across both groups, the average inter-rater ICC computed was thus .86 for the global rating of quality of joint attention.

Global Ratings of Shared Positive Affect Reliability

One of the two observers trained to transcribe the video-recorded behaviour samples rated the amount of shared positive affect observed between the mother and child in each of the mother-child behaviour samples from both groups ($N = 56$). A second trained observer independently rated randomly selected subsets of the HH-dyads (55%) and the HD-dyads (52%). The inter-rater ICC computed for shared positive affect was .91 for the HH-dyads, and .74 for the HD-dyads.

Maternal Self-Report Measures

Maternal Report of Child Adaptive Social Functioning (Appendix 5)

Mothers were asked to complete the *Adaptive Social Behavior Inventory* (ASBI; Hogan, Scott, & Bauer 1992) (Appendix 5) maternal report of child adaptive social behaviour. The ASBI was designed to assess prosocial behaviours in preschool-age

children, and is a brief inventory that is easy to administer and understand. The content of the inventory is relevant to the child's home, family, and everyday settings and includes child social skills considered appropriate with both adults and other children (Scott, Hogan, & Bauer, 1997, p. 336). The term *sign* was added to Item 16 to read: *Says or signs "Please" and "Thank you" when reminded.* The term *converse* was substituted for *talks* in Item 19 to read: *Plays games and converses with other children.* These slight modifications were not considered to affect the measure's psychometric properties.

The ASBI is an existing measure of early social adaptive competence and behaviour and has been used to assess this aspect of early development in samples of high-risk preschoolers (Greenfield, Iruka, & Munis, 2004; Hogan et al., 1992) and premature, low birth-weight children (Bradley et al., 1995). The ASBI has been also used in studies to examine the role of maternal limit-setting patterns in early social development (Houck & LeCuyer-Maus, 2002) and to evaluate early intervention programs (NICHD Study of Early Child Care, 1994; U.S. Department of Health and Human Services, Administration for Children and Families, 1997). Most recently, and pertinent to my work, Sheinkopf, Mundy, Claussen and Willoughby (2004) used the ASBI as the measure of social development in their investigation of joint attention skill in at-risk children. (See Appendix 6.)

The ASBI consists of 30 items that form three subscales: *Express*, *Comply*, and *Disrupt*. The *Express* subscale comprises 13 items tapping child initiated social interaction behaviours and affective expressiveness, and the 10 items of the *Comply* subscale tap the degree to which the child is socially responsive, cooperative, and

obedient. The *Disrupt* subscale is made up of 7 items reflecting behaviours that are socially intrusive, interfering, or aversive yet *normative* (i.e., not unusual for children this age). Mothers are asked to rate each item in terms of the response that best describes their child. Ratings use a 3-point Likert scale where *1 = Rarely or Never, 2 = Sometimes, 3 = Almost Always.* A *Prosocial* score can be computed by summing *Express* and *Comply.* High *Express* and *Comply* scores and low *Disrupt* scores are associated with better adaptive social functioning. Reverse-scored *Disrupt* items are summed with *Express* and *Comply* to result in a total score. Psychometric properties of the scale are adequate and documented in Hogan et al. (1992).

Maternal Report: Caregiver Perception Rating (Appendix 7)

To assess the validity of the child's behaviour during the behaviour sample period, mothers were asked to complete the *Caregiver Perception Rating* questionnaire from the *Communication and Symbolic Behavior Scale* (*CSBS DP*; Wetherby & Prizant, 2002) immediately following the behaviour sample procedure. Mothers rated how "typical" they considered their child's behaviour was during the observation period on items assessing alertness, emotionality, interest and attention, comfort, activity, communication, and play. Independent-sample t-tests were used to assess the presence of any significant differences between the groups.

There were no significant differences between the two groups on maternal report of typicality of children's responses to, and behaviour during, the collection of mother-child interaction data. Overall, mothers in both groups rated their children's behaviour during the sample as "typical" for all seven items assessed by the *CSBS Caregiver*

Perception questionnaire administered immediately following the behavioural sample procedure. This finding of behavioural typicality supports the validity of children's behaviour during the behaviour sample. (See Table 2.)

Data Analyses

Group differences were examined using between-subject t-tests, analysis of variance, and chi-square methods. Within-subject effects were examined using Pearson correlations. All analyses were evaluated at $p < .05$, or corrected significance levels for analyses using multiple t-tests. A between-group design was used for all data analyses and comprised one between-subjects factor "dyad hearing-status" with two levels [hearing mother-hearing child (HH), hearing mother-deaf child (HD)]. The mother-child dyad was the unit of analysis for Questions 1, 2, and 3, and the data were analyzed using independent-sample t-tests and a limited set of Pearson correlations. All significance testing was 2-tailed.

To test *Hypothesis 4*, and to answer Question 4, "mother," as the unit of analysis, was the between-subjects factor with two levels (HH-dyad mothers, HD-dyad mothers) and maternal "JA-process" was the repeated-measures factor with twelve levels. That is, the twelve *process variables* displayed by mothers inside episodes of joint attention were assessed using a repeated-measures design and independent-samples t-tests with corrected significance levels of $p = .05/12$. A significance level of significance level of .004 (2-tailed) was therefore adopted for each of the between-group comparisons. Seven *mode of communication*, two *affective*, and three *interaction style* maternal variables were assessed. The seven *mode of communication* variables were: *simultaneous auditory*

visual communication (simAVC), *sequential auditory visual communication* (seqAVC), *nonverbal communication* (NVC), *sequential total communication* (seqTC), *sequential sign* (seqS), *simultaneous total communication* (simTC), and *simultaneous sign* (simS). *Positive affect* (Affect-P) and *negative affect* (Affect-N) comprised the two affective variables assessed, and maternal *facilitative* (LET ME, LET ME-C) or *directive* style made up the three interaction style variables. The dependent variable was the *number of interaction units* in each category of process variable displayed by the mothers in the two groups. Again, all significance testing was 2-tailed.

Chapter Three

RESULTS

Between-Group Analyses: Demographic Variables

Hearing Mother-Hearing Child (HH) vs. Hearing Mother-Deaf Child (HD)

There were no significant differences between the groups on either child- or maternal demographic variables. Overall, the two groups were homogenous across all demographic variables and differed only in terms of mother-child hearing-status match (See Table 3.)

Hearing Mother-Deaf Child: Cochlear Implant Aiding vs. No Cochlear Implant Aiding

Recall, children who had either received cochlear implants, or whose implants had been activated for the first time within two weeks of participation of the study, were considered as having no cochlear implant aiding. Ten deaf children were thus considered as being aided by cochlear implants. Mean age at the time of implantation was 16.7 months (SD = 6.75, range = 10 – 29 months). Mean hearing age (i.e., number of months since cochlear implant was activated) was 12.6 months (SD = 4.67, range = 6 – 19 months).

Whether children were aided by cochlear implants (n = 10) or not (n = 17), hearing mother-deaf child dyads were homogenous across all demographic variables with the exception of child chronological age: as a group, children without cochlear implant aiding for study participation purposes were significantly younger (M = 24.82, SD = 4.98) than children with cochlear implant aiding (M = 30.30, SD = 6.85), $t(25) = -2.40$, $p < .05$. (See Table 1.)

To assess for possible within-group (i.e., HD-dyads) confounds due to cochlear implantation; that is, cochlear implants that had been surgically implanted whether they were activated or not at the time of the study, the data were reanalyzed according to surgical implantation status and not activation status of cochlear implantation. Sixteen of the deaf children had been surgically implanted. A significant group difference was found on one demographic variable. Maternal self-report revealed that deaf toddlers with cochlear implants were older when their mothers first knew something was "wrong" (M = 10.33, SD = 5.90) compared to when hearing mothers of deaf toddlers with no cochlear implants first knew something was "wrong" with their children (M = 5.73, SD = 3.15), $t(21) = -2.30$, $p < .05$. (See Table 4.)

Noteworthy, is that no significant differences on joint attention performance variables were found for hearing mothers and deaf children who were using cochlear implant aiding and hearing mothers and deaf children who were not using cochlear implant aiding during the collection of behavioural data. Cochlear implant aided HD-dyads (n = 10) and non-cochlear implant aided HD-dyads (n = 17) performance on joint attention performance variables revealed the following: (1) no significant difference in the frequency with which joint attention was established (EJA), (2) no significant difference in the frequency of exchanges *inside* established episodes of joint attention (JAspan), (3) no significant difference in the rate of exchanges *inside* established episodes of joint attention (CJAscore), and (4) no significant difference in independent observer global ratings of the *quality* of joint attention observed between the mothers and children. (See Table 5.)

In addition, there were no significant differences in maternal report of adaptive social behaviour on any of the three dimensions assessed by the *Adaptive Social Behaviour Inventory.* (See Table 6.) In sum, these findings confirm homogeneity within the hearing mother-deaf child group despite variability in cochlear implant aiding status of the children.

Relations among Demographic Variables and Study Variables: Within-Subject Analyses

Pearson correlations, chi-square, and one-way anova analyses were used to assess whether any relations existed among any of the demographic and the independent or dependent variables within the full sample ($N = 56$). There were no significant relations between the independent variable "Group" (HH, HD) and any of the demographic variables assessed. Recall, the five primary dependent variables assessed were: (1) frequency of EJA, (2) frequency of CJA, (3) CJA score, (4) quality of joint attention, and (5) child social competence and behaviour measured by the *ASBI.* Only four significant associations were found and are reported below.

The frequency with which mothers and deaf toddlers established joint attention was significantly and positively associated with how long deafness had been identified for. Specifically, the greater the number of months between identification and participation in the study, the greater the frequency with which hearing mothers and deaf toddlers established joint attention, $r(26) = .46$, $p < .05$. This finding supports the Universal Newborn Hearing Screening initiative in that mothers appear to be

compensating for and accommodating to their children's communication needs once deafness has been identified and confirmed.

One-way anova with language spoken at home as the 4-level between-subject factor (English as first language, Other language as first language, English as second language, Other language as second language) and frequency of CJA as the dependent variable, showed a significant main effect of Language, $F(3,52) = 3.97$, $p = .01$. Mothers and children with English as a first spoken home language engaged in significantly more episodes of CJA ($M = 11.44$, $SD = 2.92$, $n = 44$), compared with mothers and children with a second or third spoken language ($M = 10.77$, $SD = 3.57$, $n = 7$), another language as a first spoken home language ($M = 8.06$, $SD = 4.31$, $n = 2$), and mothers and children with English as the second spoken home language ($M = 5.67$, $SD = 3.39$, $n = 3$). It is important to point out that there was no significant relation between language spoken at home and the frequency with which joint attention was established [i.e., *Established Joint Attention* (EJA)]. Also, HH-dyads and HD-dyads did not differ significantly on language spoken at home. English was the first language of all the hearing toddlers. Three toddlers from this group were exposed to a second home language; Italian, Polish, and French, respectively. English was the first spoken language in the homes of all but two of the deaf toddlers where Urdu was the first spoken language. Urdu was the second spoken language in the home of one of the deaf toddlers, Russian in a second, German in a third, and two languages, French and Spanish, were spoken in the home of one other deaf toddler. Four of the deaf toddlers had other second spoken languages in the home. All mothers from both groups with the exception of one of the deaf toddler's mothers were

highly proficient in spoken English and spoke to their children in English during the behaviour sample. The non-English speaking mother spoke to her deaf child in Urdu, and this interaction was translated from the video-recording by an observer, blind to the study, who spoke Urdu as her native and first language. Overall, English was the second spoken language in the home of two of the deaf toddlers. It is important to note that spoken language is not native to any deaf child and thus the variable of English as a first or second (spoken) language is unlikely to be a confound in the hearing mother-deaf child group. Also, all mothers of both groups except for one mother of a deaf toddler were proficient in English, and this mother chose to complete the behaviour sample in her native language as described above. However, to test for spoken language confounds, a series of additional analyses were completed.

First, when I excluded the three hearing mother-deaf child dyads with Urdu as either a first ($n = 2$) or second spoken language ($n = 1$), the significant correlation between language spoken at home and frequency of CJA was lost. Rather than language it could be that a cultural factor may have mediated the relationship reported above between language spoken and frequency of CJA. Interestingly, and in support of this cultural hypothesis, all three deaf toddlers with Urdu as a first or second spoken language were little girls. Also, when I re-entered the one dyad that appeared to be most integrated into Canadian culture (e.g., the mother and child both wore Westernized clothing) into the analysis, the not-significant finding remained. This points again to the possible factor of culture in hearing mother-deaf (female) child joint attention when measured in terms of

frequency with which mother-child dyads engage in sustained bouts of joint attention (i.e., episodes of CJA).

To control for the possible confound therefore of culture, the study's six primary hypotheses were tested again excluding the data from the two lesser integrated/Westernized dyads with Urdu as their first spoken home language. None of the results were affected. Indeed, this finding strengthens the study's findings in that the study's significant findings are unlikely to be attributable therefore to either spoken language or cultural factors. It is also important to mention that despite significant within-subject effects of language, there was no between-group difference on languages spoken in the home.

Maternal age was positively and significantly associated with both CJA score, $r(56) = .31, p < .05$, ($M = 18.05$, $SD = 7.97$, range = 6.43 - 35.92), and an independent observer's global rating of quality of joint attention, $r(56) = .40, p < .01$, ($M = 3.04$, $SD = 1.48$, range = 1 - 7); CJA score and quality of joint attention were better in dyads with older mothers. Recall, however, that the two groups did not differ in terms of maternal age. No demographic variables were confounded with the study's measure of child adaptive social behaviour. (See Table 7.)

An independent-sample t-test was used to compare the mean duration of behaviour samples (min, s) for the two groups. The mean duration of behaviour samples was equivalent for both groups; M(HH) = 12.17, $SD = 0.98$ and M(HD) = 12.27, $SD = 1.27$. The discrepancy between protocol time of 13 minutes and the mean duration of the behaviour samples is attributable to two issues. First, two mothers in both groups closed

up and put away the bubbles after less than three minutes. Second, mechanical toy or video equipment failure resulted in the loss of one condition from one HH-dyad and one condition from two HD-dyads.

In total, mothers and toddlers in both groups jointly engaged in 730.46 episodes of joint attention; the mean number of episodes for each dyad was 14.71 (SD = 5.38) for HH-dyads and 11.25 (SD = 4.07) for HD-dyads. This difference in number of joint attention episodes between groups was significant, $t(54) = 2.699$, $p < .01$. All 730.46 episodes of joint attention were independently rated, transcribed verbatim, and coded as described in Chapter 2.

Hypotheses Testing

QUESTION 1: Do HH- and HD-dyads differ on measures of joint attention during mother-toddler interaction?

Hypothesis 1A: *Hearing mother-hearing child dyads will be significantly more competent compared to hearing mother-deaf child dyads in initiating and establishing joint attention reflected by more initiation acts [both maternal (MIA) and child (CIA) initiation acts] that are responded to by the recipient and, consequently, therefore, more instances of established joint attention (EJA).* Overall, Hypothesis 1A was supported. Comparison of the frequency of hearing children's responses with deaf children's to their hearing mothers' bids for joint attention yielded significant differences for maternal bids that followed into children's current focus of attention (*Maternal Initiation Act II*). There was a significantly greater frequency of maternal bid-child response pairings in HH-dyads (M = 2.85, SD = 2.76) compared with HD-dyads (M = 1.45, SD = 1.45), $t(54) = 2.36$, $p <$

.05. The difference between the two groups in the frequency of maternal bid-child response pairings when the mother directed the child's attention toward a new focus or topic (*Maternal Initiation Act*) was not significant. However, when the data were pooled across both types of maternal bids for joint attention, the difference between the two groups was significant. HH-dyads displayed a greater frequency of maternal bid-child response pairings ($M = 12.79$, $SD = 5.86$) compared with HD-dyads ($M = 10.03$, $SD = 4.15$), $t(54) = 2.02$, $p < .05$. Hearing mothers responded significantly more often to hearing children's initiation acts ($M = 3.91$, $SD = 2.00$), than hearing mothers of deaf children ($M = 2.53$, $SD = 2.38$), $t(54) = 2.35$, $p < .05$. The mean frequency with which episodes of joint attention were established in HH-dyads ($M = 14.71$, $SD = 5.38$) differed significantly from that in HD-dyads ($M = 11.25$, $SD = 4.07$), $t(54) = 2.70$, $p < .01$. (See Table 8 & Figure 3.)

Hypothesis 1B: *Hearing mother-hearing child dyads will be significantly more proficient in sustaining joint attention reflected by a significantly greater frequency and rate of verbal and nonverbal exchanges inside episodes of joint attention than hearing mother-deaf child dyads.* Hypothesis 1B was supported. Hearing toddlers and their mothers exchanged significantly more communicative acts overall ($M = 280.15$, $SD = 99.79$) compared with hearing mother-deaf child dyads ($M = 184.23$, $SD = 83.20$), $t(54) = 3.89$, $p < .001$. This performance difference remained pronounced when CJA scores for sustained episodes of joint attention were compared. HH-dyads significantly outperformed HD-dyads on scores of CJA ($M = 21.60$, $SD = 7.65$ vs. $M = 14.24$, $SD = 6.52$ respectively), $t(54) = 3.86$, $p < .001$. (See Table 9 & Figures 4A & 4B.)

Hypothesis 1C: *Mothers in the hearing mother-deaf child group will terminate episodes of joint attention significantly more frequently relative to mothers in the hearing mother-hearing child group.* Hypothesis 1C was not supported. Mothers of hearing toddlers, relative to mothers of deaf toddlers, terminated episodes of joint attention significantly more often. Mothers of hearing toddlers displayed a mean frequency of 4.70 (SD = 3.70) termination acts whereas mothers of deaf toddlers displayed a mean of 1.99 (SD = 2.03) termination acts, $t(54) = 3.37, p < .001$. As well, hearing and deaf toddlers did not differ significantly from one another in their propensity to terminate episodes of joint attention with their mothers. Compared with their mothers, both groups of toddlers initiated the termination of an ongoing episode of joint attention more frequently; mean child-termination acts displayed was 12.19 (SD = 5.43) in the HH-dyads toddlers and 10.24 (SD = 9.56) in the HD-dyads toddlers, $t < 1, p > .05$. (See Table 10.)

Hypothesis 1D: *Independent trained observer global ratings of the quality of joint attention in hearing mother-hearing child dyads will be significantly greater than those for hearing mother-deaf child dyads.* Hypothesis 1D was supported. Independent observer global ratings were significantly higher for the quality of joint attention observed between hearing mothers and hearing children (M = 3.71, SD = 1.55) than between hearing mothers and deaf children (M = 2.31, SD = 0.99), $t(54) = 3.97, p < .001$. (See Table 11 & Figure 5.)

QUESTION 2: Do the two groups differ on a contemporaneous measure of adaptive social behaviour?

Hypothesis 2: *Hearing toddlers will be rated as significantly more socially and behaviourally competent by their mothers compared with deaf toddlers.* Hypothesis 2 was supported. Comparison of maternal ratings of hearing children with deaf children across thirty behavioural items within three subscales found significant differences on the *Express*, $t(54) = 3.23, p < .01$, and *Disrupt*, $t(54) = 2.11, p < .05$, subscales but not on the *Compliance*, $t < 1, p > .05$, subscale. When Express and Comply were summed to form a Prosocial behaviour score, the difference between groups was significant, with hearing children rated as significantly more prosocial by their mothers ($M = 58.63$, $SD = 5.01$) than deaf children ($M = 55.13$, $SD = 6.84$), $t(54) = 2.20, p < .05$. Overall, mothers considered their hearing children more socially competent compared to deaf children as reflected by significantly higher *ASBI total score* achieved by hearing children ($M = 76.68$, $SD = 6.09$, range = 64 - 88) compared with deaf children ($M = 71.84$, $SD = 7.43$, range = 50 - 85), $t(54) = 2.67, p < .01$. (See Table 12 & Figure 6.)

QUESTION 3: Is joint attention related to adaptive social behaviour?

Hypothesis 3: *Higher scores of quality of joint attention indexed by a consummative joint attention (CJA) score will be significantly correlated with higher maternal ratings of toddlers' adaptive social competence and behaviour.* Hypothesis 3 was supported. There was a positive and significant correlation between CJA scores and maternal ratings of toddlers' adaptive social competence and behaviour, $r(56) = .52, p < .001$, such that higher CJA scores were associated with higher maternal ratings of toddler adaptive social behaviour. (See Table 13.)

QUESTION 4: If quality of joint attention as indexed by a CJA score is important for socioemotional development in early child development, then what role do hearing mothers of deaf toddlers play in sustaining episodes of joint attention when we know that joint attention processes are disrupted between hearing mothers and deaf toddlers?

Hypothesis 4: *Inside episodes of joint attention, the behavioural and response acts of hearing mothers of deaf children will not differ significantly from that of hearing mothers of hearing children.* That is, hearing mothers of deaf children, as a group, will not show the quantitative and qualitative accommodations described in the literature and as necessary for the sustaining of joint attention with severely/profoundly deaf children. Overall, Hypothesis 4 was supported. The number of communicative exchanges within each category of JA process variables (i.e., within-subjects effects) varied, and the differences between these means was significant; $F(12,648) = 184.5, p < .001$ (degrees of freedom adjusted using Greenhouse-Geisser corrected tests). The *JA-Process x Group* interaction was significant; $F(12,648) = 9.29, p < .001$ (degrees of freedom adjusted using Greenhouse-Geisser corrected tests). Both HH-dyad and HD-dyad mothers displayed the most frequent communicative exchanges within the *simultaneous auditory visual communication* (AVC) communication mode category; means were 102.50 ($SD = 40.84$) and 66.15 ($SD = 36.26$), and this difference was significant at the multiple t-test corrected significance level, $p = .05/12$ (i.e., .004); $t(54) = 3.51, p = .001$. Excluding four categories of deaf-visual/gestural communication, within the HH-dyads, maternal behavioural and communicative acts of *negative affect* were displayed the least ($M = 2.36$, $SD = 2.94$), but this was not significantly different from the frequency with which

HD-mothers displayed behavioural and communicative acts of negative affect (M = .98, SD = 1.51). The least frequent communicative acts of HD-dyad mothers were in the categories of *sequential sign* and *simultaneous sign* where means were .30 (SD = 1.54) and .07 (SD = .38), respectively. Interestingly, however, there were no significant differences between HH-dyad and HD-dyad mothers on either of these two variables.

With mother as the unit of analysis, a repeated-measures analysis of between-subjects effects found a significant main effect for Group; $F(1, 54) = 4.49$, $p < .05$. The mean number of maternal communicative exchanges overall across all twelve maternal response, or, *process*, variables assessed, was higher in the HH-dyads (M = 22.70, SE = 1.51) than in the HD-dyads (M = 18.11, SE = 1.56). Since this main effect of group was significant, independent-samples t-tests using a corrected significance level of p = .05/12 (i.e., .004) for each t-test conducted, were completed. Significant between-group differences were noted in only 3 of the 12 categories of maternal process variables assessed: (1) *simultaneous auditory-visual communication* as reported above; (2) *sequential total communication*, $t(54) = -3.24$, p = .004; and (3) *positive affect*, $t(54) = 3.27$, p = .002. Compared with HD-mothers, HH-mothers spoke more frequently to their toddlers using the *simultaneous auditory-visual* mode of communication, HH-dyads mean of 102.50 (SD = 40.84) versus HD-dyads mean of 66.15 (SD = 36.26). (See Figure 7). The frequency with which mothers directed speech toward hearing and deaf children when children were looking at the mother (i.e., *sequential auditory visual* mode) was not significantly different between-group. (See Figure 8.) The frequency with which hearing mothers directed nonverbal communication toward deaf children was greater than, but not

significantly different from, that which was directed toward hearing children. (See Figure 9.) In contrast, and not surprisingly, HD-mothers communicated significantly more frequently than HH-mothers with their toddlers using the *sequential total communication* mode of communication; HD-mothers mean = 1.60 (SD = 2.67). HH-mothers never used the *sequential total communication* mode of communication. However, HH-mothers did use a *simultaneous total communication* mode of communication when interacting with their toddlers (M = .21, SD =.94), although this was not significantly different from the HD-mothers (M = 1.30, SD = 2.11). HH-mothers (M = 32.43, SD = 23.95) expressed *positive affect* toward their toddlers significantly more frequently compared to HD-mothers (M = 16.01, SD = 10.62). (See Figure 10.) While HD-mothers, compared with HH-mothers, displayed greater frequencies of *sequential sign, and simultaneous sign,* these differences were not significant. As reported earlier, the frequency with which mothers from both groups displayed *negative affect* did not differ significantly. There was also no significant difference found in the ratio of positive affect to the total frequency of affective acts (i.e., positive + negative) displayed by mothers in either group. None of the three *maternal interaction style* variables showed significant differences between the two groups. (See Table 14.)

Additional post-hoc correlation analyses of the data collapsed across both groups revealed significant associations between *CJAscore* and 7 of the 12 maternal *process variables*: *seqAVC* [$r(56) = .57, p < .001$], *NVC* [$r(56) = .36, p < .01$], *Affect-P*[$r(56) = .65, p < .001$], *LET ME* [$r(56) = .73, p < .001$], *LET ME-C* [$r(56) = .47, p < .001$], and *DIRECT* [$r(56) = .59, p < .001$]. Correlations were all such that increased levels of

communicative acts within each of these categories were significantly associated with higher scores of CJA. While the same significant correlations remained when the HH- and HD-dyadss were separately analyzed, relations were more robust in the HD-dyads for all but *simultaneous auditory-visual* mode of communication; the correlation ($n = 29$) in the HH-dyads was .89, $p < .001$, stronger than that for the HD-dyads where $r(27) = .87$, $p < .001$. Interestingly, the largest dissociation in magnitude of correlation was in the communication mode category *nonverbal communication*: $r(29) = .39$, $p < .001$ in the HH-dyads versus $r(27) = .88$, $p < .001$ in the HD-dyads. Meaningful dissociations for *sequential auditory-visual* communication mode [HH: $r(29) = .61$, $p < .001$ vs HD: $r(27) = .75$, $p < .001$] and maternal displays of *positive affect* [HH: $r(29) = .55$, $p < .001$ vs HD: $r(27) = .69$, $p < .001$] were also found between the two groups.

Post-hoc Exploratory Analyses

Relations between Coded Observational Behaviour Measures of Joint Attention and Maternal Report of Child Social Competence

A series of simple Pearson correlations was used to explore the relations among and between the following: (a) more traditional operational definitions of joint attention, (b) the *quality* of joint attention, (c) the present study's operational definitions of joint attention, and (d) an established measure of child social competence and behaviour (i.e., ASBI total score). As described in Chapter 1, pages 39 to 50, the following variables were considered as representative of more traditional operational definitions of joint attention: *Attention-directing Maternal Initiation Acts* (MIA), *Follow-in Maternal Initiation Acts* (MIA II), *Child Initiation Acts* (CIA), and a global rating of *Quality of*

Joint Attention. The present study's operational definitions of two subtypes of joint attention (see Chapter 1, pp. 50 -51) were represented by the variables *Established Joint Attention* (EJA) and *Consummative Joint Attention* (CJA), and a score of *Consummative Joint Attention* (CJA score).

When the sample was analyzed as a whole ($N = 56$), only frequency of CJA and CJA score were significantly and positively correlated with the measure of child social competence and behaviour; $r(56) = 0.28$, $p = .04$, and $r(56) = 0.52$, $p < .001$, respectively. That is, greater frequency of CJA episodes and higher CJA score were associated with more optimal maternal ratings of child social competence and behaviour. However, none of the joint attention variables assessed were correlated with hearing-child social competence and behaviour. In contrast, MIA and CJA score were significantly and positively related to deaf children's social competence and behaviour ratings. (See Table 15A.)

Different patterns of relations among joint attention variables were found in the HH- and HD-dyads. For example, no significant associations were found between child initiation acts (CIA) and the frequencies of either established joint attention or consummative joint attention, or CJA score in the HH-dyads. In contrast, while increased frequency of CIA in the HD-dyads was also unrelated to frequency of established joint attention, it was significantly and positively related to frequency of consummative joint attention, $r(27) = 0.42$, $p = .03$. On the other hand, and different from CIA, increased frequencies of MIA significantly predicted increased frequencies of established joint attention in the full sample [$r(56) = 0.68$, $p < .001$], the HH-dyads [$r(29) = 0.57$, $p =$

.001], and the HD-dyads [$r(27) = 0.83, p < .001$]. Increased frequencies of MIA also significantly predicted increased frequencies of consummative joint attention in the full sample [$r(56) = 0.68, p < .001$], the HH-dyads [$r(29) = 0.67, p < .001$], and the HD-dyads [$r(27) = 0.77, p < .001$]. Only when the data were pooled across both groups were increased frequencies of MIA positively and significantly associated with increased CJA score, $r(56) = 0.27, p = .05$. MIA II was reliably less efficient in eliciting and establishing joint attention: Increased frequencies of MIA II significantly predicted increased frequencies of established joint attention only when the data were pooled for the full sample, $r(56) = 0.27, p = .04$. No other significant correlations were found between MIA II and other joint attention variables assessed. *Quality of Joint Attention* explained 44% of the variance in CJA Score within the full sample, $r(56) = 0.66, p < .001$; 26% of the variance in CJA score within the HH-dyads, $r(29) = 0.51, p = .01$; and 46% of the variance in CJA score within the HD-dyads, $r(27) = 0.68, p < .001$. (See Tables 15B & 15C.)

Finally, I was interested to know whether the duration of joint attention, defined in terms of *span* of joint attention and not time (s, min), was a function of who initiated the episode of joint attention. That is, I was interested to know whether the number of exchanges observed between the mother and child *inside* an episode of joint attention, was dependent on who initiated the episode of joint attention; the mother, or the child. To explore this question, data were grouped by the context within which joint attention was displayed: (1) naturalistic Free Play and (2) contrived probe tasks. Recall, the 'topics' of joint attention during the Free Play Task were spontaneously elicited whereas those

within the probe context were contrived topics of joint attention. The data for the contrived probe-condition comprised the pooled data of the Bubble, Laser Pointer, Bumble Ball, and Book Sharing tasks. There were no within-group differences for span of joint attention in either context whether the episodes of joint attention were established as a result of maternal or child initiation acts. Furthermore, there were no within-group differences as a function of whether the mother initiated joint attention through directing or following into the child's focus of attention. A series of eight unpaired t-tests were used to determine if there were between-group differences. Significance was corrected for multiple t-tests such that $p = .05/8$ (i.e., $p = .006$). No significant between-group differences in performance as a function of (1) *Maternal Initiation Acts* (MIA Attention-Directing) compared with *Maternal Initiation Acts II* (MIA Follow-In), or (2) the sum of MIA and MIA II compared with *Child Initiation Acts* (CIA) within the context of Free Play were found. That is, the number of exchanges displayed by mothers and children *inside* episodes of joint attention during Free Play was not dependent on who initiated the episode of joint attention in either the HH-dyads or the HD-dyads, and no significant differences were found between the HH- and HD-dyads. In contrast, there was a significant main effect of group on the number of exchanges displayed by mothers and children *inside* episodes of joint attention during the probe condition when mothers directed the child's attention to the contrived object/event. Inside episodes of joint attention, significantly more exchanges were displayed by the HH-dyads ($M = 30.94$, SD = 32.31) compared with the HD-dyads ($M = 20.79$, SD = 21.64) when mothers *directed* the child's attention to the contrived focus of attention, $t(206) = 2.67$, $p < .01$.There were

no significant between-group differences in span of joint attention when mothers followed into the child's attention (i.e., the contrived object/event), or when the child initiated joint attention by directing the mother's attention to the contrived object/event. (See Table 16.)

Chapter 4

DISCUSSION

The question guiding the present study was why healthy full-term children born with bilateral permanent hearing loss, but no other known problems, to hearing mothers are at risk for problems in socioemotional development. Two primary objectives guided this research. One was to move research in deaf children's socioemotional development beyond the "language argument" by examining ontologically earlier processes of *prelingual* socioemotional development. The second objective was to extend theoretical understanding of how processes thought to underlie typical development are used to explain atypical development, and similarly, how the study of atypical development informs and advances understanding of typical development.

Conceptually and methodologically, the present study extended the existing developmental and deafness literatures. The construct of joint attention was refined and a restated operational definition offered. Whereas most work in mother-child communicative interaction is child-centered, the mother-child dyad was the unit of analysis in the present study. In keeping with Tomasello and Todd's (1983) dictum that joint attention is a social interact open to maternal interactional style, the role of the mother was hypothesized to be more influential in the negotiation and maintenance of joint attention episodes. A hybrid qualitative and quantitative approach (Graesser, Gernsbacher, & Goldman, 2003, p. 13 – 14) was adopted for the reduction and analyses of the data.

Summary of the Findings

Hypotheses Testing and Exploratory Analyses

There were no significant differences between the groups on either child- or maternal demographic variables. Overall, the two groups were homogenous across all demographic variables assessed and differed only in terms of mother-child hearing-status match. This finding of demographic homogeneity was especially meaningful because we know that factors such as maternal education, the number of other children the mother has to care for, and the mother's marital status, are involved in developmental outcomes of children with disabilities. However, cultural differences were not controlled for and are thus a possible confound. Cultural differences do exist in the definition and view of child outcomes and parenting practice (McCollum & Chen, 2003). Cultural differences also exist in the interpretation, or 'meaning,' of deafness in children (personal communication, Marietta Colven, 2003; personal communication, Dr. Saroj Saigal, 2004). However, recall that when the data from the two HD-dyads who were the least acculturated to North American lifestyle and values were excluded from hypotheses testing, none of the results were affected. This was interpreted as sufficient evidence to suggest that findings were not confounded with cultural differences within the sample.

The present study addressed four primary questions: (1) Do deaf children and hearing mothers differ from hearing children and hearing mothers on measures of joint attention? (2) Do the two groups differ on a contemporaneous measure of adaptive social behaviour? (3) Are measures of joint attention contemporaneously related to adaptive social behaviour? (4) If sustained joint attention is important for socioemotional development in early child development, then what role do hearing mothers of deaf

children play in sustaining episodes of joint attention when we know that joint attention processes are disrupted between hearing mothers and deaf children?

The present study's first question asked whether deaf children and hearing mothers differed from hearing children and hearing mothers on measures of joint attention. HH- and HD-dyads differed significantly on most, but not all, measures of joint attention process and outcome. As predicted, compared with hearing mothers and hearing children, joint attention was established significantly less frequently between hearing mothers and deaf children (*Hypothesis 1A*). That is, hearing mother-hearing child dyads were more competent than hearing mother-deaf child dyads in negotiating and establishing joint attention.

Three possible routes through which the initiation of joint attention occurs are: (a) maternal initiation acts that direct the child's attention to a focus, (b) maternal initiation acts that follow into the child's existing focus of attention, and (c) child initiation acts that function to follow into the mother's focus of attention, or that direct or summon the mother's attention to a focus. When mothers attempted to initiate joint attention by directing children's attention to a focus, hearing mothers of deaf children were as successful as hearing mothers in eliciting a response from their children (*Hypothesis 1A*). In contrast, hearing mothers of hearing children were significantly more successful in their attempts to establish joint attention through following into what the child was focused on or busy with than were hearing mothers of deaf children (*Hypothesis 1A*). This latter finding is consistent with findings reported in the literature describing hearing mothers of deaf children as less responsive to what the child is focused on compared with

hearing mothers of hearing children (Lederberg & Mobley, 1990; Spencer et al., 1992; Webster, 1986, p. 80).

Jung and Short (2002) suggested the reason for hearing mothers' being less inclined to follow into the deaf child's focus of attention was a product of their "struggle" to actively engage the deaf child. But, a little more that actively engaging the child is required to follow into the deaf child's focus of attention. It was evident that hearing mothers in the sample struggled to **disengage** their deaf children's attention from a focus for the purpose of **re-engaging** the child's attention back to the focus so that they could join in and share with what the child was engaged. To be pointed out, however, is that the present study only recorded the frequency of *successful* initiation acts. Initiation acts that were either not responded to by the child or that were responded to by the child but not followed by a contingent maternal response, were not recorded. In other words, only maternal initiation acts resulting in established joint attention were recorded. What this means is that no comment can be made with respect to how "hard" mothers in either group "worked" to elicit children's attention for the purpose of joint attention, or how many maternal initiation bids were not received by children. The finding that mothers of deaf children were less efficient in engaging their children's attention by following into the child's attention may be for the simple reason that hearing mothers of deaf children made fewer attempts to follow into their children's focus of attention. Alternatively, deaf children may have "missed" their mothers' initiations. The second explanation is consistent with (1) the study's finding that both groups of mothers displayed the greatest, although significantly different, frequency of communicatives within the simultaneous

auditory visual category of communication (i.e., directing speech to the child without having the child's visual attention), and (2) Tomasello's (1988) description of how (hearing) mothers follow into their (hearing) children's line of visual attention by beginning to talk about the object or activity in which the child is engaged. When children were not actively (i.e., visually) engaged with an object of interest, scanning behaviour, including looking-to-mother, was observed in both groups and might therefore account for why mothers of deaf children were similarly successful to mothers of hearing children in directing children's attention to a new focus. Deaf children may have "seen" that the mother was talking and then followed the mothers' gaze to the object or active event. On the other hand, both groups of mothers were as unlikely to coordinate the delivery of their spoken communicatives (seqAVC) with their children's face-to-face visual attention or mutual gaze. Taken together, it seems that hearing mothers of deaf children *do* "struggle" to follow into their deaf children's focus of attention and that their apparent success in directing deaf children's attention may be one of hit-and-miss opportunism when the deaf child is not visually committed to an existing focus of attention. But, to be emphasized, is that the vast majority of joint attention episodes established for both groups had attention-directing, not attention-follow in, maternal initiation acts as their antecedents. However, the former outweighed the latter by 3.48 times in the HH-dyads compared to 5.92 times in the HD-dyads. While this again speaks to hearing mother's difficulty in following into the focus of deaf children's attention, it is evident that, at least in this sample of 18- to 36-month old children, maternal initiations

that directed children's attention were more important for joint attention to ensue than were maternal initiations that followed into with what the children were engaged.

With respect to the child attempting to engage the mother for the purpose of joint attention, the frequency with which hearing and deaf children's initiation acts were responded to by their mothers, was significantly different (*Hypothesis 1A*). Significantly more episodes of joint attention were established between hearing mothers and hearing children as a result of child initiation acts than between hearing mothers and deaf children. Again, the interpretation of this finding is limited in that the data are not representative of the total number of child initiation acts displayed relative to the number of "hits" or successful attempts to elicit the mother's attention for the purpose of joint attention during the course of the mother-child interaction observation period. Accordingly, this finding cannot be aligned with Spencer et al. (1992) suggestion that less frequent instances of joint attention between hearing mothers and deaf children is the result of "limited" maternal response to child initiations. The present study's focus on successful antecedent bids for joint attention makes it impossible to infer the overall efficiency of child initiation acts in mother-child interactions. But, this is not the only reason that is impossible to relate the findings to Spencer's group's interpretation of their data. First, it is not clear what Spencer and her colleagues mean by "limited maternal response to child initiations?" Was maternal response limited in terms of frequency? Or, was maternal response limited in terms of strategies used by mothers to respond to child initiations? Or, both? From the data provided in the report, the third option seems to be the case. Nonetheless, the more confusing issue in the interpretation of their data, and

which renders the interpretation nonsensical, is an operational one. Clearly, when mothers' responses occur during infant-object gaze (i.e., "*during* the infant' object-gazes," p. 72, emphasis in the original), it is the mother, not the child, who is displaying an initiation act, and therefore, it is not the case that the mother is responding to a child initiation act. In contrast, when mothers' responses occur after infant-object gaze (i.e., "*after* the infant terminated the object-gaze and looked back at mother," p. 72, emphasis in the original), it is now the child who is directing an initiation act toward the mother. The only thing that can be said with certainty from their data is that (1) hearing mothers of deaf children negotiated joint attention in the same way that hearing mothers negotiated joint attention with their hearing children, and (2) both groups of hearing mothers negotiated joint attention with their children differently from how deaf mothers negotiated joint attention with their deaf children. Hearing mothers were significantly more likely to follow into their children's object-gaze, and deaf mothers were significantly more likely to wait for their deaf children to actively initiate joint attention by shifting their gaze from the object to the mother. This delineation is important as it reflects the entraining of not just the deaf child's visual attention to the mother (Harris, 2001), but suggests that entraining of the requirement for deaf children to actively seek joint attention, is important too. In a sense, hearing children "have it made" in that joint attention comes to the child, if you will. Therefore, the relatively less frequent child initiation-maternal response pairings compared to maternal initiation-child response pairings produced by hearing mothers and hearing children in the present study, possibly reflects the more passive, intuitive, and incidental (taken for granted) nature of joint

attention recruitment and participation on the part of hearing children. This is in contrast to the more active, entrained (but not learned), and deliberate nature of joint attention recruitment and participation on the part of deaf children, irrespective of the mother's hearing status.

Whereas the experience of joint attention, for most hearing children of hearing mothers, comes as a "gift," the experience of joint attention for deaf children, of both hearing and deaf mothers, represents an effortful achievement. The present study's finding of equivalence between groups in terms of the frequency with which child initiation acts were responded to by mothers, is consistent with Spencer and her colleagues (1992), and Smith-Gray and Koester's (1995), findings that, despite qualitative differences in deaf infants' communicative signals, hearing and deaf infants provided equal opportunities for mothers to be responsive. Overall then, the findings point to the significantly greater likelihood for joint attention to be established between hearing mothers and their hearing and deaf children when mothers actively elicit (or "get" or "pull") and direct children's attention to a shared focus, rather than when mothers follow into children's visual attention, or when children attempt to initiate joint attention with mothers. Finally, hearing children enjoyed significantly more opportunities than deaf children to engage in joint attention with their mothers, and this was consistent with findings for children of 18- (Spencer, 2000) and 22 months-of-age [(median age); Lederberg & Mobley, 1990], and with Koester's (1994) review of the literature. It also confirms Wood (1982) and Webster's (1986, p. 80) earlier observations that deafness

interferes with processes of attention sharing between hearing mothers and young deaf children.

In absolute terms, hearing children, on average, were exposed to, and engaged in, 15 episodes of joint attention with their mothers during the course of the behavioural observation period. In contrast, deaf children, on average, were exposed to, and engaged in, 11 episodes of joint attention with their mothers during the course of the behavioural observation period. While, at face value, a difference of 4 episodes of joint attention does not seem large, the reader is reminded that the duration of the behavioural episode was (only) 13 minutes. That is, in the space of 13 minutes, and in terms of joint attention, deaf children had almost one and one half times less of one, or more, of the following: (1) access to the "minds" and affective presence of their mothers, (2) maternal "scaffolding" opportunities, (3) interpersonal and/or social interaction opportunities. More so, it must be remembered that the context for the observation of joint attention between mothers and children was that of close-proximity mother-child free play. Free play with access to novel, so-called "joint attention eliciting" toys, is a well-established and potent context for joint attention. Of greater relevance, however, is that mothers and children were seated within an arm's length of each other, and therefore visual cues were salient and accessible to deaf children. In the day-to-day context of home life, hearing children can be "called" into joint attention whether they are within the mother's visual range or not. It is noted, therefore, that the *true* difference in the frequency with which hearing mothers and deaf children engage in joint attention in daily life is likely to be dramatically less than the "afforded" performance of mothers and deaf children in the collection of the data

for this study (personal communication, Sharon Ainsworth, Educational Coordinator, Sir James Whitney School for the Deaf, Belleville, Ontario, 2005). If this is the case, then the study's finding of a significant difference in afforded (artificial?) frequency of joint attention between mothers and hearing and deaf children is a stark one.

Once joint attention was established, the question of what mothers and children "did" with the developmental opportunity theoretically proffered by joint attention, was examined. The assumption was that if joint attention serves as a developmental opportunity, then more than just establishing joint attention is necessary. That is, once joint attention is established, it needs to be sustained. One way to measure the duration or maintenance of an episode of joint attention is of course to time the duration of the episode from onset to offset. However, this method would result in data of little meaning in this sample. The same number of communicative and behavioural acts exchanged between mothers and children inside an episode of joint attention will, by definition, take longer in hearing mother-deaf child dyads. Therefore, longer duration of joint attention (measured in seconds) does not translate into the quality of joint attention defined in terms of density or "richness" of content. Accordingly, two measures were created to assess the maintenance of an episode of joint attention; Joint Attention span (JAspan), and Consummative Joint Attention Score (CJA score). To review briefly from Chapter 2, JAspan reflects the frequency of mother-child verbal and nonverbal exchanges inside episodes of joint attention summed across all episodes of joint attention observed. CJA score, on the other hand, reflects the rate (or density) of mother-child verbal and nonverbal exchanges inside episodes of joint attention summed across all episodes of

joint attention observed. As predicted, inside joint attention, hearing children and their mothers exchanged significantly more communicative acts at a greater rate compared with deaf children and their hearing mothers (*Hypothesis 1B*). An earlier study by Meadow, Greenberg, Erting, and Carmichael (1981) reported a similar finding between preschool-age deaf children and their hearing mothers compared to same-age hearing children and their hearing mothers: hearing mother-deaf child interactions were significantly shorter than hearing mother-hearing child interactions. Admittedly, mother-child interactions are not equivalent to mother-child joint attention episodes. However, the message is the same: interactions between hearing mothers and deaf children are more curtailed compared to interactions between hearing mothers and hearing children.

Based on anecdotal reports and the extant literature describing hearing mothers' experience of interaction with deaf children as frustrating and less pleasurable (e.g., Linder, 1993, p. 315), it was predicted that hearing mothers of deaf children would actively terminate joint attention significantly more often relative to hearing mothers of hearing children (*Hypothesis 1C*). This prediction was not supported by the data. Rather, mothers of hearing children, relative to mothers of deaf children, terminated episodes of joint attention significantly more often. It might be that hearing mothers are trying hard to "hang onto" the deaf child's attention once the child is engaged. This is in contrast to the tendency for hearing mothers to respond to their hearing child's shift in visual attention by talking about the child's new focus of interest (Jamieson, 1995b). That is, the mother lets the current episode of joint attention go at the same time that she follows into the hearing child's new focus of attention, attempting thereby, to initiate a new episode of

joint attention. The significant finding of less frequent termination acts displayed by hearing mothers of deaf children is in keeping with Koester's (1994) suggestion, based on the work of Spencer et al. (1992), that hearing mothers compensate by exerting increased effort to keep their deaf children's visual attention once it has been gained. Thus, if one index of maternal compensation is less frequent termination of joint attention, it is likely that hearing mothers are overriding the deaf child's active attempts to terminate or shift attention from the current focus of joint attention to a new focus. Of course, it might also be that hearing mothers are missing the deaf child's signals for disengagement. In terms of its possible implications, there is another way to interpret this finding. If hearing mothers are either missing or overriding their deaf children's indirect or explicit termination acts, it is reasonable to think that the child's involvement will become more passive at this point. As a consequence, the deaf child is likely to become "bored" (personal communication, Darlene Horsley-Hurst, E. C. Drury School for the Deaf, Milton, Ontario, 2005). In this way too, a learning history is set up, the result of which might be diminished episodes of joint attention - in terms of frequency and quality - between hearing mothers and deaf children. Finally, similar to the display of child initiation-maternal response pairings, there was no significant difference between hearing and deaf children in terms of how often they terminated episodes of joint attention and, both groups of children were more likely to terminate joint attention than were their mothers (*Hypothesis 1C*).

It is very likely that deaf children in the sample did experience joint attention with their hearing mothers as boring. Independent observer global ratings of the *quality* of

joint attention (i.e., mutuality, coordination, shared meaning, and shared pleasure/enjoyment) observed between hearing mothers and deaf children were significantly lower than those between hearing mothers and hearing children (*Hypothesis 1D*). Also, mothers of deaf children, compared to hearing children, directed significantly fewer expressions of positive affect toward their children inside joint attention episodes. This finding is similar to those that describe the quality of interactions between hearing mothers and deaf children, compared to those of other mothers and children, as less positive and low in energy (Meadow-Orlans, 1997; Meadow-Orlans & Spencer, 1996). Nonetheless, in the present study, an independent trained observer's ratings of *shared positive affect* between mothers and children inside joint attention, showed no significant difference between the two groups. This corroborates findings by Waxman, Spencer, and Poisson (1996), who also did not replicate findings of reduced *shared positive affect* between hearing mothers and 24- to 28-month-old deaf children when the dyad was the unit of analysis. Whereas the present study used a global rating to assess the amount of shared positive affect, Waxman's group used an interval recording method by simply noting the occurrence or nonoccurrence of overt pleasure displayed by either the child or mother while interacting with or observing one another in each 15 second time interval of a 30 minute free play interaction with toys. Nonetheless, in the present study, while there was no significant difference on a global rating of shared affect, frequency recording of hearing mother's expressions of positive affect directed to deaf children, relative to hearing children, was significantly different. It appears that deaf children's responses to the significantly fewer expressions of maternal positive affect may have been heightened

such that these were turned into opportunities, by the child, for the sharing of positive affect with the mother. Affiliative themes typically characterize joint attention interactions (Green, Gustafson, & West, 1980) and social competence development is associated with interpersonal social interactions that are high in quality and maternal affective responsiveness (Becker, 1987, p. 65; Grolnick, 1990; Marschark, 1997, p. 82; Mundy & Willoughby, 1996).

Question 2 asked whether the two groups differed on a contemporaneous measure of adaptive social behaviour and, Question 3, asked whether the present study's measures of joint attention were contemporaneously related to adaptive social behaviour. Deaf children were indeed rated as significantly less socially and behaviourally competent by their mothers than were hearing children (*Hypothesis 2*). This is in line with findings reported in the literature (e.g., Hastings, 1979; Jung & Short, 2002; Koester & Meadow-Orlans, 1999; Meadow-Orlans, p. 48, p. 96; Smith-Gray & Koester, 1995; Thompson et al., 2001). Lower CJA scores were significantly associated with poorer scores of child social competence and behaviour on the ASBI scale (*Hypothesis 3*). Additional within-group analyses revealed an interesting and important difference. Despite the fact that a traditional subjective measure of the quality of mother-child interaction inside episodes of joint attention (Hypothesis 1D) and two non-traditional measures of the quality of sustained joint attention (Hypothesis 1B) were significantly higher in hearing mothers and hearing children compared to hearing mothers and deaf children, neither the traditional nor nontraditional measures were significantly associated with hearing children's scores on the ASBI. In fact, not one of the seven joint attention process-variables assessed were

correlated with social competence and behaviour in hearing children. In contrast, two of these seven joint attention variables were positively correlated with social competence and behaviour in deaf children: (1) attention-directing maternal initiation acts explained 18% of the variance, and (2) the rate of verbal and nonverbal communicative exchanges inside episodes of joint attention, explained 40% of the variance in children's ASBI scores. Also to be noted is that the frequency of CJA was not significantly associated with child social competence and behaviour, suggesting therefore, that it is the quality, and not the quantity, of episodes of consummative joint attention between the hearing mother and deaf child that is important for early socioemotional development in deaf children with hearing mothers.

Question 4 asked what role, if sustained joint attention is related to early socioemotional development, hearing mothers of deaf children play in sustaining episodes of joint attention given that joint attention processes are disrupted between hearing mothers and deaf children. It is clear now that this is an important and meaningful question. The assumption was that hearing mothers of deaf children would negotiate joint attention with their deaf children in the same way that hearing mothers negotiated joint attention with their hearing children. That is, hearing mothers of deaf children, as a group, would not show the quantitative and qualitative accommodations described in the literature as necessary for engaging severely/profoundly deaf children. As reported earlier, Hypothesis 4 was supported.

Inside joint attention, hearing mothers in both groups communicated with their children most often by talking to the child at the same time that the child was visually

focused on the toy with which she was playing. That is, the majority of mothers' used a simultaneous auditory visual mode of communication inside joint attention, although mothers spoke significantly less frequently to their deaf children compared to hearing children. This finding confirms empirical and clinical/early intervention (Spencer, 1993; Watkins, 2004, p. 335) and anecdotal reports that hearing mothers vocalize and talk less to their deaf children compared with hearing children. The mother of one deaf child in the present study self-reported that she and her husband "stopped talking to (child's name) when we found out he was deaf." A second child's mother was not sure why she had to "talk" to her child because "he is deaf, you know." Watkins (2004, p. 335) reports a similar comment from a hearing mother: "I would start singing to him at night, and I would catch myself thinking, "Why am I singing to this baby? He can't hear me." Inside joint attention, the frequency with which mothers coordinated their spoken communicatives with children's visual attention directed to them, was low in both groups. But, the finding that hearing mothers of deaf children communicated significantly more frequently with their toddlers using the *sequential total communication* mode of communication than did hearing mothers of hearing children is encouraging. That is, hearing mothers of deaf children displayed significantly more communicatives where exaggerated gesture and sign (ASL or homesign) accompanied their spoken communicatives, and where both components were visually accessible to the child. In this way, both the nonverbal and spoken components of the mother's communicative are seen by the child. While hearing mothers of deaf children, compared with hearing mothers of hearing children, displayed greater frequencies of *nonverbal communication,*

the difference was not significant. This finding of increased nonverbal communication by hearing mothers of deaf children, while not significant, is consistent with findings of Spencer (1993) and Lederberg and Everhart (1998). Hearing mothers of deaf children also displayed a greater number of signed communicatives than mothers of hearing children, but the differences were not significant. However, despite the fact that 48% of the mothers of deaf children were incorporating gesture and sign on a day-to-day basis in communication with their children (i.e., ASL, TC, or some combination of Oral, ASL, TC, and gesture), hearing mothers typically do not produce significant amounts of signing during behaviour samples (Spencer, 1993), and this might explain the low incidence of sign and exaggerated gesture (i.e., ASL, homesign, and/or TC) in the present study. Overall, however, it appears that hearing mothers of deaf children are adapting their communicative strategies in more formal than natural ways. That is, mothers may be relying more on being directed or instructed in how to communicate with and engage their deaf children than on maximizing, or "amplifying," their natural nonverbal communication abilities. That sequential forms of deaf-visual/sign/gestural modalities were not significantly related to the quality of consummative joint attention (CJA score) was an unexpected finding, but might be explained by the limited data with respect to the amount of signing displayed by mothers during the data observation period. Alternatively, the small amounts of TC and ASL/homesign communicatives displayed by the mothers of the sample's deaf children might rather reflect maternal skill deficits (see Spencer, 2000). Recall that the dissociation in the magnitude of correlation between maternal variables and the quality of consummative joint attention (CJA score) was the

greatest for how often mothers displayed nonverbal communicative behaviour. While maternal nonverbal communicatives were positively and significantly associated with the quality of consummative joint attention in the full sample and within each of the two groups, the frequency of maternal nonverbal displays accounted for an impressive 77% of the difference in the quality of consummative joint attention within the HD-dyads in comparison to (only) 15% within the HH-dyads. That the frequency of nonverbal displays accounted for more than two thirds of the difference in the quality of consummative joint attention within the HD-dyads is likely explained by the post-hoc computation of the percentage of all maternal communicatives directed toward the deaf child by the mother that were not accessible to the deaf child (i.e., not within the child's line of sight or visual attention). Including nonverbal communicative acts, 48% of all hearing mothers' responses inside joint attention were not accessible to deaf children. More meaningful, however, is that when nonverbal communicative acts were excluded from the computation, a full 84% of hearing mothers' responses inside joint attention was not accessible to deaf children. That is, in the absence of nonverbal communication, deaf children may miss up to 84% of their hearing mothers' communicatives inside episodes of joint attention. It is not unreasonable to think that the percentage of missed communication would be greater outside of focused joint attention episodes, that is, in the context of the incidental, spontaneous, or casual episodes of interaction, communication, and co-activity of general day-to-day mother-child relationship. Maternal nonverbal communication is thus clearly a critical component of joint attention between hearing mothers and deaf children. "Amplifying" and stepping up the frequency of nonverbal

communicatives may naturally, albeit indirectly, not only increase the proportion of maternal communicatives accessible to the deaf child , but will "pull" and "hold" the deaf child's attention making sustained episodes of joint attention more likely. From Chapter 2, the reader is reminded that the present study coded maternal utterances as *Total Communication* when the "sign" used by the mother was home-sign or formal ASL or when an everyday/familiar gesture [e.g., the mother beckons the child by crooking her finger; or, the mother turns her palms to face up with shoulder shrugging to communicate "what?" or the mother turns her palms up and visually scans to communicate "where?" (Prendergast & McCollum, 1996)] that the mother used was more exaggerated than we would expect in hearing speaking/listening interactions. In other words, all other instances of non-exaggerated visible gestures displayed by the mother, and which we would expect to observe in typical HH-interactions, were coded as nonverbal communication in both HH- and HD-dyads. The purpose here was to establish an equivalent baseline of nonverbal communication by mothers of both groups such that displays of exaggerated gesture and/or home- or formal signing would not swamp any difference between hearing mothers of deaf children in comparison to hearing mothers of hearing children. In this way, the presence or absence of true differences in the use of nonverbal communication between the two group's mothers would be revealed.

As described earlier, hearing mothers directed significantly more positive expressions and acts toward hearing children than toward deaf children. But, hearing mothers of deaf children were no more negative in affect with their children than were hearing mothers with hearing children; both groups of mothers displayed low frequencies

of negative emotion directed toward their children. Maternal displays of positive affect toward children were positively and significantly related to the quality of consummative joint attention episodes (CJA score) for the sample in general as well as for each of the groups separately, and speaks to Harry Harlow's "affective connection" hypothesis. Roger and Lewis (1989) offer a behavioural explanation for the mediating effect of positive affect in mother-child interactions. Specifically, Rogers and Lewis characterize maternal positive affect as a reinforcing agent. This is similar to Dube et al.'s (2004) delineation of joint attention as a behavioural chain with maternal acts functioning as positive reinforcement of a prior child communicative, and as a discriminatory stimulus, for the next child communicative. The child's attention is, thus, retained and positive affect encourages the child to continue to interact with the mother. In this way, sustained episodes of joint attention interaction are "trained up" or shaped.

The findings of no significant differences between the two groups of mothers in terms of maternal interactive style is interesting in that it diverges from findings generally reported in the literature. Hearing mothers of deaf children are typically reported, if not characterized, as more controlling and directive than hearing mothers of hearing children (Collins, 1969; Meadow, 1980, p. 80; Sacks, 2000, p. 53; Watkins, 2004, p. 740; Webster, 1986, p. 87). Of course it is difficult to draw direct comparisons between the present study's findings and those of the extant literature; the present study was constrained to the examination of joint attention during natural mother-child interaction. The extant literature is more diffuse and vague in it's communication of what, and to which, aspects of mother-child interaction the findings apply. It is very reasonable to think that hearing

mothers of deaf children are, as the literature suggests, more directive than hearing mothers of hearing children. It is more difficult and effortful for hearing mothers to elicit attention from deaf children, and this is especially the case the more mobile the child becomes (Harris, 2001). But, once joint attention has been established between hearing mothers and deaf children, hearing mothers may feel more secure – or, paradoxically, in control – inside joint attention that they do outside joint attention, and consequently, may relax their interactive style and allow the child greater autonomy inside joint attention compared with interactions outside joint attention.

In summary, patterns of joint attention interaction behaviour between hearing mothers and 18- to 36-month old hearing and deaf children have been described. Patterns of mother-child interaction are well entrenched by preschool-age (Jamieson, 1995b) in terms of stable and characteristic ways of relating (Weinberg & Tronick, 1998b). Relations between joint attention and child social competence and behaviour were noted. Specifically, joint attention is more likely to be instrumental in the socioemotional development of deaf children with hearing mothers than it is in the socioemotional development of hearing children. This finding can be explained by deferring to a social learning theory perspective.

The social learning perspective is a theoretical approach to the development of children that emphasizes the importance of learning through observation and imitation of behaviours modeled by others. Self-regulation and social skills, for example, are viewed as learned behaviours (Hughes, 1996, p. 62). Key is observational learning. That is, learning occurs through listening to, noticing, and watching, other people's behaviour.

However, the social environment and tasks for hearing children are taken for granted by the social learning perspective. Because deaf children do not have equivalent access to the social environment, the social learning theory perspective is hard-pressed to fully explain social development in deaf children.

Hearing children are exposed to formal and incidental input opportunities (personal communication, Marietta Colven, 2004) from "multimodal" interactions with parents, other adults, siblings, and peers (Preisler & Ahlström, 1997), overheard conversations, stories, news, and gossip (Becker, 1987, p. 69; Sacks, 2000, p.11; Watkins, 2004; Wood & Wood, 1997), and television and radio, amongst many others. Exposure sets up opportunities for hearing children to learn beliefs and values, social rules, social context, and social strategies through observation, imitation, incidental and formal teaching, modeling, questioning, feedback, repetition, and practice (Meadow-Orlans, 1987, p. 29; personal communication, Dr. Nicole Walton-Allen, 2005). But, deaf children are limited to what is visually accessible. Deaf children do not have equal access to the social environment, and this is very frustrating for the deaf child (personal communication, Darlene Horsley-Hurst, 2003). For example, preschool deaf children have no access to other children's play-based conversations or overheard strategies for joining or inviting other children in play. Not only does this create a social gap (personal communication, Marietta Colven, 2004) but the deaf child loses ground in terms of social development.

Where the gap in social learning theory exists, is in its poor recognition of observational learning being explicitly conditional upon alerting and orienting processes

of attention. While hearing children are almost continuously exposed to, and certainly do get much information from the auditory environment, observational learning through the visual modality is implicit in social learning theory. But, whereas visual access to the environment is, at any one point, constrained to perhaps 120 degrees, auditory access to the environment is wrap-around (i.e., 360 degrees). There are several implications here for deaf children.

Obviously, deaf children who are severely to profoundly deaf, as were the children in the present study's sample, have little to no auditory access to the environment (without aiding). Second, but no different from hearing children, visual access to the environment is constrained at a perceptual level. But third, unlike deaf children, hearing children have *indirect* visual access to the environment as a function of their ability to automatically monitor the auditory environment. That is, hearing children are responsive to auditory cues that trigger looking responses as a consequence. Thus, not only do hearing children have privileged access to the auditory environment, but, hearing children have greater access to the visual environment compared to deaf children. While social learning theory can explain the breakdown of social development in deaf children to be the result of impoverished social learning opportunities – formal or incidental – social learning theory, by itself, cannot explain social development in deaf children. Rather, social learning theory in conjunction with joint attention theory is more likely to adequately serve as a model for social development in deaf children. That is, social partners, beginning with the mother, bridge, expose, interpret, and bring, the auditory and visual environments to the deaf child. Joint attention occasions the practicing of social

skills and promotes cognitive development in the development of the deaf child. Episodes of sustained joint attention with the mother are points of developmental contact for young deaf children. In the negotiating, establishing, and sustaining of joint attention with the mother, the deaf child learns through observation, imitation, incidental and formal teaching, modeling, questioning, feedback, and practice. Through joint attention, the deaf child is also affirmed as a contributing social partner. The findings of the present study support this view.

Joint Attention: Characterization and Operational Issues

Not only have relations among joint attention and the development of language and cognition been described in the literature since the 1960s, but, more recently, relations among joint attention and early socio-cognitive and socioemotional development have been described. However, as described in Chapter 1, the operational definition and characterization of joint attention is not standard across the literature. In addition, few attempts have been made to examine how joint attention supports social development. Finally, some of the literature views joint attention as an ability "in" the child, rather than as the product of a series of purposeful interpersonal exchanges. The restated model and operational definition of joint attention was exploratively tested by examining and comparing relations among an established measure of child social competence and more traditional operational measures of joint attention to those among the restated operational measures of joint attention. Frequency of MIA, MIA II, and CIA, and the global rating of the quality of joint attention, were used as proxy traditional joint attention measures. Frequency of EJA and CJA, and the quality of consummative joint attention episodes

(CJA score), represent the restated model of joint attention. Both the traditional and restated models of joint attention predict a variable pattern of significant relations among joint attention measures and social competence and behaviour. Interestingly, no significant associations were found between traditional operational measures of joint attention and social development in hearing children. This is particularly surprising since the three types of initiation acts (MIA, MIA II, and CIA) making up three of the traditional joint attention variables, were, given the present study's observation and coding protocol, paired with response acts. That is, none of the recorded initiation acts were stand-alone instances of an initiation act directed to the partner (e.g., Mundy et al.'s *initiates joint attention* category). In contrast, two of the present study's operational measures of joint attention, frequency of CJA and CJA score, were significantly and positively associated with child social competence and behaviour assessed within the full sample. This suggests that for joint attention to function as an underlying process in social development, more than establishing joint attention is required, and certainly, more than just initiating or responding to a bid for joint attention, is necessary. Rather, frequent and sustained episodes of joint attention are necessary; and especially, increased rate or density of exchanges inside episodes of sustained joint attention (CJA score) are associated with increased child social behaviour scores. By definition then, establishing joint attention appears necessary, but not sufficient, for social development. When the two groups were analyzed separately, neither traditional, nor restated, joint attention measures were associated with hearing children's social competence and behaviour. In contrast, the more traditional MIA and the present study's CJA score were both

significantly and positively related to deaf children's social competence and behaviour ratings. This finding makes three important points: (1) compared to traditional measures of joint attention, restated operational definitions and measures of joint attention provided more information with respect to understanding the role of joint attention in early social development, (2) the hearing mother plays an important role in eliciting and gaining the deaf child's attention for the purpose of joint attention, and (3) sustained and communicatively (verbal, nonverbal) active episodes of joint attention are the cornerstones of social development in deaf children, but not hearing children.

The different patterns of relations found among joint attention variables extend and challenge existing thinking about joint attention, and specifically, the negotiation of joint attention between mothers and children. Overall, for both deaf and hearing children, collectively and separately, attention-directing maternal initiation acts, more than child initiated acts, and more than maternal follow-in acts, were instrumental in creating opportunities for joint attention to ensue. And this was particularly the case in the context of novelty. More particularly, significantly more communicative exchanges occurred inside episodes of joint attention initiated by mothers by actively directing children's attention to the novel stimuli in the hearing mother-hearing child group compared with the hearing mother-deaf child group. Yet again, deaf children were 'limited' in their exposure to the immediate environment. This finding is concerning because we know that cognitive growth and socioemotional development requires exposure to novelty and the mastering of novel experiences. The present study's finding that maternal directing of the child's attention, and not her following into the child's focus of attention, was

significantly more instrumental in successfully establishing joint attention with both hearing and deaf 18- to 36-month old toddlers, serves also to caution the generalizing of findings across early childhood. While the literature emphasizes the importance and effectiveness of the mother following into the child's current focus of attention, the samples in some studies comprise older than toddler-age children, ranging up to 5-years of age in some studies.

Episodes of Established Joint Attention (EJA) and Consummative Joint Attention (CJA) were observed in both groups in each of the five different tasks; that is, across-condition (dyad hearing status) and across-task or context reliability was found for both EJA and CJA. In terms of validity, significantly greater frequencies of EJA and CJA, as well as significantly higher CJA scores, discriminated the HH-group from the HD-group. To recall too, the present study's primary independent measure of mother-child joint attention, *Consummative Joint Attention score*, is a process variable that reflects the synthesis of two theoretically disparate and interchangeable uses of the term "joint attention" in the literature. That is, the present measure of joint attention incorporates the initiation of, and entry into, joint attention, as well as the sustaining and termination of joint attention episodes. Improved *content validity* thus allows for inferences to be made both about specific components of joint attention and more generally across the process of joint attention as a whole.

In sum, the more complete and objective operational model of joint attention formulated and presented in this work, facilitates prediction and hypothesis generation

related to early child development and which can be tested through the lenses of psychology, sociology, education, or medical science.

Limitations of the Research

There are limitations to the present study. Controlling for the number of home-visits mothers and deaf children had received from the Preschool Home-visiting program (i.e., not the length of time that mothers and deaf children had been enrolled in the early intervention program) was not possible for reasons described in Chapter 2. Another limitation is that no deaf mothers with deaf children were included as a third group. The timeline and cross-section design of the research did not allow for the recruiting of deaf-deaf dyads who met all the inclusion criteria. Data from one deaf mother and her deaf 12-month old child were collected but are obviously insufficient to serve as a comparison. It is important, however, to point out that variability exists within linguistic orientations of deaf mothers (personal communication, Darlene Horsley-Hurst, 2005; Meadow-Orlans, 1987, p. 35), deaf mother-deaf infant interaction, and the developmental outcomes of young deaf children with deaf mothers (personal communication, Sharon Ainsworth, Robarts School for the Deaf, London, 2005; Sister Claudette Bogner, Prinicipal, St. Vincent School for the Deaf, South Africa, 2004). The inclusion of a third group is recommended for future studies. The heterogeneity in communication option is another possible confound, especially because only two of the children had ASL as their first language. The issue of cochlear aiding was discussed in detail in Chapter 2. As a brief summary, the reader is reminded that there were no significant differences on joint attention performance variables between hearing mothers and deaf children using

cochlear implant aiding (n = 10) and hearing mothers and deaf children not using cochlear implant aiding (n = 17). Specifically: (1) there was no significant difference in the number of times that mothers and children established joint attention during the 13 minutes of interaction; (2) there was no significant difference between the number of mother-child back-and-forth behavioural and communication acts inside episodes of joint attention; (3) consummative joint attention scores did not differ significantly; (4) the degree of mutuality and reciprocity, and the expression of positive emotion was the same in both groups too. It could have been though, that mothers of the deaf children with surgically implanted cochlears (n = 16), similar to mothers of orally trained children compared with mothers of children using TC, were more achievement oriented, ambitious, optimistic, or hopeful (Hastings, 1979). To counter the argument that maternal factors of motivation and/or hope could have biased the findings, additional analyses were conducted as reported in Chapter 2. No significant differences were found on any of the study's dependent variables. Finally, while transcribers and independent observers were blind to the hypotheses of the research, it was not always possible for them to be blind to the hearing status of the children.

It is to be noted that many studies on deafness suffer from problems of poor control. Problems include, but are not limited to, those of mixed etiology of deafness, the presence of additional disability in some of the participants, and the misinterpretation of outsider and/or hearing researchers with no experience of or exposure to deafness making their work vulnerable to hearing cultural value bias. To address the problem of mixed etiology of deafness, the sample was limited to hearing and deaf toddlers, between 18-

and 36-months of age, who had been full-term and healthy at birth and who displayed no known disabilities, craniofacial anomalies or morphological abnormalities of the pinna and ear canal, no prenatal exposure to maternal TORCH infections and substance abuse (alcohol, cocaine etc.), and no family history of hereditary childhood sensorineural hearing loss. In the deaf toddlers, etiology of deafness was restricted to congenital bilateral deafness that was severe to profound in range and that was not the result of prenatal birth trauma, postpartum infection (e.g., bacterial meningitis, jaundice) or accident. Despite the stringency of my inclusion criteria, my sample size, for a clinical sample, was substantial; 29 hearing mother-hearing child dyads, and 27 hearing mother-deaf child dyads, all observed in their homes across the province. I was, of course, acutely aware of my status as a hearing researcher. To this end, I endeavoured to "educate" myself through exposure to the world of deaf education, deaf culture, and deaf studies. I accomplished this through reading autobiographies of deaf people, the storied experiences of hearing parents of deaf children, and articles from Gallaudet University for the Deaf. I met, worked, and socialized with deaf families, deaf children, ASL interpreters, deaf teachers of the deaf, hearing teachers of the deaf, psychologists, social workers, principals, early intervention workers, and pre-school teachers at all three residential schools for the deaf in Ontario and at two schools for the deaf in South Africa. I attended workshops organized by the Deaf Schools and one by the London Health Sciences cochlear implant group. I visited and sat in the classrooms of the residential schools and I spent a day in the Grade 2 classroom of a mainstream school observing a

little deaf boy who has an interpreter in the classroom with him and a hearing English speaking teacher who does not sign.

A number of other issues known to influence mother-child interactions were not, however, examined in the present study. These include child temperament, attachment, marital satisfaction, and maternal depression.

With respect to attachment, recall from Chapter 1 that, while hearing mothers were less likely to share in the deaf child's focus of attention to objects or activities (Lederberg & Mobley, 1990; Webster, 1986, p. 80), Lederberg and Mobley's (1990) finding was independent of the quality of attachment between 22 month old deaf and hearing children and their mothers. Lederberg and Mobley's finding of no differences in attachment security between deaf and hearing children and their hearing mothers is corroborated by other groups too (Gallaudet Infant Study, 2003; Hadadian, 1995; Koester & MacTurk, 1991 in Spencer, 2003, p. 340; Lederberg & Prezbindowski, 2000). Also, we know from the autism literature, that despite impaired social interaction, children with autism and other pervasive developmental disorders, are "attached" to their mothers and display, like typically developing children, secure, insecure, or disorganized attachment behaviour in response to the mother's departure in experimental settings (personal communication, Dr. Melissa Rutherford, 2003; Willemsen-Swinkels, Bakermans-Kranenburg, van IJzendoorn, et al., 2000). It is also important to stress the fact that the present study was concerned with joint attention as a *general principle,* or mechanism, of development, not individual principles of, or differences in, development (Bukatko & Daehler, 1998, p. 9).

Accordingly, for the purposes of this research, data on maternal depression was also not collected. It was not considered important to account for what mediates the relations between hearing mothers' responses to the identification of deafness and the disruption of interaction with the child; *that* hearing mother-deaf child interactions are disrupted was the issue. However, it is important to keep in mind that hearing mothers of otherwise normal, healthy, and full-term deaf children (like the mothers in the sample of HD-dyads recruited for this research) suffer depression more often than hearing mothers of extremely low birth weight or multiply handicapped deaf children, who view their child as a "miracle baby" (personal communication, Judy Johnstone, E. C. Drury School for the Deaf, Milton, Ontario, 2004). Anecdotally, one mother noted on the demographic questionnaire that "My child is perfect to me, but when I was carrying him I didn't expect him to be born deaf." Another mother noted that "When we found out our child was deaf – first came devastation and then panic – knowing that our child may or may not be able to communicate like our older child – and function independently in the regular "hearing" world. Now we know he will do great things and will be successful. Through all the work, and mostly because of his personal successes, I am no longer worried about his future." In fact, in a recent meta-analysis by Moores, Jatho, and Dunn (2001) of 21 works published in issues of the *American Annals of the Deaf* between 1996 and 2000, and comprising samples from around the world (e.g., England, Germany, Greece, Turkey, and North America), concluded that the assumed grieving process that hearing parents go through, is likely "an overstatement." Overall, the authors acknowledged the undeniable stress associated with identification of deafness but highlighted the resilience of parents.

Nonetheless, and while not initially included in the design of the study, or officially reported, affective data were collected from the hearing mothers of deaf children using the *Positive and Negative Affect Scale* (PANAS; Watson, Clark, & Tellegen, 1988). Because this measure was instituted at a point in the data collection when most of the hearing mother-hearing child data had been collected, data were only collected from 9 of the 29 HH-mothers. Notwithstanding the unequal sample sizes, independent t-tests showed no significant differences between the two groups of mothers on either the positive affect scale or the negative affect scale.

Because only one of the hearing mothers had an older deaf child, it is unlikely that differences in performance within the HD-dyads can be attributed to maternal experience or familiarity with deafness, or that the younger second deaf child – and study participant – had an older deaf sibling as a communicative partner (Hastings, 1979, p. 112).

In terms of method, the findings of the study reflect mother-child joint attention not mother-child interaction. That is, the data were constrained to successful initiation acts and to interaction inside but not outside joint attention. Thus, the study's findings can not be generalized to mother-child interaction between hearing mothers of hearing and deaf children between the ages of 18 to 36 months.

These limitations not withstanding, the strengths of the study include the relatively large clinical population sample size ($n = 27$) as previously indicated. The findings of the study also reflect twelve hours and thirteen minutes of verbatim mother-child interaction, and 730.46 episodes of qualified joint attention (426.65 episodes in the HH-dyads, 303.82 episodes in the HD-dyads). Methodologically, the criteria for joint attention were

rigorous and conservative. The qualitative, micro-analysis of mother-child joint attention was in-depth and novel, and examined both the process and outcome of joint attention. Evaluative research that measures outcomes rather than, or in isolation of, process, is typically low on information on processes or mechanisms involved (Webster, 1986, p. 50). I was also committed to taking the deaf children's need for visual access into account such that the data would not underestimate deaf children's ability. To accomplish this, the behaviour observation set-up was arranged within a confined play area so that the mother and child were at all times communicatively accessible to one another, and that the toys were within arms reach of both the mother and child. A more subtle issue presented itself in the coding of nonverbal responses. Operationally, what qualified as a maternal nonverbal communicative act for a hearing child, did not always qualify as a maternal nonverbal communicative act for a deaf child. An example here is that of the mother laughing. Unless the deaf child saw the mother laughing, the deaf child was not aware of her mother's nonverbal act of laughter. This issue was resolved by coding maternal nonverbal communicative acts as *nonverbal communication* on the proviso that the act was accessible to the deaf child, or in the case of the hearing child, would have been accessible to a deaf child in the same situation. Inaccessible vocal and gestural or postural nonverbal communications were coded as, respectively, instances of *simultaneous auditory visual communication* and *simultaneous Total Communication.* Finally, the collection of data in the home setting makes the findings more generalizable to the natural context than laboratory-based findings. Naturally, however, the findings can only be generalized with caution given the free play design of the study which would

have maximized the possibility for joint attention in both groups, but especially for the HD-dyads. Overall, the implications of the present study's findings are two fold: (1) implications for theory, and (2) implications for policy and practice.

Implications of the Findings for Theory and the Advancement of Knowledge

Taken together, the present study's findings are of theoretical importance for the following reasons: (1) the restated operational model of joint attention extends and challenges existing operational models of joint attention; (2) significantly more joint attention episodes were associated with attention-directing maternal initiation acts compared to maternal follow-in and child initiation acts; (3) understanding of the posited role of joint attention in the early socioemotional development of typically developing hearing children were extended by the present study; (4) evidence for the possibly critical role of joint attention in the early socioemotional development of deaf children was found; (5) social learning perspectives of social development in hearing children help explain problems in the social development of deaf children but are limited with respect to the normal social development of deaf children; (6) social learning perspectives augmented by joint attention theory are likely to be more informative to the understanding of normal early socioemotional development of deaf children with hearing parents; (7) the study's findings are in agreement with the shift from a deficit-model of deafness, to the view that ineffective patterns of interaction with hearing adults (Jamieson, 1995b) underlie difficulties in early socioemotional development of deaf children; (8) joint attention is forwarded as an early *prelingual* mechanism through which these ineffective patterns of interactions between deaf children and hearing mothers might

influence development; (9) the study's findings also confirm the existence of joint attention between hearing mothers and deaf children despite visual attention to the mother being "the sine qua non of communication" in young deaf children (Prendergast & McCollum, 1996), and that joint attention between mothers and deaf children clearly requires a "divided attention" (Wood, 1982; Wood & Wood, 1997); (10) in other words, by accommodating the absence of auditory sensory abilities in deaf children through timing, coordination, and nonverbal behaviours, joint attention between hearing mothers and deaf children is possible; (11) it is the quality, and not the quantity, of sustained episodes of joint attention between the hearing mother and deaf child that is important for early socioemotional development in deaf children with hearing mothers; and (12) the hearing mother is a crucial environmental support for the developmental capacities of the deaf child. Albeit indirectly, the findings also highlight the role that auditory perception plays in typical socioemotional development. Next, because difficulties in mother-child joint attention have also been described in samples comprising low birth weight infants, low-income adolescent mothers, families from other communities, and depressed mothers (for review see Goldsmith & Rogoff, 1997), the relevance of the findings extends the greater clinical literature in joint attention processes underlying development in clinically compromised samples.

In addition, the findings were consistent with the view of hearing mother-deaf child interactions appearing 'depressed' (e.g., Koester, 1994). Broadly stated, disruption in the present study's sample of hearing mother-deaf child interactions occurred within the same two primary *channels of developmental contact* described earlier in Chapter 1:

communication and shared attention. Furthermore, disruption was evident in terms of both the 'mechanics' and the quality of sustained joint attention.

Within the body of 'theory of mind' social-cognitive literature, joint attention has been theoretically proposed as a candidate "developmental precursor" (Baron-Cohen, 1989; Baron-Cohen, Leslie, & Frith, 1985; Baron-Cohen et al., 1994; Charman, Baron-Cohen, Swettenham, Baird, Cox, & Drew, 2000; Gomez, Sarria, & Tamarit, 1993; Sigman & Mundy, 1993) of the emergence of theory of mind ability around the age of four. The inferred mechanism is one of early experience in social interactions (Mundy & Neal, 2001). It is difficult to align the present study's findings of no significant association between joint attention and child social competence and behaviour in hearing children, with the ontological hypothesis of joint attention's role in the development (or acquisition) of theory of mind ability.

Obviously, this work contributes most directly to research in and understanding of the early development of deaf children, and especially deaf children with hearing families. This contribution to the knowledge base is perhaps of special value given that most of the research on children who are deaf addresses educational issues and cognitive development as opposed to issues of socioemotional development (Meadow-Orlans, 1990 cited in Sheridan, 2001, p.10). The findings of developmental relations between joint attention and early socioemotional development in deaf children support a developmental psychopathology perspective of development that broadens the "language" argument for and account of problems in deaf children's social development. [If anything, the language argument is likely one of a "pragmatic language" argument. Pragmatic

language is defined as the interpersonal function of language; that is, how language is used to relate socially to others and to ask for what we need or want (Schirmer, 1994, p. 21)]. Communication and language development, social development, and cognitive development, unfold and "grow" recursively (Becker, 1987, p. 60; Meadow, 1980, p. 82; Watkins, 2004, p. 65). It is essential for mother-child interactions to consist of more than labeling drills and vocabulary development.

Implications of the Findings for Policy and Practice

Universal Newborn Hearing Screening Program

The frequency with which mothers and deaf toddlers established joint attention was significantly and positively associated with how long deafness had been identified for. This finding supports the Universal Newborn Hearing Screening initiative in that mothers appear to be compensating for and accommodating to their children's communication needs once deafness has been identified and confirmed.

The objective of the Universal Newborn Hearing Screening Program is to have a confirmation of deafness in place by three months postnatal age. Prior to newborn screening, it was unlikely that mothers would have begun even to suspect that "something was wrong" with their three month old (deaf) infant, especially because, in the first six months of life, deaf infants babble in the same way that hearing infants babble. For example, the mothers of deaf children in this study reported knowing that something was wrong when their children were around eight months of age. The mean age at which deafness was confirmed was 11.67 months of age. However, deaf infants display ambiguous signals different from those of hearing infants. Assuming an intuitive model

of 'mothering,' the hearing mother may interpret her infant's unpredictable response pattern as an indication of her caregiving abilities. Over time, and with an eroding sense of confidence and competence, the mother may engage her infant in fewer and fewer social interactions such as face-to-face play. The mother of one of the deaf children in the sample whose deafness was confirmed at 2 years-of-age noted that, when deafness was confirmed, a lot of her son's behaviour was explained. For example, she then understood why he cried and fussed excessively each night when she put the light out at bedtime: in the dark, the child was cut off from both the auditory and visual environment.

We know that infants of mothers who are depressed are relatively protected from the effects of maternal depression when depression is transient and not chronic, that is, does not extend beyond six months postnatal age (Campbell, Cohn, & Meyers, 1995). Also, the second half of the first year of postnatal life is a turning point in the infant's development as it marks the time when the infant begins to turn from the mother toward the environment. This is evident in the shift from face-to-face engagement with the mother to object-engagement around six months of age. A few months later, the infant begins to integrate her engagement of the object world with her engagement of her primary social environment – her mother – in episodes of joint attention. However, joint attention, by definition, is an interpersonal event and therefore, conditional upon the mother's emotional availability and readiness for social interaction with her infant. Accordingly, the earlier in postnatal life deafness is identified, the better. Not only does earlier identification buy both the mother and infant time with respect to the mother's affective response and adjustment to the news that her infant is deaf, and for

accommodations in mother-child interactions to begin, but the mother's perception of the child may be less disrupted. The mother of two deaf children reported experiencing the identification of her older child's deafness at 26 months-of-age as a loss because she had "thought of him as a hearing child for two years." In contrast, the identification of deafness in her newborn infant had not been accompanied by a sense of loss because "deafness was a part of who she always was from birth." These anecdotal data support the findings of Meadow-Orlans (1987, p. 32) that parents experienced the ambiguity of their child's "condition" as more difficult than the "firm diagnosis" of deafness. It is important to point out however, that depression and a mother's perception of her competence as a mother are noted in the literature to have similar effects on mother-infant interaction and child developmental outcome (Gelfand & Teti, 1990; Teti & Gelfand, 1991).

Early Intervention: Parent-Training Model

Supporting the development of maternal competence is therefore essential. The most salient area of difficulty that the sample's hearing mothers of deaf children, relative to hearing mothers of hearing children, appear to experience seems to lie in their abilities not only to elicit, direct, follow, maintain, regain, and entrain the deaf infant's visual attention, but to coordinate and modify the production of communicative acts inside joint attention such that these are accessible to the deaf child. This supports the view of maternal skill deficit being accommodated; more specifically, the study supports, and speaks to the delivery of, parent-training models of early intervention. The "critical issue" in early intervention is to uncover and entrain "the capacities and resources in the

child and in the caregiving environment that can sustain and enhance developmental momentum" (Meisels & Fenichel, 1996, p. 6). The findings of the study suggest numerous areas of guidance for mothers of deaf children and ways that mothers can be more effective in negotiating joint attention with deaf children. For example, by identifying the weaknesses and strengths in the way hearing mothers navigate and engage in joint attention with their deaf children, suggestions, in terms of process variables, can be made for focused **intervention targets**:

1. Maternal Attention-Directing Initiation Acts

While no significant difference was observed between HD-mothers and HH-mothers in terms of frequency of EJA as an outcome directing their children's attention to a focus, HD-mothers can be reassured of the efficiency of and importance in actively directing their deaf little ones' attention for the purpose of shared focus. To be especially emphasized is the need to consciously and actively direct deaf children's attention to novel objects and events in the child's immediate environment.

2. Maternal Follow-In Initiation Acts

HD-mothers were significantly less successful in entering into children's current foci of attention compared with HH-mothers. Despite the finding that maternal follow-in initiatives were least frequently associated with the establishing of joint attention with 18- to 36-month old toddlers, it might be that this maternal skill becomes more important for establishing joint attention with older preschool-age children when levels of mobility, exploration, and independence are naturally increasing. To anticipate this natural developmental trajectory, and especially in light of the extant literature documenting the

difficulty HD-mothers display in following into deaf children's foci of attention, early intervention practices might therefore include the early entraining and reinforcement of maternal follow-in skill in HD-mothers.

3. Child Initiation Acts

Joint attention was established significantly less frequently as a result of child initiatives in the HD-group compared with the HH-group. While this might mean that deaf children were displaying significantly less frequent initiation acts, it could also have been that hearing mothers were not receiving (noticing) or understanding deaf children's qualitatively different invitational signals.

4. Maternal Termination of Joint Attention

HD-mothers can be encouraged to follow their more intuitive style of being alert to and allowing their children's shifts in attention rather than trying to "hang onto" moments of joint attention with their deaf children. Prolonged and directive attention *inside* episodes of joint attention may serve only to make or reinforce interaction with the mother as less rewarding, perhaps even boring, for the deaf child.

5. Mode of Communication

In general, hearing/speaking mothers of deaf children are to be encouraged to <u>continue</u> talking to their children! Also, because the timing of nonverbal communication is naturally more likely to be displayed in face-to-face engagement, the importance of increasing levels of natural nonverbal communication is to be made explicit to HD-mothers. Most importantly however, is to support mothers in their evident natural ability reflected by the data to begin compensating, following confirmation of deafness, to some

degree for their deaf children's qualitatively different communicative needs. That is, to equip hearing parents with sequential visual strategies and a working appreciation for the importance thereof.

6. Maternal Expression of Positive Affect

As noted earlier, maternal expression of positive affect is an important and well-documented component of mother-child interaction. That maternal expression of positive affect is likely to be an important intervention target is also given by the juxtaposition of the present study's finding that significantly fewer maternal expressions of positive affect were accessible to deaf toddlers with hearing mothers than hearing toddlers with hearing mothers, with findings reported in the literature describing Deaf mothers as significantly more positively and affectively expressive than hearing mothers of hearing children.

A major focus therefore for Parent Training programs is to disseminate and build parental knowledge and understanding of *why* joint attention will quarterback early social and emotional development in their deaf children and hence, *why* parents' skill-development in *how* to team with and entrain their deaf children in joint attention proficiency is essential. More specifically, the focus will incorporate the delineated process of joint attention beginning with (1) *how* to first initiate the negotiation of joint attention, followed by (2) *how* to secure or establish joint attention, and then, once established, (3) *how* to keep joint attention going at the same time as being aware and remaining alert to the natural ebb-and-flow of topic focus and children's shifts in attention so as to understand (4) *why* and *when* to exit from a current episode of joint attention.

Synthesis and Conclusion

Joint attention is an *interpersonal* phenomenon, and the experience of joint attention is an *interpersonal* event. The role of joint attention in early socioemotional development may be more important for deaf than hearing children. Hearing children are more protected from the effects of 'maternal environment deprivation' compared to deaf children. The effects of maternal environment deprivation (such as chronic maternal depression) are impoverished mother-child social interaction and joint attention opportunities. But, these are more likely to be less damaging for hearing children than for deaf children. This is because the objective world ("objektiwe welt") is fully accessible to hearing children, and therefore, the experienced world [("erlebte welt"), William Stern, 1935 cited in Kreppner, 2003, p. 195) is less likely to be one of mental and interpersonal isolation and deprivation than it is for deaf children. That is, when the mother is conceptualized as the (hearing or deaf) child's first and most immediate "social environment," then, theoretically, the "poverty of the stimulus" (de Villiers & de Villiers, 2000, p. 219), "impoverished environment thesis" (e.g., personal communication, Dr. Joel Hundert, 2003; Weinberg & Tronick, 1998a, 1998b), "affective contact" (e.g., Greenspan, 1990; Hobson, 1993, p.204; personal communication, Dr. Colwyn Trevarthen, 2002; Stern, 1974) models of developmental psychopathology explain the amplified role of joint attention in deaf children's socioemotional development. The working hypothesis of this research was that episodes of mother-child *joint attention* are an important avenue for socioemotional development in the second and third years of postnatal life, and that this is particularly the case when the child is deaf and does not have the same access to auditory

attentional cues from the environment or to incidental and observational/vicarious social learning opportunities as the hearing child. Thus, the working hypothesis of the research was supported by the findings. It is suggested that because early socioemotional development paves the way for emerging peer interactions around 3-years of age, deaf children are more likely to experience difficulty in peer interaction. Peer interaction, in and of itself, is important for the growing child to meet her social and emotional needs that are facilitated through interaction, information exchange, friendship, cliques, and reciprocity (Becker, 1987, p. 66). Thus, the significant but small difference between the two groups of children on the ASBI measure of child social competence and behaviour, is predicted to widen with increasing chronological age. This is also in keeping with extant findings of an increasing gap between hearing and deaf children's social competence with increasing chronological age (Greenberg, 1980; Marschark, Lang, & Albertini, 2002, p. 64; Watkins, 2004, p. 1685). Longitudinal work would inform the developmental relations between mother-child joint attention, early socioemotional development, and later socioemotional outcome in deaf children with hearing mothers.

In sum, it appears that a deliberate, rather than intuitive, model of mothering is required by hearing mothers to accommodate and adjust to interaction with deaf children for joint attention interaction and adaptive patterns of early socioemotional development to regularly and reliably occur. However, a deliberate model of mothering includes not only the learning and incorporation of new communicative strategies, skills, and ways of being with the deaf child, but also, the recognition and encouragement of the mother's natural human capacity for nonverbal communication. A hearing mother who is

reassured of her natural strength and skill in nonverbal communication and ability to compensate for and adjust to a more visual modality, and who is informed of, guided in, and equipped with communicative skills to accommodate joint attention with her deaf child, will be more successful in "pulling" the deaf child into the objective and experienced worlds. It does not have to be that the deaf child becomes more and more "tuned out" from the immediate world. To conclude, this study corroborates the special case *of* joint attention in deafness and forwards the special case *for* joint attention in deafness.

"Those of us willling to accept a role in the lives of Deaf children constantly have to challenge assumptions about what Deaf children can and cannot do and explore new avenues to allow them to reach their potentials."

~ Marc Marschark, 1997 ~

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Table 1

Demographic Variables Within the Study Sample's Hearing Mother-Deaf Child Group (n = 27)

	Hearing mother-deaf child no cochlear implant aiding[1] (n = 17)			Hearing mother-deaf child with cochlear implant aiding (n = 10)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Child variables								
Sex	17	10 males, 7 females		10	3 males, 7 females		$\underline{X}^2(1) = 2.10$	$p > .05$
Chronological age (months)	17	24.82	4.98	10	30.3	6.85	$t(25) = -2.40$	$p = .02$
Daycare/preschool attendance	17	9 attend, 8 do not attend		10	3 attend, 7 do not attend		$\underline{X}^2(1) = 1.34$	$p > .05$
Hours per week	11	14.75	14.89	3	20.00	15.61	$t(12) = -.54$	*p=.60*
Age when deafness confirmed	17	13.1	6.97	10	9.25	4.84	$t(25) = 1.53$	*p=.14*
Age when mother knew that something was "wrong"[2]	15	6.87	4.20	8	10.50	6.41	$t(23) = .32$	*p=.12*
Time (months) from when mother knew something was "wrong" to identification[2]	15	4.63	4.94	10	4.05	3.79	$t(23) = .32$	*p=.76*
Time (months) from identification to study participation[2]	16	15.59	8.37	10	13.25	4.26	$t(24) = .82$	*p=.42*
Age when communication option was begun[2 3]	14	14.07	7.67	9	14.22	8.04	$t(21) = -.05$	*p=.96*
Time (months) of exposure to communication option[2]	14	12.07	11.17	9	13.89	8.45	$t(23) = -.42$	*p=.68*

Table 1/continued

Demographic Variables Within the Study Sample's Hearing Mother-Deaf Child Group (n = 27)

	Hearing mother-deaf child no cochlear implant aiding[1] (n = 17)			Hearing mother-deaf child with cochlear implant aiding (n = 10)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Maternal variables								
Age (years)	17	31.56	4.08	10	31.7	4.27	$t(25) = -.09$	$p=.93$
Marital status	17	14 married, 3 not married		10	9 married, 1 not married		$X^2(1) = .29$	$p>.05$
Parity	17	6 *para* 1		10	2 *para* 1		$X^2(1) = .71$	$p>.05$
Number of other children	17	1.06	1.09	10	0.90	0.57	$t(25) = .43$	$p=.67$
Age of other children (years)	10	6.90	5.33	8	4.88	2.28	$t(16) = 1.00$	$p=.33$
Level of education[2]	17	5.53	0.94	9	5.22	1.39	$t(24) = .67$	$p=.51$
English as first language	17	16 yes, 1 no		10	9 yes, 1 no		$X^2(1) = .16$	$p>.05$

[1]For the purposes of this study, children who had just received cochlear implants (defined as cochlear implants not yet activated or cochlear implants that had been activated two or less weeks before participation in the study) were considered as having *no* cochlear implant aiding.

[2]Discrepant sample sizes are explained by missing data for some of the children

[3]American Sign Language, Auditory Verbal Therapy, Oral, Total Communication

Level of Education was assessed as follows: 1 = Less than 7th grade, 2 = Junior high school, 3 = Grade 10/Grade 11, 4 = High school graduate, 5 = Partial college/at least one year of specialized training, 6 = College or university graduate, and 7 = Graduate professional training (MA, MSc., MD, MBA, PhD)

Table 2

Duration of Behaviour Sample[1] and CSBS Behaviour Sample Reliability Assessment Using Maternal Report[2]

	Hearing mother-hearing child			Hearing mother-deaf child				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Duration of behaviour sampl (min, s)	29	12.17	0.98	27	12.27	1.27	$t(54) = -.33$	$p = .74$
CSBS Caregiver Perception								
Alertness	29	1.93	0.26	27	1.93	0.38	$t(54) = .06$	$p = .95$
Emotionality	29	2.03	0.19	27	2.07	0.38	$t(54) = -.50$	$p = .62$
Interest and attention	29	2.14	0.44	27	1.93	0.47	$t(54) = 1.73$	$p = .09$
Level of child's comfort	29	1.86	0.44	27	1.74	0.45	$t(54) = 1.02$	$p = .31$
Level of child's activity	29	1.93	0.37	27	1.87	0.51	$t(54) = .51$	$p = .61$
Level of communication	29	1.79	0.41	27	1.89	0.63	$t(54) = -.68$	$p = .50$
Play behaviour	29	2.03	0.33	27	2.00	0.28	$t(54) = .43$	$p = .67$

[1]The behaviour sample comprised one unstructured and four semistructurecd joint attention-eliciting conditions: Free-Play (5 min), Bubble Blowing (3 min), Laser Pointer (1 min), Bumble Ball (1 min), and Book Sharing (3 min). The protocol time was thus 13 min ($M = 12.22$, $SD = 1.12$, $N = 56$) in total.

[2]*Behavior Sample: Caregiver Perception Rating* (CSBS-DP; Wetherby & Prizant, 2002) was completed immediately following the behaviour sample procedure. Mothers were asked to rate their child's behaviour during the sample in terms of how typical it was where 1 = *Less than usual*, 2 = *Typical*, and 3 = *More than usual*

Table 3

Demographic Variables for the Full Sample (N = 56)

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Child variables								
Sex	29	16 males, 13 females		27	13 males, 14 females		$\underline{X}^2(1) = .28$	$p > .05$
Chronological age (months)	29	26.04	5.20	27	26.85	6.23	$t(54) = -.54$	$p = .60$
Daycare/preschool attendance[1]	28	16 attend, 12 do not attend		26	14 attend, 12 do not attend		$\underline{X}^2(1) = .65$	$p > .05$
Hours per week	16	19.77	13.47	14	15.86	14.60	$t(28) = .76$	$p = .86$
Age when deafness confirmed				27	11.67	6.45		
Age when mother knew that something was "wrong"				23	8.13	5.24		
Time (months) from when mother knew something was "wrong" to identification				25	4.4	4.44		
Time (months) from identification to study participation				26	14.69	7.06		
Age when communication option was begun				23	14.13	7.64		
Listening age				16	10.81	6.07		
Expressive age				17	8.94	3.63		
Receptive age				17	9.59	4.02		

Table 3/continued

Demographic Variables for the Full Sample (N = 56)

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Maternal variables								
Age (years)	29	33.38	4.59	27	31.61	4.07	$t(54) = 1.52$	$p = .13$
Marital status	29	28 married, 1 not married		27	23 married, 4 not married		$\underline{X}^2(1) = 2.22$	$p > .05$
Parity	29	14 *para* 1		27	8 *para* 1		$\underline{X}^2(1) = 2.04$	$p > .05$
Number of other children	29	0.72	0.92	27	1.00	0.92	$t(54) = -1.12$	$p = .27$
Age of other children (years)	11	4.73	1.85	18	6	4.27	$t(27) = -.93$	$p = .36$
English as first language[2]	29	29 yes		27	25 yes, 2 no		$\underline{X}^2(1) = 2.23$	$p > .05$
Level of education[3]	29	5.62	0.82	26	5.42	1.1	$t(53) = .76$	$p = .45$

[1]Data were missing for one hearing and one deaf child.

[2]Two of the hearing toddlers were exposed to a second home language (Italian). Russian was the second language spoken in the home of one of the deaf toddlers and three languages (English, French, and Spanish) were spoken in the home of another deaf toddler Urdu was spoken exclusively in one deaf toddler's home, while one other deaf toddler had German spoken as a first language and English as a second language in the home. All mothers with the exception of one mother of a deaf toddler were proficient in spoken English and spoke to their children in English during the behaviour sample. The non-English speaking mother spoke to her deaf toddler in Urdu, and this was translated from the videorecording by an observer blind to the study and whose native language was Urdu.

[3]1 = Less than 7th grade, 2 = Junior high school, 3 = Grade 10/Grade 11, 4 = High school graduate, 5 = Partial college or at least 1-year of specialized training, 6 = College or university graduate, and 7 = Graduate professional training (MA, MSc., MD, MBA, PhD)

Table 4

Demographics: Hearing Mothers and Deaf Children With and Without Surgically Implanted Cochlears

	Hearing mother-deaf child no cochlear implant (n = 11)			Hearing mother-deaf child cochlear implant (n = 16)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Child variables								
Sex	11	5 males, 6 females		16	8 males, 8 females		$\underline{X}^2(1) = .05$	$p > .05$
Chronological age (months)	11	25.73	5.18	16	27.63	6.91	$t(25) = -.77$	$p = .45$
Daycare/preschool attendance	11	6 attend, 5 do not attend		16	8 attend, 8 do not attend		$\underline{X}^2(1) = .01$	$p > .05$
Hours per week	6	17.42	15.91	8	14.72	14.54	$t(12) = .33$	$p = .75$
Age when deafness confirmed	11	13.32	7.00	16	10.53	6.00	$t(25) = 1.11$	$p = .28$
Age when mother knew that something was "wrong"[1]	11	5.73	3.15	12	10.33	5.90	$t(21) = -2.30$	$p = .03$
Time (months) from when mother knew something was "wrong" to identification[1]	11	5.50	5.44	14	3.54	3.43	$t(23) = 1.10$	$p = .28$
Time (months) from identification to study participation[1]	11	16.32	9.55	15	13.50	4.52	$t(24) = 1.01$	$p = .33$
Age when communication option was begun[1] [2]	11	13.09	7.45	12	15.08	8.01	$t(21) = -.62$	$p = .54$
Time (months) of exposure to communication option[1]	11	14.18	11.66	12	11.50	8.58	$t(21) = .63$	$p = .53$

Table 4/continued

Demographics: Hearing Mothers and Deaf Children With and Without Surgically Implanted Cochlears

	Hearing mother-deaf child no cochlear implant (n = 11)			Hearing mother-deaf child cochlear implant (n = 16)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Maternal variables								
Age (years)	11	31.36	4.06	16	31.78	4.20	$t(25) = -.26$	$p=.80$
Marital status	11	8 married, 3 not married		16	15 married, 1 not married		$X^2(1) = 2.28$	$p>.05$
Parity	11	4 *para* 1		16	4 *para* 1		$X^2(1) = .40$	$p>.05$
Number of other children	11	0.91	0.83	16	1.06	1.00	$t(25) = -.42$	$p=.68$
Age of other children (years)	6	7.92	6.67	12	5.04	2.23	$t(16) = 1.38$	$p=.19$
Level of education[1] [3]	11	5.53	0.90	15	5.20	1.21	$t(24) = 1.22$	$p=.24$
English as first language	11	11 yes		16	14 yes, 2 no		$X^2(1) = 1.50$	$p>.05$

[1]Discrepant sample sizes are explained by missing data for some of the children

[2]American Sign Language, Auditory Verbal Therapy, Oral, Total Communication

[3]1 = Less than 7th grade, 2 = Junior high school, 3 = Grade 10/Grade 11, 4 = High school graduate, 5 = Partial college/at least one year of specialized training, 6 = College or university graduate, and 7 = Graduate professional training (MA, MSc., MD, MBA, PhD

Table 5

Joint Attention Performance Variables Assessed in Hearing Mother-Deaf Child Dyads With and Without Cochlear Implant Aiding

	Hearing mother-deaf child no cochlear implant (n = 17)			Hearing mother-deaf child with cochlear implant (n = 10)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Frequency with which JA was established (EJA)	17	11.95	4.28	10	10.07	3.6	$t(25) = 1.16$	*p=.26*
Frequency exchanges inside JA (Joint attention span, JAspan)	17	168.21	85.96	10	211.47	74.53	$t(25) = -1.32$	*p=.20*
Rate of exchanges inside JA *(Consummative joint attention* score, CJAscore)	17	12.94	6.61	10	16.46	6.03	$t(25) = -1.38$	*p=.18*
Quality of joint attention (Global Rating)	17	2.09	0.69	10	2.70	1.32	$t(25) = -1.60$	*p=.12*

Note: The mean number of months that the 10 children with cochlear implants that had been activated for *more* than two weeks at the time of participation in the study was 12.60 (range: 6 - 19 months), and the mean age of cochlear implantation was 16.70 months of age (range: 10 - 29 months of age).

Table 6

Adaptive Social Behaviour Scores in Deaf Children With and Without Cochlear Implant Aiding

	Hearing mother-deaf child no cochlear implant (n = 17)			Hearing mother-deaf child with cochlear implant (n = 10)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Expressiveness	17	33.21	2.27	10	32.30	6.04	$t(25) = .56$	*p=.58*
Compliance	17	22.05	3.37	10	22.30	4.67	$t(25) = -.16$	*p=.87*
Disruptiveness (reverse scored)	17	16.20	2.84	10	17.70	1.57	$t(25) = -1.53$	*p=.14*
Prosocial behaviour	17	55.44	4.57	10	54.60	9.88	$t(25) = .30$	*p=.77*
ASBI total score	17	71.57	5.85	10	72.30	9.91	$t(25) = -.24$	*p=.81*

Adaptive Social Behaviour Inventory (Hogan, Scott, & Bauer, 1992)

Table 7

Relations Between Demographic and Study Variables Within the Full Sample (N = 56)

Study variable	Demographic variable	Statistic	*p* (2-tailed)
Independent variable[1]			
1. Dyad hearing-status (HH, HD)		No significant relations were found	
Dependent variables[3]			
1. Frequency of EJA	Months since deafness was confirmed	$r(26) = .46$	$p<.05$
2. Frequency of CJA	Language spoken at home[2]	$F(3,52) = 3.97$	$p<.01$
3. CJA score	Mother's age	$r(56) = .31$	$p<.05$
4. Quality of JA-episodes	Mother's age	$r(56) = .40$	$p<.05$
5. ASBI		No significant relations were found	

[1]HH = Hearing mother-hearing child, HD = Hearing mother-deaf child

[2]1 = English as first language, 2 = Other first language, 3 = English as second language, 4 = Other second language

[3]*EJA* = Established joint attention

CJA = Consummative joint attention

CJA score reflects the total number of communicative exchanges inside *sustained* episodes of joint attention summed across the five conditions of the behaviour sample and divided by the total time (min, s) of the behaviour sample ($M = 12.22$, $SD = 1.12$, $N = 56$). A *sustained* episode of JA was operationally defined to comprise a minimum of two communicative exchanges once JA was established (i.e., following EJA).

Quality of JA was defined as an independent observer's overall impression of the degree of shared meaning, dyadic mutuality, and shared positive affect observed between a mother and child within and across all joint attention episodes across the five conditions of the behaviour sample and rated on a 7-point Likert scale where *1 = Poor, 3 = Average, 5 = Good, 7 = Excellent*

ASBI = Adaptive Social Behavior Inventory (Hogan, Scott, & Bauer, 1992)

Table 8

Hypothesis 1A: Hearing mother-hearing child dyads will be significantly more competent compared with hearing mother-deaf child dyads in initiating and establishing joint attention reflected by more initiation acts that are responded to by the recipient and more instances of established joint attention.

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Maternal Initiation Act (MIA; Attention-directing)	29	9.93	4.36	27	8.58	3.90	$t(54) = 1.22$	$p = .23$
Maternal Initiation Act II (MIA2; Follow-in)	29	2.85	2.76	27	1.45	1.45	$t(54) = 2.36$	$p = .02$
Maternal Initiation Acts overall (sum of MIA and MIA2)	29	12.79	5.86	27	10.03	4.15	$t(54) = 2.02$	$p = .05$
Child Initiation Act	29	3.91	2.00	27	2.53	2.38	$t(54) = 2.35$	$p = .02$
Established Joint Attention (EJA)	29	14.71	5.38	27	11.25	4.07	$t(54) = 2.70$	$p = .01$

Table 9

Hypothesis 1B: Hearing mother-hearing child dyads will be significantly more proficient in sustaining joint attention reflected by a significantly greater frequency and rate of verbal and nonverbal exchanges inside episodes of joint attention compared with hearing mother-deaf child dyads.

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Frequency of exchanges (Joint attention span, JAspan)	29	280.15	99.79	27	184.23	83.20	$t(54) = 3.89$	$p < .001$
Rate of exchanges (Consummative joint attention score, CJAscore)	29	21.60	7.65	27	14.24	6.52	$t(54) = 3.86$	$p < .001$

JAspan is a frequency count of communicative exchanges inside episodes of joint attention summed across all episodes of JA established during the the five conditions of the behaviour sample; that is, JAspan is inclusive of "empty" episodes of JA. *CJA score* reflects the total number of communicative exchanges inside *sustained* episodes of joint attention summed across the five conditions of the behaviour sample and divided by the total time (min, s) of the behaviour sample ($M = 12.22$, SD = 1.12, $N = 56$). A *sustained* episode of JA was operationally defined to comprise a minimum of two communicative exchanges once JA was established (i.e., following EJA).

Table 10

Hypothesis 1C: Mothers in the hearing mother-deaf child dyads will terminate episodes of joint attention significantly more frequently relative to mothers in the hearing mother-hearing child dyads.

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Termination acts								
Maternal termination act (MT)	29	4.70	3.70	27	1.99	2.03	$t(54) = 3.37$	$p = .001$
Child termination act (CT)	29	12.19	5.43	27	10.24	9.56	$t(54) = .95$	$p = .35$

Table 11

Hypothesis 1D: Independent observer global ratings of the quality of joint attention in hearing mother-hearing child dyads will be significantly greater than those for hearing mother-deaf child dyads.

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Quality of joint attention rating	29	3.71	1.55	27	2.31	0.99	$t(54) = 3.97$	$p < .001$

Quality of JA was defined as an independent observer's overall impression of the degree of shared meaning, dyadic mutuality, and shared positive affect observed between a mother and child within and across all joint attention episodes across the five conditions of the behaviour sample and rated on a 7-point Likert scale where *1 = Poor, 3 = Average, 5 = Good, 7 = Excellent*

Table 12

Hypothesis 2: Hearing toddlers will be rated as significantly more socially and behaviourally competent by their mothers compared with deaf toddlers.

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Expressiveness	29	35.72	2.49	27	32.87	4.00	$t(54) = 3.23$	$p = .002$
Compliance	29	22.91	3.24	27	22.14	3.81	$t(54) = .81$	$p = .42$
Disruptiveness (reverse scored)	29	18.05	2.06	27	16.75	2.53	$t(54) = 2.11$	$p = .04$
Prosocial behaviour	29	58.63	5.01	27	55.13	6.84	$t(54) = 2.20$	$p = .03$
ASBI total score	29	76.68	6.09	27	71.84	7.43	$t(54) = 2.67$	$p = .01$

The Adaptive Social Behavior Inventory (ASBI) is a thirty-item scale focusing on prosocial and normative negative behaviours and was designed to test prosocial behaviours in pre-kindergarten-aged children. The scale consists of three subscales, two of which assess prosocial behaviour (Express and Comply) and one which assesses negative behaviour (Disrupt). A total score is computed by summing maternal ratings of prosocial and disruptive (reverse scored) items with a possible range of scores between 42 to 88. Higher scores reflect more optimal adaptive social behavioural development.

Table 13

Hypothesis 3: The quality of joint attention indexed by a consummative joint attention (CJA) score will be positively correlated with maternal ratings of children's adaptive social competence and behaviour (ASBI).

	Statistic	*p* (2-tailed)
Relation between CJA and ASBI	$r(56) = .52$	$p < .001$

Table 14

Hypothesis 4: Inside episodes of joint attention, the behavioural and response acts of hearing mothers of deaf children will not differ significantly from that of hearing mothers of hearing children.

	Hearing mother-hearing child (n = 29)			Hearing mother-deaf child (n = 27)				
	n	Mean	SD	n	Mean	SD	Statistic	*p* (2-tailed)
Mode of communication								
Simultaneous auditory visual	29	102.5	40.84	27	66.15	36.26	$t(54) = 3.51$	$p = .001$
Sequential auditory visual	29	10.13	9.32	27	11.06	11.70	$t(54) = -.33$	$p = .74$
Nonverbal communication	29	42.62	17.83	27	54.88	18.57	$t(54) = -2.52$	$p = .02$
Sequential TC	29	0.00	0.00	27	1.61	2.67	$t(54) = -3.24$	$p = .004$
Sequential ASL/homesign	29	0.00	0.00	27	0.30	1.54	$t(54) = -1.04$	$p = .30$
Simultaneous TC	29	0.21	0.94	27	1.30	2.11	$t(54) = -2.53$	$p = .02$
Simultaneous ASL/homesign	29	0.00	0.00	27	0.07	0.3849	$t(54) = -1.04$	$p = .30$
Maternal affective acts								
Postive affect	29	32.43	23.95	27	16.01	10.62	$t(54) = 3.26$	$p = .002$
Negative affect	29	2.36	2.94	27	0.98	1.51	$t(54) = 2.19$	$p = .03$
Maternal style								
Facilitation (LET ME)	29	54.08	28.39	27	38.54	24.55	$t(54) = 2.18$	$p = .03$
Conditional facilitation (LET ME-C)	29	6.09	4.73	27	4.97	4.64	$t(54) = .90$	$p = .37$
Directive (DIRECT)	29	43.81	21.55	27	38.62	20.38	$t(54) = .93$	$p = .36$

Differences are significant at the multiple t-test corrected significance level, $p = .05/12$ (i.e., $p = .004$)

Table 15A

Significant Relations among Joint Attention Variables and Child Social Competence and Behaviour Assessed within the Full Sample (N = 56)

	Frequency MIA	Frequency MIA II	Frequency CIA	Frequency EJA	Frequency CJA	Quality of JA	CJA Score	ASBI
Frequency MIA	1.000							
Frequency MIA II		1.000						
Frequency CIA			1.000					
Frequency EJA	**0.68****	**.27***	**0.30***	1.000				
Frequency CJA	**0.68***		**0.40***	**0.76****	1.000			
Quality of JA				**0.32***	**0.28***	1.000		
CJA Score	**0.27***		**0.31***	**0.39****	**0.46****	**0.66****	1.000	
ASBI					**0.28***		**0.52****	1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
EJA = Established Joint Attention; *CJA* = Consummative Joint Attention; *JA* = Joint Attention
ASBI = Adaptive Social Behavior Inventory Total score

Table 15B

Exploratory Relations among Joint Attention Variables and Child Social Competence and Behaviour Assessed within Hearing Mother-Hearing Child Dyads (n = 29)

	Frequency MIA	Frequency MIA II	Frequency CIA	Frequency EJA	Frequency CJA	Quality of JA	CJA Score	ASBI
Frequency MIA	1.000							
Frequency MIA II		1.000						
Frequency CIA	**-0.41***		1.000					
Frequency EJA	**0.57****			1.000				
Frequency CJA	**0.67***			**0.61***	1.000			
Quality of JA						1.000		
CJA Score						**0.51****	1.000	
ASBI								1.000

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

EJA = Established Joint Attention; *CJA* = Consummative Joint Attention; *JA* = Joint Attention

ASBI = Adaptive Social Behavior Inventory Total score

Table 15C

Exploratory Relations among Joint Attention Variables and Child Social Competence and Behaviour Assessed within Hearing Mother-Deaf Child Dyads (n = 27)

	Frequency MIA	Frequency MIA II	Frequency CIA	Frequency EJA	Frequency CJA	Quality of JA	CJA Score	ASBI
Frequency MIA	1.000							
Frequency MIA II		1.000						
Frequency CIA			1.000					
Frequency EJA	**0.83****			1.000				
Frequency CJA	**0.77***		**0.42***	**0.97****	1.000			
Quality of JA						1.000		
CJA Score				**0.49****	**0.53****	**0.68****	1.000	
ASBI	**0.42***						**0.63****	1.000

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
EJA = Established Joint Attention; *CJA* = Consummative Joint Attention; *JA* = Joint Attention
ASBI = Adaptive Social Behavior Inventory Total score

Table 16

Is joint attention span (i.e., number of exchanges inside an episode of joint attention) related to who initiates the episode of joint attention? Within- and between-group exploratory analyses.

	Hearing mother-hearing child (n = 29)				Hearing mother-deaf child (n = 27)				
	n	Mean	SD	$p < .01$[1]	n	Mean	SD	$p < .01$[1]	$p < .01$[2]
Free Play									
MIA (Attention directing)	98	10.6	13.01		70	11.46	12.10		$p > .006$
vs.				$p > .01$				$p > .01$	
MIA II (Follow-in)	40	13.4	18.28		21	10.33	8.99		$p > .006$
Sum MIA + MIA II	138	11.4	14.72		91	11.20	11.42		$p > .006$
vs.				$p > .01$				$p > .01$	
CIA (Child Initiation Act)	62	14.6	23.04		31	17.55	27.05		$p > .006$
Probe Composite (Bubbles, Laser, Bumble Ball, and Books)									
MIA (Attention directing)	103	30.9	32.31		105	20.79	21.64		$t(206) = 2.67, p < .006$
vs.				$p > .01$				$p > .01$	
MIA II (Follow-in)	14	31.6	25.28		13	22.85	18.29		$p > .006$
Sum MIA + MIA II	117	31	31.45		118	21.02	21.24		$t(233) = 2.86, p < .006$
vs.				$p > .01$				$p > .01$	
Child Initiation Act (CIA)	49	29.2	34.95		37	17.97	21.38		$p > .006$

[1]Differences are significant at the multiple t-test corrected significance level, $p = .05/4$ (i.e., $p = .01$)
[2]Differences are significant at the multiple t-test corrected significance level, $p = .05/8$ (i.e., $p = .006$)

Figure 1A. *Joint Attention Behaviour Chain Following the Display of a Child Initiation Act*

CIA → MR^1 → CR^1 → MR^2 ▶ EJA → Inside JA → MT/CT → Repair act → Regained JA
→ Repair act → Termination of JA
→ Termination of JA (no repair act)

CIA = Child Initiation Act; *MR^1* = Maternal Response to CIA; *CR^1* = Child Response to MR^1; *MR^2* = Maternal Response to CR^1; *EJA* = Established Joint Attention; *CT* = Child Termination Act; *MT* = Maternal Termination Act; *JA* = Joint Attention.

Figure 1B. *Joint Attention Behaviour Chain Following the Display of a Maternal Initiation Act*

MIA*→ CR^1 → MR^1 → CR^2 ▶EJA → Inside JA → MT/CT→ Repair act → Regained JA
→ Repair act → Termination of JA
→ Termination of JA (no repair act)

---

* MIA/MIA II

MIA = Maternal Initiation Act (Attention-Directing); *MIA II* = Maternal Initiation Act II (Follow-In); *CR^1* = Child Response to MIA/MIA II; *MR^1* = Maternal Response to CR^1; *CR^2* = Child Response to MR^1; *EJA* = Established Joint Attention; CT = Child Termination Act; MT = Maternal Termination Act; *JA* = Joint Attention.

Figure 2A. *Process Model of Joint Attention in Hearing Mother-Hearing Child Dyads*

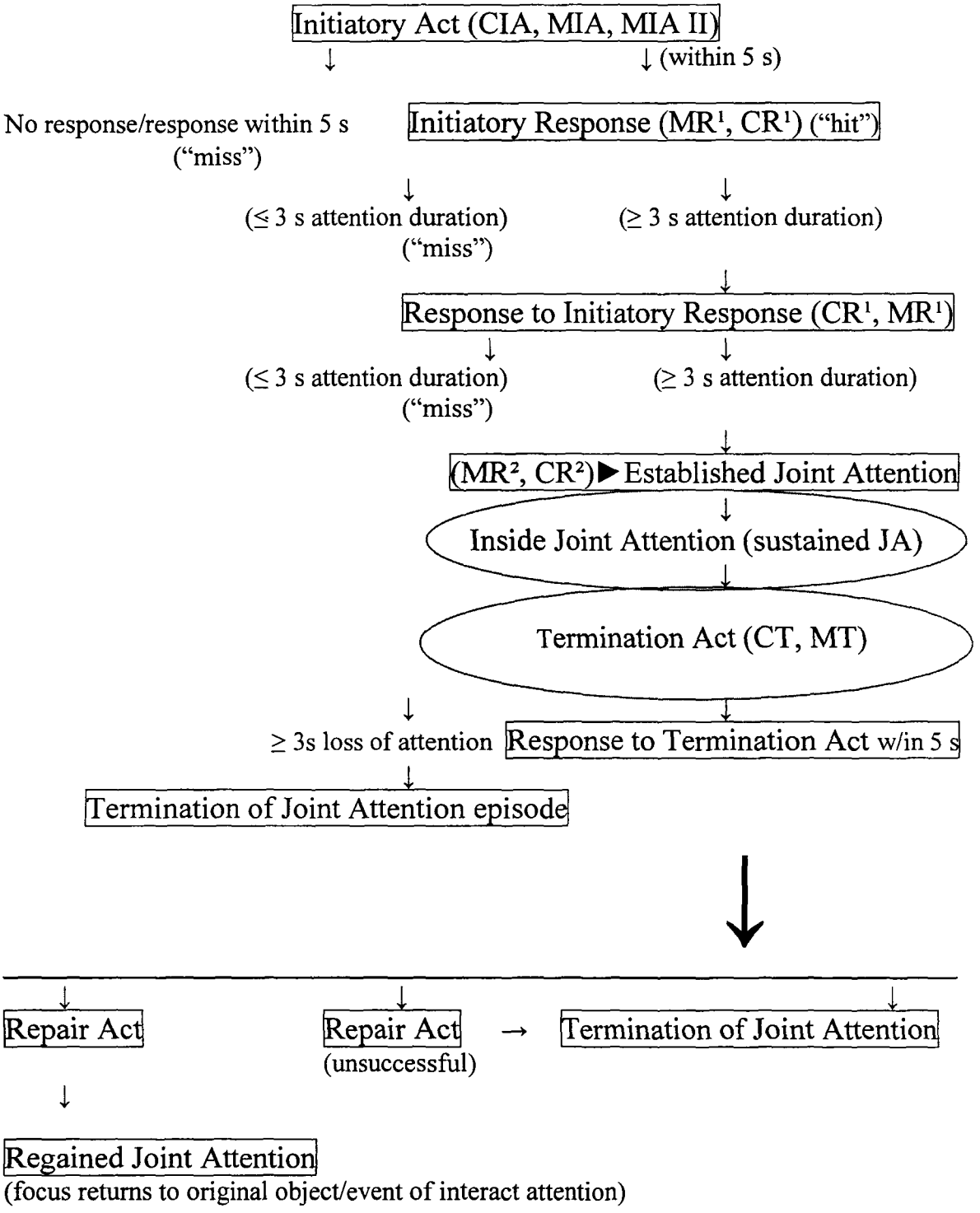


Figure 2B. *Process Model of Joint Attention in Hearing Mother-Deaf Child Dyads*

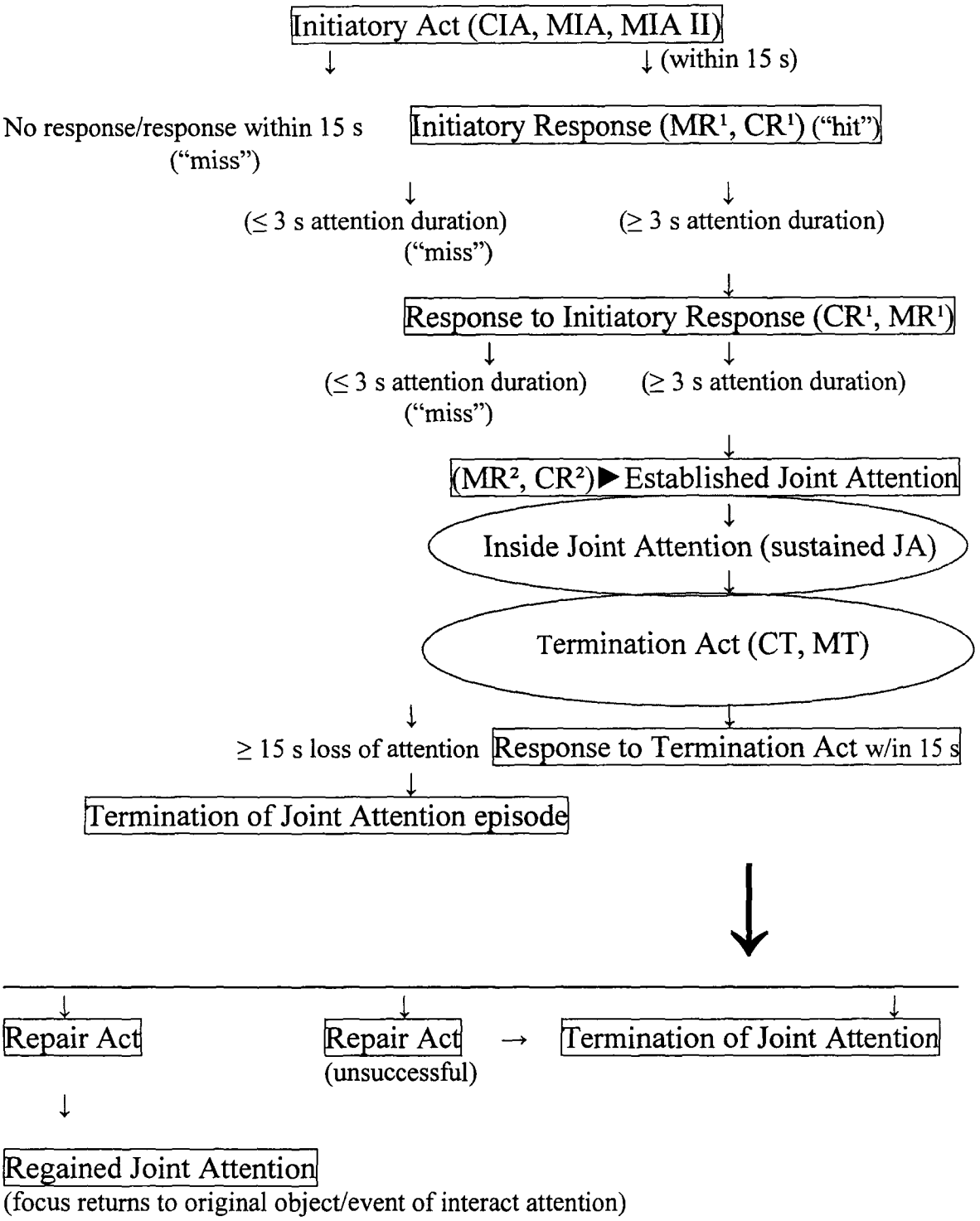


Figure 3. *Frequency of Established Joint Attention (EJA) for Hearing-Hearing (n = 29) and Hearing-Deaf (n= 27) Dyads. p = .01*

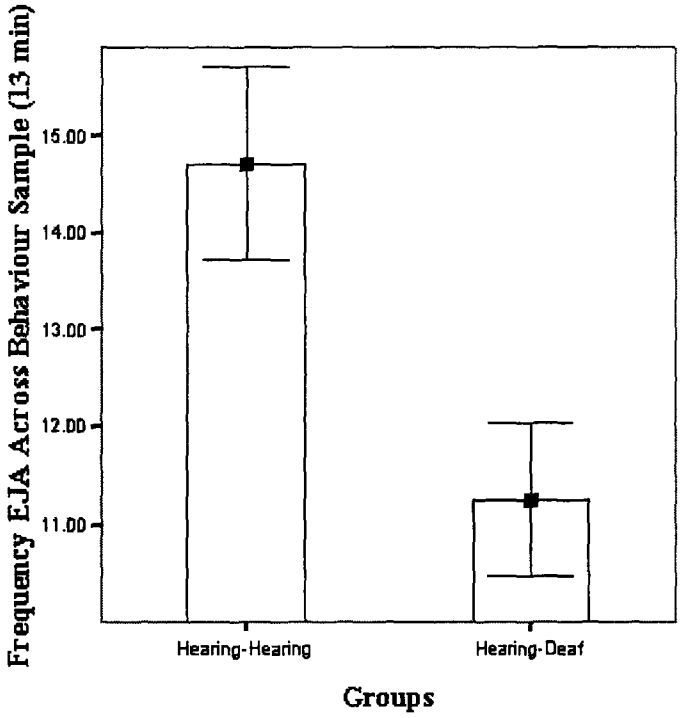


Figure 4A. *Frequency of Consummative Joint Attention (CJA) for Hearing-Hearing (n = 29) and Hearing-Deaf (n = 27) Dyads. p = .03*

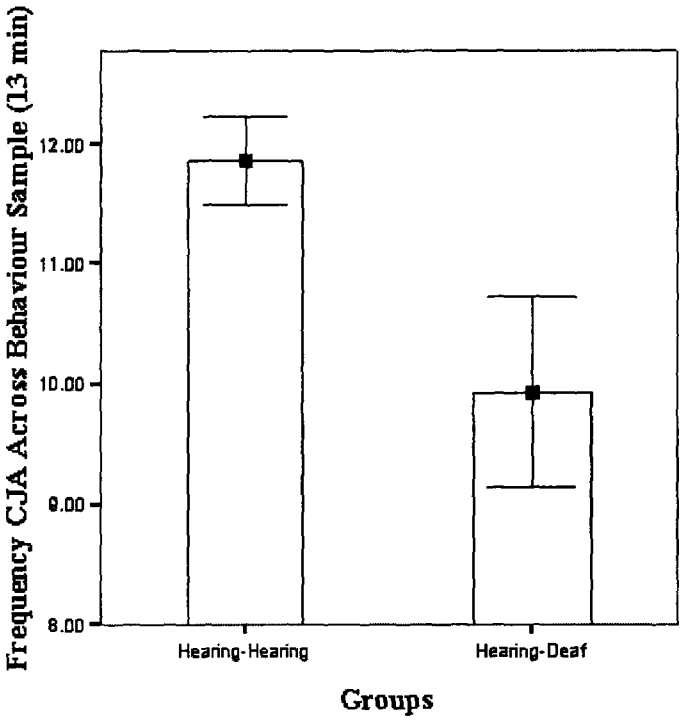


Figure 4B. *Quality of Consummative Joint Attention (CJA score) for Hearing-Hearing (n = 29) and Hearing-Deaf (n = 27) Dyads. $p < .001$*

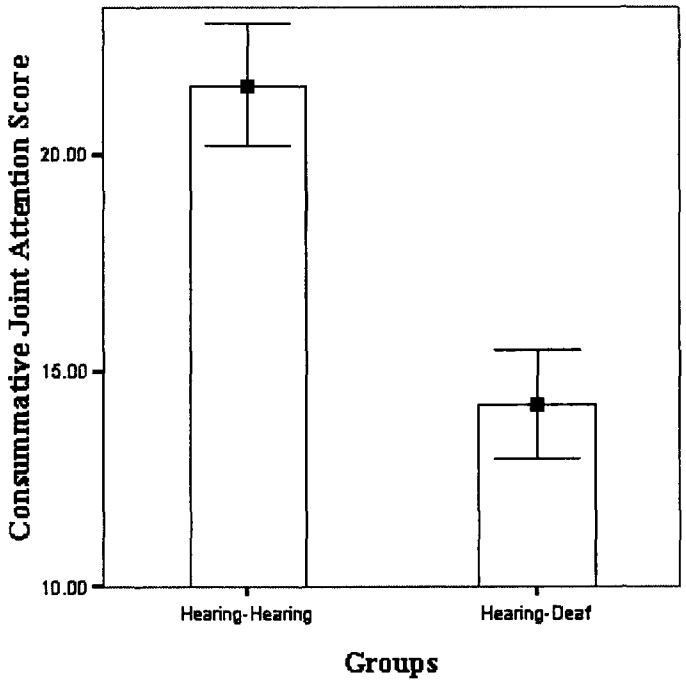


Figure 5. *Independent Observer Global Ratings of the Quality of Joint Attention for Hearing-Hearing (n = 29) and Hearing-Deaf (n = 27) Dyads. $p < .001$*

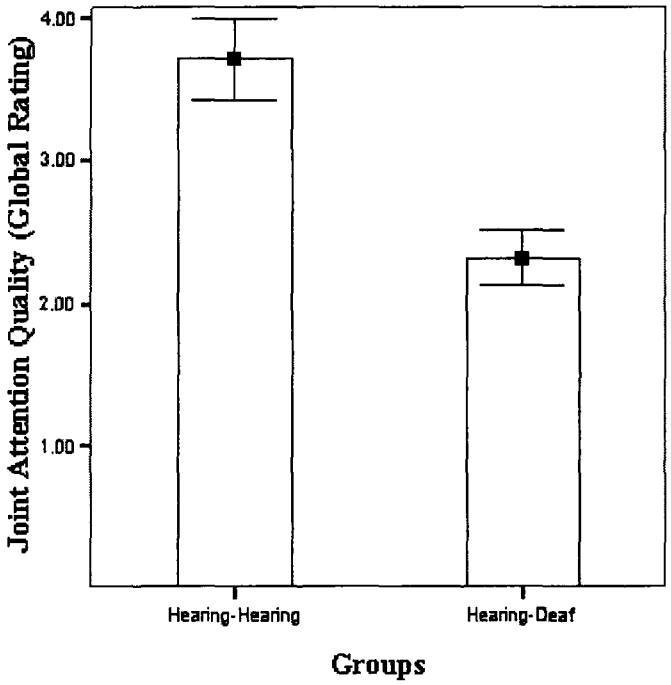


Figure 6. *Maternal Report of Child Social Competence and Behaviour in Hearing (n = 29) and Deaf (n = 27) Children. p = .01*

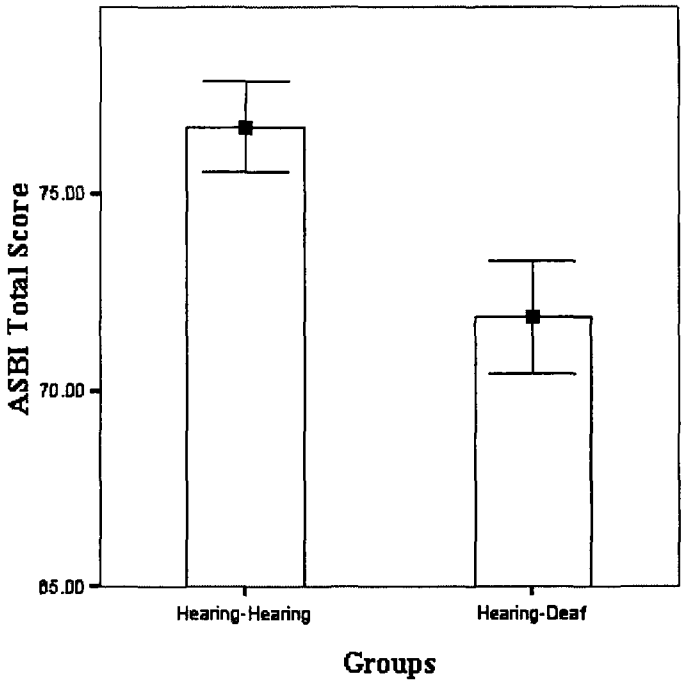


Figure 7. *Frequency of Maternal Simultaneous Auditory Visual Communicatives (simAVC) inside Joint Attention Episodes for Hearing-Hearing (n = 29) and Hearing-Deaf Dyads (n = 27). p = .001*

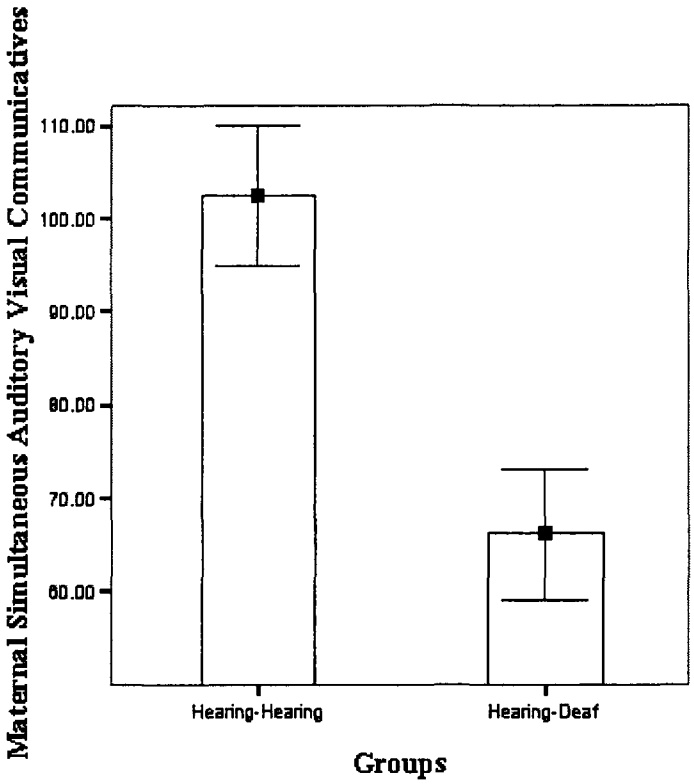


Figure 8. *Frequency of Maternal Sequential Auditory Visual Communicatives inside Joint Attention Episodes for Hearing-Hearing (n = 29) and Hearing-Deaf (n = 27) Dyads. p = .74*

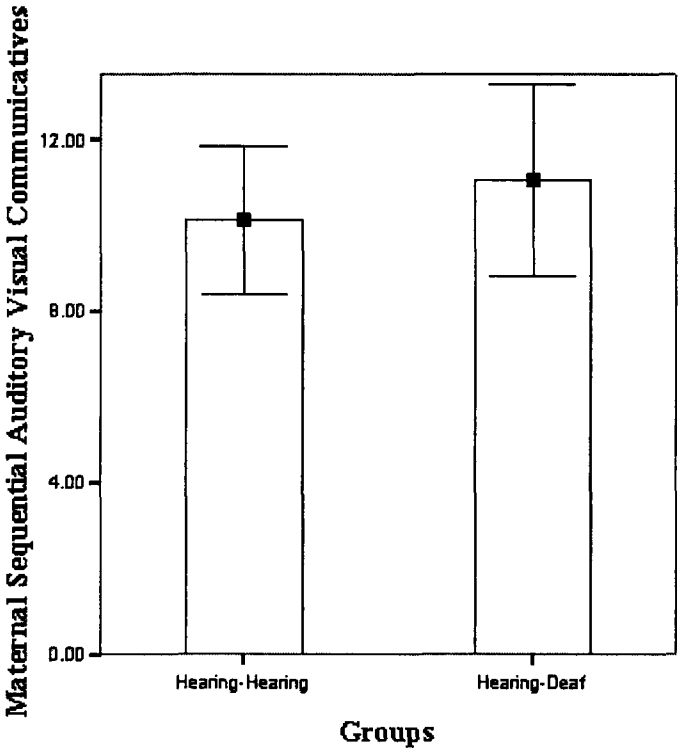


Figure 9. *Frequency of Maternal Nonverbal Communicatives (NVC) inside Joint Attention Episodes for Hearing-Hearing (n = 29) and Hearing-Deaf (n = 27) Dyads. p = .06*

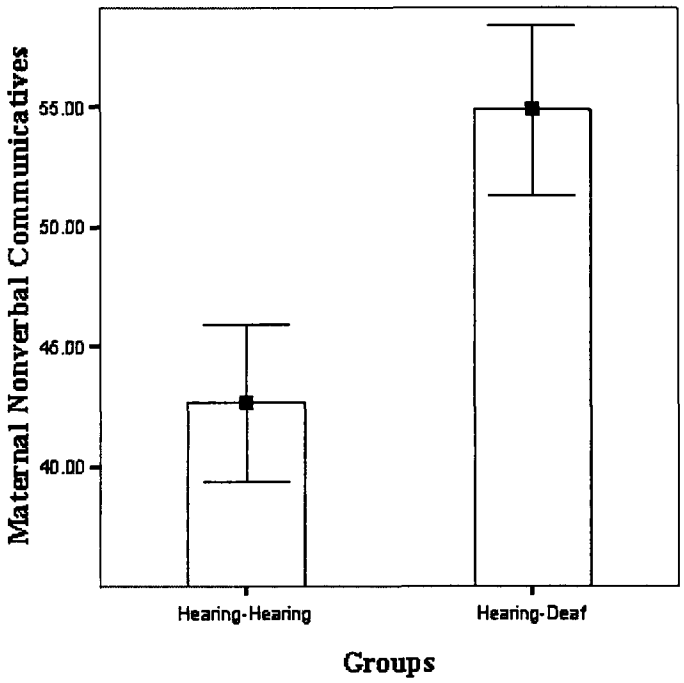
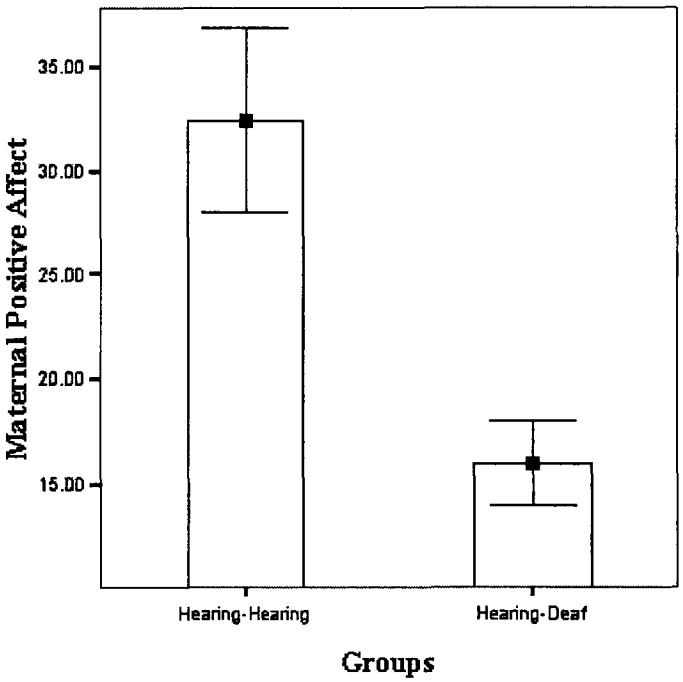


Figure 10. *Frequency of Maternal Displays of Positive Affect Directed toward Hearing (n = 29) and Deaf (n =27) Children inside Joint Attention Episodes. p = .002*



Appendix 1

By way of demonstrating how this model of joint attention compares with some of the existing traditional models of joint attention, I have superimposed (in bold font) the restated operational behaviour chain of joint attention onto the working definitions of five researchers in the field as described earlier.

***Example 1*: Dube et al., (2004)**

MO
↓ (R) (SR+) (SD) (R) (SR+) (SD)
Gaze shift→Adult-attending behaviour→Event-related behaviour →Adult-mediated consequence
CIA **MR^1** **CR^1 to MR^1** **MR^2 to CR^1►EJA**

***Example 2*: Tomasello & Todd (1983); Tomasello & Farrar (1986)**

Tomasello and Farrar (1986) provided the following as an example of joint attention established between a mother and child dyad who participated in their study:

> "The child hands the mother a spoon, looking to her face; she places it in a cup; he takes it out, mouths it, and puts it back in the cup, looking to the mother; they continue this until someone (usually the child) shifts attention. Had the child played with these objects alone, this would not have been a joint attention episode even if the mother was visually focused on the objects throughout."

First, I will juxtapose Tomasello and Todd's (1983) operational definition of joint attention (see left hand column) and Tomasello and Farrar's (1986) exemplar of joint attention established between a mother and child extracted from a video-recording transcript of theirs (see right hand column). Next, I will superimpose (in bold font) the restated joint attention behavioural chain onto the transcript-derived exemplar.

(1) They begin with one member of the dyad initiating interaction with the other;	(1) The child hands the mother a spoon looking to her face;
(2) both members then visually focus on a single object or activity for a minimum of 3 s (either member could look away briefly during an extended interaction)	(2) she places it in a cup; he takes it out, mouths it, and puts it back in the cup, looking to the mother;
(3) the episode terminates if either the mother or the child disengages from the interaction by shifting attention or leaving the scene for more than 3 s or if an outside distraction interrupts the interaction for more than 3 s	(3) they continue with this until someone, (usually the child)shifts attention.
(4) at some point during the joint focus (possibly at initiation) the child directed some overt behavior toward the mother (especially gaze to face) as evidence that he was aware of their interaction, thus excluding onlooking.	

Now, superimposing (in bold font) the restated joint attention behavioural chain onto Thomas and Farrar's exemplar of joint attention:

The child hands the mother a spoon, looking at her face; → she places it in a cup; →
CIA **MR¹**

he takes it out of the cup, mouths it, and puts it back in a cup, looking to the mother; →
CR¹ to MR¹

they continue with this until someone (usually the child) shifts attention.
MR² to CR¹►EJA … and implicit progression of sequence inside JA episode to termination

***Example 3*: Rocissano and Yatchmink (1984)**

The reader is reminded of Rocissano and Yatchmink's (1984) delineation of joint attention as a series of three or more synchronous (i.e., contingent and coordinated) turns that follows the display of an initiation act and which continue until an asynchronous turn (e.g., ignoring the partner's previous turn, redirecting focus of attention) is produced; that is:

Initiation act → synchronous turn 1 → synchronous turn 2 → synchronous turn 3 = JA →
CIA (MIA) MR¹ (CR¹) CR¹ (MR¹) MR² (CR²) ►EJA

asynchronous turn → JA ends
MT/CT → Repair act → Regained JA
→ Repair act → Termination of JA
→ Termination of JA (no repair act)

Example 4: **Wetherby and Prizant (2002)**

The reader is referred to Wetherby and Prizant's earlier stated clarification of joint attention coding on page 68 of the CSBS DP manual; specifically:

> After putting the lid on the bowl, she (21-mos old Camille) said, "Hot hot." (Notice that the first time Camille said, "Hot hot," it was not counted as a communicative act because it was not directed. Then, her mom said, "Hot dogs." Camille clarified what she was saying by repeating "hot hot" while looking at her mom. This second production of "hot hot" was a nice example of joint attention.

Working from the point where Wetherby and Prizant considered joint attention to begin:

Then, her mom said, "Hot dogs." → Camille clarified what she was saying by repeating "hot hot"
MIA II **CR[1]**

while looking at her mom.

Note, that in terms of the restated operational definition of joint attention, Camille and her mother would not be considered to have established joint attention with one another (yet).

***Example 5*: Spencer et al. (1992)**

Spencer and her colleagues asked two questions of their data which I have translated in terms of my restated operational definition of joint attention.

Question 1 asked whether mothers of hearing and deaf children follow in to the child's focus of attention in an attempt to elicit JA. Translated, Question 1 examines the frequency of **MIA II** acts (i.e., *respond* or possibly, *wait*) produced by mothers in interaction with their hearing and deaf children (through *respond* or possibly, *wait*).

Question 2 asked whether deaf mothers of deaf children, compared with hearing mothers of hearing children and hearing mothers of deaf children, use different strategies to provide responses to the deaf child without interfering with the child's ability to establish visual attention to objects once the child had responded to the mother's initial follow-in act. Translated, Question 2's target behavioural variable is **MR^1**; that is, the third variable in the behavioural chain such that MIA II $\rightarrow$ CR^1 $\rightarrow$ **MR^1.**

Appendix 2

SAMPLE LETTER OF INFORMATION TO PARENTS OF DEAF CHILDREN

Would you and your child like to join a child development study?

Susan Tasker is a doctoral student from the Psychology Department at McMaster University, Hamilton, and would like to invite you and your child to participate in a study as part of her doctoral dissertation.

Specifically, Susan is interested in understanding how little children born deaf come to understand that their feelings, 'wantings', thinking, and actions are separate from another persons, and that other people have their own feelings, desires, and thoughts too. The abilities to appreciate the 'minds' of others and to engage in shared or joint experiences with others, plays a very important part in the early development and social adjustment of a little child.

Susan is writing to you to ask you, as a mother-and-child pair, whether you and your little one will help her to learn more about how children born deaf grow and learn and change with time, and how different children understand, interpret, and interact with their world as they develop, grow, learn, and change.

If you express an interest in participating in the study, Susan will contact you by phone, introduce herself, and answer any questions you may have. If you are still interested, together we will arrange a visit in your home at a time convenient to you. The visit should take about 45 minutes. During this time, you will be asked to complete some checklist questionnaires, and your child will be invited to play with different toys that Susan will bring with her. Susan will be videorecording your child's play and interaction behaviors so that she can code the behaviors from the video at a later time point in the laboratory at McMaster University.

Your answers and your child's participation will remain confidential; no names will be used and only group data will be reported. Also, you are free to withdraw from the study at any time.

Thank you for considering this request. Should you so wish, please feel free to contact Susan at: 905 525-9140 Ext: 24798 or by e-mail: taskersl@mcmaster.ca

If you are interested in possibly participating in the study and are happy for Susan to contact you, please indicate below:

Name of parent: _____ Name of your child: _____

Your child's date of birth: _____ Today's date: _____

Telephone numbers: (H) _____ (B) _____

Anything that you would like Susan to know before she calls you? _____

_____

_____

Appendix 3A (Deaf Children)

Subject ID: _____ CONSENT TO PARTICIPATE IN RESEARCH

Early social development in deaf children with hearing mothers: Investigation among group of children between 18 and 36 months of age.

You are asked to take part in a research study conducted by Dr. Louis A. Schmidt and Susan L. Tasker, a doctoral student, from the Psychology Department at McMaster University, Hamilton. The results of this study will contribute to Susan Tasker's doctoral research.

If you have any questions or concerns about the research, please feel free to contact either Dr. Louis Schmidt 905 529-5140 ext: 23028 or Susan Tasker at 905 529-5140 ext: 24798.

The purpose of the study is to learn more about how children born deaf come to make sense of their daily world and people around them. This ability is important for children's social and emotional development.

Specifically, the study is designed to see how deaf children respond in their social world when they are playing freely on the floor with interesting and different toys and books and other play things.

The information Susan obtains from this study will be able to help parents and caregivers of deaf children to better understand the special way in which their children communicate and how they, as parents, can best help and support their little child's social and behavioural development.

If you are happy to take part in this study, Susan will ask you to complete a set of questionnaires that ask about your child and how you are managing as a caregiver. You will then be invited to sit on the floor with your child while he or she plays with a set of toys that Susan brings with her, and after about 2 to 10 minutes of free play, Susan will ask you to blow bubbles for your child. After this, Susan will activate two active objects for about 1-minute each. These objects will move around the floor area where you and your child will be seated. Next, Susan will ask you to let your child show you a book that he chooses from those she brings with her, and then Susan will give your child some playdough to play with for the last 3-minutes of play. The play session will be video recorded for later coding in the laboratory.

The total length of time for participation should be no more than one to one and a half hours at the most. Susan will be happy to send you the results from the study when it is complete.

There are no risks or discomforts for either you or your child. But, if your child does become upset at any point during the visit, Susan will ask you whether you would like her to stop the testing, and she will happily do this.

While your child does not stand to directly benefit from participation in this study, he or she will be helping towards future research and intervention in children who are deaf. Your child will receive an age-appropriate toy as a token of appreciation for participating in the study.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. All written records, video tapes, and questionnaires will be stored in a locked cabinet within a secure area of Dr. Schmidt and Susan's laboratory. Only Susan's supervisor, Dr. Schmidt, Susan, and assigned research assistants will have access to the information and video recording for the purposes of coding and scoring. You retain the right to see the video tape of your child's participation at any time. Permission and consent will be obtained directly from the parent should Susan wish to use the tape for educational or professional purposes (e.g., professional conference). If this is not the case, the video tape will be erased and destroyed upon completion of data analyses.

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your data from the study. You may also refuse to answer any questions you do not want to answer and still remain in the study. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through both the McMaster Research Ethics Board (MREB) and by the Research Ethics Committee, Provincial Schools for the Deaf, Belleville Ontario (Ontario Ministry of Education and Training). If you have questions regarding your rights as a research participant, please contact:

MREB Secretariat McMaster University 1280 Main Street W., GH-306 Hamilton, ON L8S 4L9	Telephone: 905.525.9140 ext. 23142 E-mail: srebsec@mcmaster.ca Fax: 905.540.8019
Dr. Richard Dart, C. Psych Ernest C. Drury School for the Deaf Milton, Ontario	Telephone: 905.878.2851 ext. 268 E-mail: richard.dart@edu.gov.on.ca
Dr. Ken Palmer, C. Psych Sir James Whitney School for the Deaf Belleville, Ontario	Telephone: 1 800 501-6240 ext. 370 E-mail: ken.palmer@edu.gov.on.ca

Dr. Cathy Chovaz McKinnon, C. Psych
Robarts School for the Deaf
London, Ontario

Telephone: TTY 519.434.5019
E-mail: cjpsych@rogers.com

Thank you for considering this request.

SIGNATURE OF RESEARCH PARTICIPANT/LEGAL REPRESENTATIVE

I understand the information provided for the study **"Early social development in deaf children with hearing mothers"** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study.

Name of Participant	Name of Parent
Signature of Parent	Date Telephone number(s)

Postal Address: _____

SIGNATURE OF INVESTIGATOR
In my judgement, the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

Signature of Investigator	Date

Appendix 3B (Hearing Children)

Subject ID: _____ CONSENT TO PARTICIPATE IN RESEARCH

Early social development in children born deaf: Investigation among a comparison group of hearing children between 18 and 36 months of age.

You are asked to participate in a research study conducted by Dr. Louis A. Schmidt and Susan L. Tasker, a doctoral student, from the Psychology Department at McMaster University, Hamilton. The results of this study will contribute to Susan Tasker's dissertation.

If you have any questions or concerns about the research, please feel free to contact either Dr. Louis A. Schmidt at 905 529-5140 ext: 23028 or Susan Tasker at 905 529-5140 ext: 24798. The purpose of the study is to learn more about how hearing children, compared with children born deaf, come to make sense of their day-to-day worlds and to understand that their thinking, beliefs, desires, and feelings are separate, and may be different, from somebody else's. An understanding of other minds is considered fundamental to emotional and social adjustment in childhood.

The study is designed to assess how deaf infants compared with same age hearing children communicate and engage their social world in free play.

With the information we obtain from this study, we will be able to help parents and caregivers of deaf infants to adjust to the special communicative style of their children in such as way as to facilitate social development and behavioural adjustment.

If you volunteer to participate in this study, we would ask you to complete a set of questionnaires designed to collect information on your child, and how you have managed and adjusted to your role as caregiver. We will then provide your child with a set of novel and conventional toys to play with for a period of 15 minutes. Free play will be video recorded for later coding in the laboratory. After 5 minutes of free play, there will be short periods of play for you and your child with bubbles, following a light and a battery operated toy, sharing of books, and play with playdough.

Your child has been assigned to a hearing child comparison group. The total length of time for participation should be no longer than 45 minutes. Research findings will be made available to participants at the completion of the study.

There are no risks or discomforts associated with participation in this study. However, should your child become upset at any point during the visit, we will discontinue the testing at your discretion.

While your child does not stand to directly benefit from participation in this study, his/her contribution to the understanding of early psychological development, specifically sociocognitive and socioemotional development, will be of benefit to future research and intervention endeavours within the field. Most importantly, beginning from January 2003, the Ontario Ministry of Health and Long-Term Care insitituted provincial wide Universal Newborn Hearing Screening, with the direct purpose of identifying Bilateral Permanent Hearing Loss before 6 months of age. Findings of this dissertation research will contribute to early intervention understanding and practise in guiding parents and caregivers to accommodate and adjust to their infant's deaf-visual mode of early communication in such a way that early processes of social emotional development are optimally facilitated and established.

Your child will receive an age-appropriate toy as a token of our appreciation for participating in the study.

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. All written records, video tapes, and questionnaires will be stored in a locked cabinet within a secure area of Dr. Schmidt's laboratory. Only Dr. Schmidt, Susan Tasker, and assigned research assistants will have access to the data for the purposes of coding and scoring. Participating parents retain the right to review the video tape of their child's participation at any time. Permission and consent will be obtained directly from the parent should one of the investigators wish to use the tape for educational or professional purposes (e.g., professional conference). If this is not the case, the video tape will be erased and destroyed on completion of data analyses.

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your data from the study. You may also refuse to answer any questions you do not want to answer and still remain in the study. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the McMaster Research Ethics Board (MREB). If you have questions regarding your rights as a research participant, please contact:

MREB Secretariat
McMaster University
1280 Main Street W., GH-306
Hamilton, ON L8S 4L9

Telephone: 905-525-9140, ext. 23142
E-mail: srebsec@mcmaster.ca
Fax: 905-540-8019

Thank you for considering this request.

SIGNATURE OF RESEARCH PARTICIPANT/LEGAL REPRESENTATIVE

I understand the information provided for the study **"Early social development in children born deaf"** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____ _____

Name of Participant Name of Parent

_____ _____

Signature of Parent Date Telephone number(s)

Postal Address: _____

SIGNATURE OF INVESTIGATOR

In my judgement, the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

_____ _____

Signature of Investigator Date

Appendix 4A (Deaf Children)

Date: _____

Subject: _____

Child's gender: **Male** **Female**

DEMOGRAPHIC INFORMATION

The following questions are required to describe the children and parents participating in this study as a group. No individual will be identified in any report of this study.

1. Date of your child's birth? _____
2. Age of child when hearing loss was identified? _____ (months)
3. Who confirmed your child's hearing loss? _____
4. How was this confirmation reached? _____
5. Age of child when you knew something "wasn't right"? _____ (months)
6. Communication option (i.e., ASL, AV, Oral, TC) at home? At school? Age(s) when communication option(s) instituted? _____

   _____

   _____
7. How often does your child have a story verbally told and/or signed to him/her? (on average per week) _____
8. What is your child's favourite story? _____
9. Is your child curious? _____
10. What makes you think this? _____
11. What is your age? _____ (years)
12. Are you hearing, hard of hearing, or deaf? _____

13. What is your present family arrangement?

    1 two parent family
    2 single parent family

14. Is this your first experience being a parent?

    1 yes 2 no

15. If no, please list other children by age, and indicate gender and hearing status:

    Age _____ male female hearing hard of hearing deaf

    Age _____ male female hearing hard of hearing deaf

    Age _____ male female hearing hard of hearing deaf

    Age _____ male female hearing hard of hearing deaf

16. What is the highest level of education that you have completed?

    1 less than 7th grade
    2 junior high school (9th grade)
    3 partial high school (10th or 11th grade)
    4 high school graduate
    5 partial college (at least 1 yr. or specialized training)
    6 standard college or university graduate
    7 graduate professional training (MA, MSc, MD, MBA, PhD)

17. What language do you speak at home?

    1 English as first language
    2 Other language as first language; please specify _____
    3 English as second language
    4 Other language as second language; please specify _____

18. Does your child attend daycare or preschool? If yes, how many days (and hours per day) per week on average? _____

Should you wish to do so, please note any other comments in the space provided below:

_____

Thank you.

Appendix 4B (Hearing Children)

Date: _____

Subject: _____

Child's gender: **Male** **Female**

DEMOGRAPHIC INFORMATION

The following questions are required to describe the children and parents participating in this study as a group. No individual will be identified in any report of this study.

19. Date of your child's birth? _____

20. How often does your child have a story told to him/her? (on average per week)

_____

21. What is your child's favourite story? _____

22. Is your child curious? _____

23. What makes you think this? _____

24. What is your age? _____ (years)

25. Are you hearing, hard of hearing, or deaf? _____

26. What is your present family arrangement?

1 two parent family
2 single parent family

27. Is this your first experience being a parent?

1 yes 2 no

28. If no, please list other children by age, and indicate gender and hearing status:

Age _____ male female hearing hard of hearing deaf

Age _____ male female hearing hard of hearing deaf

Age _____ male female hearing hard of hearing deaf

Age _____ male female hearing hard of hearing deaf

29. What is the highest level of education that you have completed?

1 less than 7th grade
2 junior high school (9th grade)
3 partial high school (10th or 11th grade)
4 high school graduate
5 partial college (at least 1 yr. or specialized training)
6 standard college or university graduate
7 graduate professional training (MA, MSc, MD, MBA, PhD)

30. What language do you speak at home?

1 English as first language
2 Other language as first language; please specify _____
3 English as second language
4 Other language as second language; please specify _____

Should you wish to do so, please note any other comments in the space provided below:

_____

_____

_____

Thank you.

Appendix 5

Date: _____ Subject: _____

The ADAPTIVE SOCIAL BEHAVIOR INVENTORY*

Please circle the number/ response that best describes your child.

RARELY or NEVER	SOMETIMES	ALMOST ALWAYS	
1	2	3	**1.** Understands others' feelings, like when they are happy, sad or mad
1	2	3	**2.** Is helpful to other children
1	2	3	**3.** Is obedient and compliant
1	2	3	**4.** When you give him/her an idea for playing, he/she frowns, shrugs shoulders, pouts or stamps foot
1	2	3	**5.** Follows rules in games
1	2	3	**6.** Gets upset when you don't pay enough attention
1	2	3	**7.** Sympathetic toward other children's distress, tries to comfort others if they are upset
1	2	3	**8.** Waits his/her turn in games or other activities
1	2	3	**9.** Is open and direct about what he/she wants
1	2	3	**10.** Co-operates with your request
1	2	3	**11.** Can easily get other children to pay attention to him/her
1	2	3	**12.** Says or signs[1] nice or friendly things to others
1	2	3	**13.** Will join a group of children playing
1	2	3	**14.** In social activities, tends to just watch others
1	2	3	**15.** Follows household or family rules
1	2	3	**16.** Says or signs[1] "Please" and "Thank you" when reminded
1	2	3	**17.** Asks or wants to go play with other children
1	2	3	**18.** Is calm and easy-going
1	2	3	**19.** Plays games and converses[1] with other children
1	2	3	**20.** Shares toys or possessions

RARELY or NEVER	SOMETIMES	ALMOST ALWAYS	
1	2	3	**21.** Teases other children, uses name-calling
1	2	3	**22.** Is confident with other people
1	2	3	**23.** Prevents other children from carrying out routines
1	2	3	**24.** Tends to be proud of things he/she does
1	2	3	**25.** Accepts changes without fighting against them or becoming upset
1	2	3	**26.** Bullies other children
1	2	3	**27.** Is interested in many and different things
1	2	3	**28.** Is worried about not getting enough
1	2	3	**29.** Is bossy, needs to have his/her way
1	2	3	**30.** Enjoys conversing with you

[1] Modified by Susan Tasker to accommodate deaf children's communication modalities.

Appendix 6

Works incorporating the ***Adaptive Social Behavior Inventory*** **(ASBI)** as a measure of early social adaptive competence and behaviour

Base Reference/Primary Citation:

Hogan, A. E., Scott, K. E., & Bauer, C. R. (1992). The Adaptive Social Behavior Inventory (ASBI): A new assessment of social competence in high-risk three-year-olds. *Journal of Psychoeducational Assessment, 10*, 230 – 239.

Other Citations:

Bradley, R. H., Whiteside, L., Mundfrom, D. J., Blevins-Knabe, B., Casey, P. H., Caldwell, B. M., Kelleher, K. H., Pope, S., & Barrett, K. (1995). Home environment and adaptive social behavior among premature, low birth weight children: alternative models of environmental action. *Journal of Pediatric Psychology, 20,* 347 – 362.

Greenfield, D. B., Iruka, I. U., & Munis, P. (2004). Assessment of social competence in high risk preschoolers: Evaluation of the Adaptive Social Behavior Inventory (ASBI) across home and school settings. *Journal of Psychoeducational Assessment, 22*(3), 223.

Houck, G. M., & LeCuyer-Maus, E. A. (2002). Maternal limit-setting patterns and toddler development of self-concept and social competence. *Issues in Comprehensive Pediatric Nursing, 25,* 21 – 41.

Scott, K. G., Hogan, A. E., & Bauer, C. R. (1997). Social competence: The Adaptive Social Behavior Inventory (ASBI). In R. T. Gross, D. Spiker, & C. W. Haynes (Eds.), *Helping Low Birth Weight, Premature Babies* (pp. 335 – 340). Stanford, California: Stanford University Press.

Sheinkopf, S. J., Mundy, P., Claussen, A. H., & Willoughby, J. (2004). Infant joint attention skill and preschool behavioral outcomes in at-risk children. *Development and Psychopathology, 16,* 273 – 291.

The National Impact Evaluation of the Comprehensive Child Development Program (CCDP), (1997). U.S. Department of Health and Human Services, Administration for Children and Families. Retrieved from the web 18/01/2005 http://www.acf.hhs.gov/programs/core/pubs_reports/ccdp/ccdp_intro.html

The National Institute of Child Health and Human Development (NICHD) Study of Early Child Care (1994). Documentation of the research is available in the publication, NICHD Early Child Care Research Network (1994). Child Care and Child Development: The NICHD Study of Early Child Care. In S. L. Friedman and H. C. Haywood (Eds.), *Developmental Followup: Concepts, Domains and Methods*, (pp. 377 – 396). New York: Academic Press. Retrieved from the web 17/01/2005 http://www.childcareresearch.org/location/ccrca383

Appendix 7

Date: _____

Subject: _____

BEHAVIOR SAMPLE: CAREGIVER PERCEPTION RATING

Please tell us whether your child's behavior and responses during the study today compare with how he/she usually behaves and responds in similar situations. Please circle the MOST CORRECT response description.

	1	2	3
1. **Alertness**	less than usual/ sleepy	typical	more alert than usual
2. **Emotionality**	more negative than usual	typical	more positive than usual
3. **Level of interest and attention**	less interest than usual	typical	more interest/ more attention
4. **Comfort level**	more cautious/wary than usual	typical	more comfortable/relaxed than usual
5. **Activity level**	less active than usual	typical	more active than usual
6. **Overall level of communication**	less than usual	typical	greater than usual
7. **Play behavior**	less organized and less focused	typical	more organized and more focused

Comments:

_____

_____

_____

Thank you.

Appendix 8

SAMPLE INVENTORY OF BEHAVIOURAL AND COMMUNICATIVE ACTS INVOLVED IN THE NEGOTIATION, MAINTENANCE, AND TERMINATION OF JOINT ATTENTION

(1) Representative Forms of Initiation Acts CIA, MIA, MIA II

ATTENTION-SEEKING OR DIRECT-TO-SELF ATTENTION BEHAVIOUR

Attention-seeking (Prendergast & McCollum, 1996) or ***direct-to-self attention behaviour*** (Spencer, 2000) includes visual, vocal, motor, and tactile direct-to-self acts and showing-off behaviour. Physical strategies might include *rhythmic activities* (Koester & Meadow-Orlans, 1999; Smith-Gray & Koester, 1995) such as repetitious hand and arm waving, kicking and/or cycling of the feet, rocking, opening and closing the hands, or jumping up and down to attract the mother's attention, or tapping on the floor, child, or object to get the child's visual attention (Prendergast & McCollum, 1996).

COMMENT

Comment on object or action includes verbal and gestural acts used to direct the partner's attention to the referent object or action/activity or to follow into the partner's focus of attention. For example:
C: Putting farmer in the truck (no social cues directed to mother)
M: *Go take the farmer for a ride on the farm?* (i.e., the mother's comment follows into the child's focus of attention)

DIRECTIVE

Directives or ***commands*** are statements or instructions used to lead or control the topic of the desired joint attention interaction, for example: *show me the*; *find the*; *bring the*; *give me the* (Schwartz & Miller, 1996, p. 109).

GAZE BEHAVIOUR

Gaze behaviour is a well-established index of attention-eliciting behaviour (Koester & Meadow-Orlans, 1999). Specifically, the initiating partner directs gaze (or visual focus) on the recipient's face (Harris, 2001; Ochs & Schieffelin, 1979, p. 3; Prendergast & McCollum, 1996; Smith-Gray & Koester, 1995) for at least two consecutive seconds without a vocal prompt or touching the recipient. Note: For gaze behaviour to be considered as an initiation act, the partner to whom the gaze is directed must not be actively engaged with the initiating partner or seeking her attention (Prendergast & McCollum, 1996). That is, only when gaze occurs spontaneously in this way, does it function as a "summons to attend" (Ochs, 1979, p. 58).

GAZE SHIFT

Gaze shift or ***three-point gaze shift*** involves shifting eye gaze between the recipient partner, the object of interest, and back to the recipient partner (or, object-person-object) (Wetherby & Prizant, 2002, p. 78) and which may or may not be accompanied by other vocal or gestural acts. For example, the child displays a gaze shift when she looks at the bubble jar, then looks up at the mother's face, and then looks back to the bubble jar.

GESTURE

Gesture functions to invite or elicit a social partner's attention (Ochs, 1979, p. 3) and includes the following categories noted by Namy et al. (2000):

1. *deictic gestures* (e.g., pointing and 'trace' gestures e.g., the mother uses her finger to trace or outline the shape of an object illustrated in the book)
2. *conventional gestures* (e.g., shaking the head to mean "no;" *show, give,* and *offer* gestures) (see below)
3. *representational gestures* (e.g., extending and retracting the index finger to indicate a snail; homesign and formal ASL signs)
4. *emphatic gestures* (e.g., extending the arms outward and toward the social partner)

More on conventional gestures

Conventional gestures are everyday familiar gestures used by hearing-speaking/listening social partners. For example, *show, offer,* and *give* gestures are all classed as conventional gesture. Conventional gestures such as "calling" the partner's attention by crooking the index finger and turning both palms up with shoulder shrugging for *What?* or with visual scanning for *Where?*" are most representative of spontaneous (i.e., not elicited) *gesture* in mother-child interaction (Prendergast & McCollum, 1996). Two other *conventional* and prototypic joint attention gestures are *Initiation Act-Shows* and *Initiation Act-Offers* (Mundy, Hogan, & Doehring, 1996, pp. 15 - 16):

***Show* gestures** or *Initiation Act-Shows* include, for example: holding a toy up or out towards the recipient partner while looking at, gesturing, or directing vocalizations to the recipient partner; pointing or gesturing towards a toy or event that the recipient partner is not engaged with or attending to or perhaps even noticed (such as the red point

light in the Laser Pointer task); demonstrating how something works or what actions can be done to an object; showing the recipient partner an action with the toy while "calling" the recipients attention to the toy through vocal or gestural acts such as hand waving. Note: To distinguish a *show* gesture from a *give* gesture, the initiating partner must demonstrate resistance by quickly retracting the object being shown to the recipient (Mundy et al., 1996, p. 17).

***Offer* gestures** or *Initiation Act-Offers* are *giving* gestures that are displayed with eye contact (Mundy et al., 1996, p. 16) and do not necessarily result in the release or giving of the object to the recipient of the *offer* gesture (Newland, Roggman, & Boyce, 2001). *Offer* gestures are displayed, for example, when the initiating partner extends the object toward the recipient, moves or places the object in front of the recipient, or on the recipient's lap.

Conventional gestures also include deictic, distal gestures eye and finger pointings (Priesler & Ahlström, 1997), open-hand reaching, pointing at a distance, and waving (Wetherby & Prizant, 2002, p. 13).

GREETINGS
Greeting acts are used by the initiating partner to indicate that she has noticed the presence of a person or object and to signal the desire for interaction with the social partner (from Wetherby & Prizant, 2002, p. 50).

IMITATION
Imitation acts match or repeat the social partner's vocal, facial, gestural, or motor behaviour

INVITATIONS
Invitations (Prendergast & McCollum, 1996) include suggestions and ideas expressed in ways such as *I know! Let's pretend that ....*

LABELING

Labeling or naming (Priesler & Ahlström, 1997) in the form of a statement can function to pull or direct the recipient's attention to the object (e.g., *duck!*) or event (e.g., *light!*). *Labeling* also serves as a way for one or other of the mother or child to move or follow into the focus of the other (Tomasello & Farrar, 1986) (e.g., the child is playing with the doll and the mother says *Dolly! Pretty dolly.)*

MIRRORING

Mirroring occurs when the one or other of the mother or child mirrors the posture, vocal intonation, or other movements of the partner, or reflects back to the other something of, or about, the other's own self (Chatoor, Egan, Getson et al., 1987) (e.g., *You are so clever! Wow, look what you can do! You made a pizza! You are so polite!*). Mirroring is qualitatively distinguishable from imitation and reciprocity.

NONVERBAL SIGNALS

Nonverbal elicitors of attention include the following examples grouped according to modality:

1. Motor movement

Body movement and postures (Greenspan, 1990; Koester & Meadow-Orlans, 1999; Marschark, Lang, & Albertini, 2002, pp. 70 – 74; Patterson, 1982; Priesler & Ahlström, 1997; Spencer, 2000; Stern, 1974) that communicate interest, surprise, attention etc.:

Examples:
Mother moves face closer in or further out as a display of interest or surprise
Head postures – wagging, cocking
Emphatic shaking of hands and arms
Waves hands or arms

Approach and withdrawal movements with whole body, face, or hand (Braungart-Rieker, Garwood, Powers, & Notaro, 1998; Brazelton, 1982; Greenspan, 1990; Stern, 1974; Stifter & Braungart, 1995; Tronick & Gianino, 1986)

Examples:
Pulls or tugs at mother
Climbs onto mother
Turning toward

Vocalizations (Braungart-Rieker, Garwood, Powers, & Notaro, 1998; Greenspan, 1990; Mertan, Nadel, & Leveau, 1993, pp. 190 – 201; Ochs & Schieffelin, 1979, p. 3; Stern, 1974; Tronick & Gianino, 1986)

Examples:
Laughter
Increased pitch or loudness of voice

Whispers
Hums
Say or calls "mommy" "mama" "mmmm" etc.
Says or calls child's name
Squeals (as in a squeal of delight or excitement)
Child babbling as if "telling" or "asking" mother something
Flowing or breathy [h] sounds e.g., hi, ha, oh, ah
Nasalized prolonged falling intonation sound [n]

Other behaviours that communicate interest and serve as bids for joint attention include the following:
Examples:
Mother give child the bubble jar
Mother (child) is interested in what child (mother) is doing
Suggests
Requests and demands
Tapping on the floor or on objects to get attention or to draw attention to
Clapping

POSITVE AFFECT: EXPRESSIONS AND BEHAVIOUR

Affective expressions and behaviour are universal prelinguistic communication modalities (Mundy, Hogan, & Doehring, 1996, p. 15) and include facial expressions, gestures, and vocalizations such as smiles, eye-winks, laughs, squeals of delight, and giggles that are directed to the social partner (Brown & Dunn, 1991; Braungart-Rieker, Garwood, Powers, & Notaro, 1998; Harris, 2001; Ochs, 1979, p. 3; Smith-Gray & Koester, 1995; Schwartz & Miller, 1996, p. 109; Tronick & Gianino, 1986; Vandell & George, 1981), displays of affection such as kisses, hugs, tickles (Calkins & Johnson, 1998; Green, Gustafson, & West, 1980), approach movements that increase proximity between the mother and child (Stern, 1974), and any exaggerated changes in facial expression, posture, and large body acts such as clapping hands and jumping up and down (Brown & Dunn, 1991; Greenspan, 1990; Vandell & George, 1981). Affective expressions function to communicate experiential or feeling states such as interest and joy, and cognitive states of attention and arousal to the social partner (Stern, 1974). Flowing or breathy "h" sounds such as *hi, ha, oh, ah* are expressions of pleasure, surprise, and recognition (Ochs & Shieffelin, 1979, p. 132). Teasing is also representative of positive of social-affective interaction (Louw, 1991, p. 301), but context is essential for the discrimination of playful versus hostile teasing.

PRAISE & ENCOURAGEMENT

Praise and encouragement are typically used to follow into the child's or mother's focus of attention in an attempt to initiate joint attention.

PROHIBITED OR PROVOCATIVE BEHAVIOUR

Prohibited or ***provocative*** *behaviour* are typically acts that guarantee a mother's attention, although not necessarily for the purpose of joint attention (observer is to infer whether or not joint attention is the goal). For example, the child takes a toy from the mother that the mother had not offered to the child, takes her hearing aids off, places an object or playdough in her mouth, or sucks on doll's bottle (Newland, Roggman, & Boyce, 2001; Smith-Gray & Koester, 1995).

PROSOCIAL TOUCH

Prosocial touch (e.g., Smith-Gray & Koester, 1995; Spencer, 2000; Vandell & George, 1981) is person-person contact through, for example, pat, comfort, stroke (Vandell & George, 1981).

PROTODECLARATIVES

Protodeclaratives are communicative acts such as showing, telling, and sharing that the child uses to initiate and maintain interaction with those around her.

PROTOIMPERATIVES

Protoimperatives typically take the form of *requests* and *demands* for attention, compliance, or instrumental purposes such as access to tangibles or material needs or to obtain help (Meltzhoff & Brooks, 2001). Examples of imperatives include, *Stop it! No! Come! Look!* (Priesler & Ahlström, 1997) or when the child addresses the mother and waits for her response or action that helps the child complete her activity or to get what she wants (Ochs & Shieffelin, 1979, p.124).

QUESTIONS

Questions are more often used by the mother than the child to elicit attention for joint attention purposes (Girolamametto & Weitzman, 2002; Ochs, 1979, p. 3; Wood & Wood, 1997). A range of question types or formats are identified in the literature, including:

"Two-choice" questions (Wood & Wood, 1997)

M: *Are you making soup?*

wh-type questions (Girolamametto & Weitzman, 2002; Wood & Wood, 1997) And, especially, open ended *wh-* questions (i.e., what, where, when, why, who).

Rhetorical questions (Corsaro, 1979, pp. 378 – 381; Ochs, 1979, p. 3) *Rhetorical questions*, or questions with answers, are used by the mother to initiate joint attention and also to help the mother to confirm the child's interpretation of the a situation to create a shared meaning.

Example 1: *Do you know what I think is in the pot? I think there is soup in the pot.*

Example 2: *What is the piggy doing, is he eating his cereal too?*

Tag questions (Corsaro, 1979, pp. 378 – 381)

Tag questions are used to direct or follow into the social partner's focus of attention, and to confirm understanding. For example: *To cook the soup we have to switch the stove on. Right?*

Leading questions (Corsaro, 1979, pp. 378 – 381) function to direct or follow into the social partner's focus of attention. as well as expanding on (rather than confirming) a topic
M: *Did you ask the dolly if she was thirsty?*
C: *No.*
M: *Do you think that the dolly is thirsty?*
C: *Yes.*
M: *What do you think the dolly would like to drink?*
C: *Tea! Dolly want tea.*
M: *Tea? Does she? Hmm. Good. Good.*

REFERENCE

Reference is the most pervasive communicative act in caregiver-child interactions and is used when the speaker *believes* the child can identify to what is being referred (Ochs, 1979, p. 16) (emphasis not in the original). Reference is often achieved by touching, pointing, and eye gaze (Atkinson, 1979, pp. 229 – 251; Bates, Camaioni, & Volterra, 1979, pp. 111 - 128).

REPETITION

The ***repetition*** of prior utterances, words or sentences, or gestures are used not only to imitate but as a means of participating in conversation (Camaioni, 1979; Ochs, Schieffelin, & Platt, 979, pp. 259 – 260; Ochs, 1979, p. 3). Repetition is also representative of an early form of collaboration and mutual involvement (Camaioni, 1979, p. 330).
Example 1:
M: *Let's cook soup.*
C: *Cook soup.*
Example 2:
M: *Oh!* [Bumble Ball is activated by investigator, M notices]
C: *Oh!* [C notices Bumble Ball]
M: *Oh! Wow!*
Example 3:
C: Bends down to put Bumble Ball onto the floor, *My ball!*
M: Looks and points at ball *no, my ball!*
C: *My ball!*
M: Smiles, *My ball!*
C: Looks at M and inclines head slightly *It's both our ball!*

SELF-DISCLOSURE

Statements of ***self-disclosure*** are "personal contributions" (Wood & Wood, 1997) that serve the purpose of sharing feelings, thoughts, desires, likes and dislikes, and ideas in interpersonal communication (Priesler & Ahlström, 1997). For example, the mother might state: *I don't like pasta. I like soup.*

STATEMENTS

Statements typically provide information to the social partner and/or commentary on some aspect of the interaction environment (Corsaro, 1979, pp. 381; Wood & Wood, 1997).

SUMMONS

A ***summons*** is used to gain the attention of the social partner for the purpose of interaction (Ochs, 1979, p. 58) such as: *You know what?* Other instances of summonses include calling the social partner's name, clapping or waving hands, or touching, moving, reaching out, or directing gaze toward the social partner. Note the functional differences in gaze behaviour highlighted here: when gaze occurs before an utterance, then gaze functions as a summons to attend; in contrast, when gaze occurs after an utterance, it may, for example, function as a confirmation or check of understanding.

VOCALIZATIONS

Vocalizations include any sound or verbalization directed to the social partner that is accompanied by some other act (e.g., gesture, touch, gaze) to signal social intent (Tronick & Gianino, 1986; Vandell & George, 1981).

(2) Response to Initiation Act
CR[1]; MR[1]

A ***response-to-initiation*** is a behavioural or communicative act that serves to acknowledge the initiation act. That is, the recipient's response demonstrates recognition or awareness – or the lack thereof - of the initiation act that was directed toward her. A marker of acknowledgment (Newland et al., 2001) is, by definition then, any contextually appropriate behaviour (verbal, nonverbal) that is contingent with, and displayed within 5 s of, an initiation act, and that functions only to confirm or acknowledge the initiation act. That is, the response-to-initiation does not extend beyond the substance of the initiation act (Corsaro, 1979, pp. 376 – 377; Mertan et al., 1993, p. 194; Wetherby & Prizant, 2002, pp. 53 – 54) but rather functions to reward the initiating partner for having initiated the interaction (Watkins, 2004, p. 1339). Examples include acts that communicate ***accepting, acknowledging, noticing, comprehension,*** or ***understanding*** in active terms of the purpose of the initiation act to the sender of the act (Corsaro, 1979, pp. 376 - 377; Mundy et al., 1996; Newland et al., 2001; Vandell & George, 1981; Wetherby & Prizant, 2002; Wood & Wood, 1997). Typically initiation acts are considered 'successful' when the initiation act or "invitation" (Prendergast & McCollum, 1996) is accepted or acknowledged by the recipient through acts of "contact attention" (Peacocke, 2002) such as, eye contact, smiling and other facial expresions, attention and engagement, the production of a spoken or signed utterance (in the line of vision), proximal/distal pointing and other relational gestures, touch, lean, postural openness, or head shakes and nods (e.g., Bates et al., 1987; Green, Gustafson, & West; 1980; Greenspan, 1990; Marschark, Lang, & Albertini, 2002, pp. 69 – 73; Meadow-Orlans, Smith-Gray, & Dyssegaard, 1995;

Mundy et al., 1996; Ochs, 1979, p. 58; Patterson, 1982; Peacocke, 2002; Prizant & Wetherby, 1990; Sheinkopf et al., 2004; Spencer, 2000; Wetherby & Prizant, 2002). Note: An initiatory response does not however guarantee a result of *established joint attention.* An initiation response that is not followed by at least 3 s of mutual attention (visual, auditory, postural etc.) directed toward the intended focus, is considered a *second order miss* (see Figure 2A).

No response-to-initiation and ***rejection-of-initiation*** also serves as feedback to the sender of the initiation act. For the present study, ***no response-to-initiation*** was operationally defined as the failure of the recipient to respond to an initiation act within 5 s of the initiation act being directed toward her from the sender, and was considered a *first order miss* (see Figure 2A). A response therefore that was inappropriately ***delayed*** was considered as a ***no response-to-initiation*** event. ***Rejection-of-initiation*** (i.e., the decline of an invitation for joint attention) was defined as response within 5 s of the initiation act that actively rejected the initiation act through, for example, distancing or increasing interpersonal space and ignoring behaviour (Corsaro, 1979, pp. 376 - 377; Patterson 1982). Note: For ***no response-to-initiation*** or ***rejection-of-initiation*** to be considered to have occurred, the eliciting initiation act must have been appropriate and accessible to the recipient (Vandell & George, 1981).

Examples of *response-to-initiation*:

Example 1:
The child *offers* or *shows* the mother a toy and the mother ***accepts*** the toy by actively reaching her arms out to take the toy.

Example 2:

The child *offers* or *shows* the mother the baby doll and the mother ***accepts*** the child's putting the doll onto her lap at the same time that she smiles at the child, or makes eye contact with the child, or says/signs something to indicate to the child that she recognizes the child's offer (e.g., *You're giving me the dolly?* or *Thank you.*)

Example 3:
The mother ***acknowledges*** the child's initiation act by offering a general reaction such as saying: *Oh, really!* or by paraphrasing what the child said, for example:
C: *I play dolly now.*
M: (Says child's name) *play with the dolly.*

Example 4:
The mother ***seeks clarification***: *I'm not sure, do you mean the pig wants to eat the cereal?* or *I'm sorry, tell me again?*

Example 5:
The mother communicates her ***understanding*** of the child's intended purpose: *Oh, I think I understand, do you mean the pig wants to eat cereal too?*

The following response categories all function as ***response-to-initiation*** acts that communicate acceptance, acknowledgement, noticing, understanding etc. of the initiation act:

ACTIVE LISTENING
Active listening includes interpersonal mirroring, imitation, or reflecting back as a way to check or confirm attention and/or accuracy of understanding and to maintain interaction (Girolamametto & Weitzman, 2002; Rogers & Pennington, 1991).

ELABORATION & EXPANSION
Elaboration and ***expansion*** of the interpersonal topic occurs through, for example, simple comments and commentary; chit-chat; reflective discussion or narratives; the transmission of descriptive, conceptual, and affective information (*Dolly is sad. Dolly crying.*); describing behaviours or actions; adding a variation to an imitated behaviour; pretend play; self-disclosure of desires, feelings and thoughts; and modeling through repetition, rewording, explanation, feedback, reasoning, or demonstration (Brown & Dunn, 1991; Girolamametto & Weitzman, 2002; Ochs & Schieffelin, 1979, pp. 260; Rocissano & Yatchmink, 1984).

Example 1:
C: *Lady* [C crawling onto M's lap and pointing to the Bumble Ball]
M: *The lady put the ball on.* [Positions C on her lap to face the Bumble Ball and extends her arm, with open hand, out toward Bumble Ball; C looks at ball]
Example 2:

C: Hugs doll, *Baby*
M: Hold's doll's bottle to doll's mouth, smiling at C

IMITATION (see p. 242)

MIRRORING (see p. 243)

NONVERBAL SIGNALS (see p. 243)

Other behaviours that communicate cooperation, participation, and mutual engagement include the following:
Examples:
Mother (child) is interested in what child (mother) is doing
Suggests
Child *waits expectantly* for mother to blow bubbles or mother waits expectantly for child to pick up Bumble Ball etc.
Claps
Waiting for a turn (Schwartz & Miller, 1996, p. 123)

ORIENTING
Orienting is a prototypical response to a bid for attention and is characterized as an alerting response to an initiation act, for example, a head turn (Dawson et al., 1998)

QUESTIONS (see p. 245)

REPETITION (see p. 246)

(3) Establishing Joint Attention and (4) Sustaining Joint Attention: Contingent and Coordinated Turn-Taking Inside Joint Attention
CR^2; MR^2; ... CR^n, MR^n

Third- and greater-order child- and maternal responses (i.e., CR^2; MR^2; ... CR^n, MR^n) are topic-relevant response acts (Girolametto & Weitzman, 2002) that, respectively, precede the establishment of joint attention and function to sustain joint attention. Joint attention episodes are sustained through contextually- and topic-relevant child- and maternal responses that function to encourage participation and involvement through turn-taking, reciprocity, and feedback (Girolametto & Weitzman, 2002; personal communication, Dr. Nicole Walton-Allen, 2005). Responses are required to be contingent to, and coordinated with, the prior response such that the "coherence, continuity, and threads" of the mother-child interact are created and maintained (Graesser, Gernsbacher, & Goldman, 2003, p. 12). Topic-relevant response acts include: compromise and cooperation through compliance or agreement with a suggestion, or, actions and mutual suggestions for the next action on the object; acts and vocalizations that help, guide, support, or enable; describing or labeling actions appropriate to the object; manipulating the moving parts of the toy, acting on, or using the object to perform an action (e.g., rolling the Bumble Ball); imitating or completing an action begun by the social partner; encouragement and praises; and talking, gesturing, or signing about the *topic.* Other topic-relevant response acts are listed below and include the same responses listed earlier as *response-to-initiation* acts.

ACKNOWLEDGEMENT (see p. 248)

ACTIVE LISTENING (see p. 250)

ELABORATION & EXPANSION (see p. 250)

GESTURE (see p. 241)
***Show/offer* gestures** serve to expand upon the topic or focus of established joint attention by suggesting or modeling the use of the object (or another object) in a pretend or thematically related way (e.g., the mother *offers* the haircurler-sponge as an item of food to the child who is stirring a toy pot on the stove), or to encourage an action or response from the social partner (e.g., the mother extends her arms toward the child *offering* the Bumble Ball to the child at the same time that she says *Your turn, You hold it now.*)

HELP & GUIDANCE
A directive response can function to sustain joint attention by providing structured information and help or assistance for the child either verbally (e.g., *Put the bottle in the doll's mouth)* or nonverbally (e.g., by physically demonstrating how to hold the bottle to the doll's mouth), often reassuring or guiding the child in uncertain or novel situations (i.e., responses serve a social referencing function) (Dube et al., 2004; Landry et al., 1998).

IMITATION (see p. 242)

LABELING (see p. 243)

MIRRORING (see p. 243)

NONVERBAL SIGNALS (see p. 243)

PRAISE & ENCOURAGEMENT (see p. 244)

QUESTIONS (see p. 245)

REQUESTS
Requests typically serve a help-seeking function to obtain objects or help, and which, in the context of established joint attention, may serve to sustain joint attention. Other types of requests functioning to sustain joint attention are ***requests to notice***, ***requests for confirmation***, and ***requests for information*** (Corsaro,1979, p. 381; Ochs, 1979, p. 3; Wetherby & Prizant, 2002, p. 50; Wood & Wood, 1997).

SHARED POSITIVE AFFECT
Shared positive affect is the coordination of the expression of positive affect (see above) accompanied by gaze directed toward the other, immediately before, during, or after the display of positive affect (Wetherby & Prizant, 2002, p. 49).

(5) Termination Acts
CT, MT

Termination acts are any acts resulting in threatened or actual termination of the joint attention episode and can be characterized and grouped as behavioural and communicative acts that communicate (1) over-involvement or, (2) non-involvement.

Acts of ***over-involvement*** include directive statements, questions, and other attention-directing behavioural acts that attempt to interrupt an established topic and/or change the topic to another topic (e.g., *Let's do this now)* (Corsaro, 1979, pp. 37 - 381; Newland et al.,; Wood & Wood, 1997).

Non-involvement acts function to actively withdraw and disengage from the interactive process and include, for example: rocking movements, leg or foot movements when seated, and object manipulations (Patterson, 1982); self-manipulations such as rubbing, scratching, licking lips, or covering eyes (Patterson, 1982); gaze aversion or looking away from the interaction (Prendergast & McCollum, 1996) or mother (Stern, 1974) and other active attempts by the child to distance self or to physically disengage from mother such as arching of back, squirming (Smith-Gray & Koester, 1995), turning, or looking away toward surroundings (Koester & Meadow-Orlans, 1999) or physically moving away from the object, event, or activity of joint attention focus; greetings or other signals of leave taking or termination (e.g., saying *hello* to the VCR!) (Corsaro, 1979; pp. 376 - 377; Wetherby & Prizant, 2002, p. 50); off-topic acts not relevant to the topic of joint attention (Corsaro, 1979, pp. 376 – 377, 1979); no-response acts (see p. 249); onlooking behaviour, and "zoned out" behaviours such as the child's narrow focus of attention on a part of her own body, for example, her fingers or belly-button, as an

alternate focus (Koester & Meadow-Orlans, 1999; Tronick & Gianino, 1986; personal communication, Dr. Nicole Walton-Allen, 2005).

Exemplar NONVERBAL SIGNALS marking withdrawal from joint attention:

Autonomic indicators are considered to reflect behavioural distress and include spitting up, gagging, hiccoughing (Brazelton, 1973), and yawning.

Gross motor or aggressive/venting behaviour (Calkins & Johnson, 1998) is exemplified in tantruming (e.g., lies down on floor, curls into fetal position), banging, kicking, throwing, and throwing of hitting an object of frustration; head rubbing; slamming the book shut; rubbing hands up and down on clothing; or rubbing the pages or cover of book with one or both hands before turning away or pushing book away; or pushing away or throwing of toys (Calkins & Johnson, 1998; Ochs & Shieffelin, 1979, p. 136; Hundert, Mahoney, Mundy & Vernon, 1998). Other examples include the mother moving her face closer in or further out as a display of command, reprimand or disinterest; the child or mother wags or shakes their head or emphatically shakes hands and arms.

Negative vocalizations:

Examples:
Loudness of voice
Cries
Whines
Whimpering
Fussing
Screaming/shouting

Self-comforting/soothing behaviours function to reduce distress and include, for example: thumb-, finger- and other object-sucking; hand-in-mouth; hand-stroking-cheek or rubbing head; hand and/or feet clasping; rocking; hairtwirling; other self-manipulative behaviour (Blass & Shah, 1995; Braungart-Rieker, Garwood, Powers, & Notaro, 1998; Calkins & Johnson, 1998; Tronick & Gianino, 1986), rubbing of eyes, and babbling and/or vocalizations (personal communication, Marietta Colven, January 2002).

Withdrawal behaviour, possibly the most primitive and fundamental fall-back regulatory behaviour (Stifter & Brungart, 1995) and which, young children in particular, use as an active coping strategy (e.g., freezing; inhibition; escape behavior such as turning, twisting or arching away; scanning behaviours; glassy-eyed) (e.g., Stern, 1974; Stifter & Brungart, 1995; Tronick & Gianino, 1986). Helplessness and passivity may take the form of ragged breathing and fingering, self-comforting and staring into space (Tronick & Gianino, 1986). Both mothers and children may pull or tug on one another,

push the other away, or turn away from one another to communicate disengagement and/or cut-off.

Note: One or the other of the mother or the child may immediately (within 3 s of the termination act) attempt to regain the partners on-topic attention and thereby repair joint attention. For example, in response to the child's act of putting playdough into her mouth, the mother shifts to exploratory interaction with her child and suggests rather that they smell the playdough. That is, the mother has redirected the child's attention from mouthing to smelling the playdough.

Appendix 9

COMMUNICATION & LANGUAGE

Communication is the exchange of thoughts, messages, or information through non-linguistic cues such as visual, vocal, facial, tactile, gestural and other nonverbal communicative acts. More specifically, there are two ways, or *modes*, of communication: (1) Hearing-listening/speaking, and (2) Deaf-visual/sign.

Language (e.g., English, ASL, or others) is the exchange of thoughts, messages, or information through linguistic cues within a symbolic system of communication that can be in the form of speech or printed words (e.g., spoken English or written English), or signs (e.g., ASL) (Watkins, 2004, p. 66, p. 315). A language is "native" when it develops starting from birth (Mayberry, 2003, p. 496). It is important to note that language includes more than vocabulary, grammar, and semantics (Schirmer, 1994, pp. 11 – 16; Watkins, 2004, p. 738). Notably, language includes the way we use language socially and communicatively to relate to our social world and to ask for what we need or want, is referred to in the linguistic literature as ***pragmatic language*** (Bates, 1976 cited in Rowland, 2000, p. 478; Schirmer, 1994, p. 12). It is also important to note that the ability to speak is distinguished from the ability to understand and produce language, that is, speech and language are dissociable in deaf children's development (Mayberry, 2003, p. 491).

Communication Options and Approaches in Deaf Communication

American Sign Language (ASL)
ASL is a manual language comprised of signs and sign sentences with a linguistic structure that is different from spoken English (Mayberry, 2003, p. 490; SKI HI curriculum, 2004). ASL is a natural language that has evolved independently of spoken or written English and is perceived by the eyes (i.e., the sensory component) and expressed with the hands, arms, body, and face (the motor component) (Mayberry, 2003, pp. 490 - 496).

Auditory Verbal (AV)
AV is a communication training program that emphasizes auditory skills by teaching the child listening skills through one-on-one therapy. Residual hearing with the aid of amplification (hearing aid, cochlear implant) is the focal information and language input modality. No manual communication is used and the child is discouraged from using visual cues (Ontario Provincial Schools Preschool Home-Visiting Program).

Bilingual-Bicultural (Bi-Bi)
The Bi-Bi approach uses ASL as a first language and some form(s) of English are taught as a second language and both Hearing and Deaf cultures are embraced (Watson, 2004, p. 671).

Manually Coded English (MCE)
MCE is a formal sign-language system based on English grammar and used in Total Communication. That is, signs (or words) are borrowed from ASL but are signed in English word order. Finger spelling (i.e., the manual alphabet) is used to spell English words and other non-ASL signs are used to indicate English grammatical structures and words (Mayberry, 2003, p.499; SKI HI curriculum, 2004).

Oralism (Aural/Oral)
The *Oral* approach is a vocal-only mode of instruction that encourages the deaf child to maximize the use of residual hearing through amplification (hearing aids, cochlear implant, FM systems) and to "watch" the spoken word on the lips of others (i.e., speech reading). Any form of manual sign language is discouraged although the use of conventional gestures is accepted (Mayberry, 2003, p. 498; SKI HI curriculum, 2004).

Total Communication (TC)
Total Communication is the use of the "all input" approach inclusive of simultaneous signing and speaking to communicate with the deaf child. TC emerged in 1967 as a communication and educational philosophy and attempts to embrace, and tolerate, all approaches to support communication and to teach vocabulary and language in whatever way works. That is, manual, oral, auditory, and written modes of communication through the use of sign, gesture, mime, speech, lipreading, listening, pictures, print, and/or writing are all supported and accepted (personal communication, Sister Claudette, St. Vincent School for the Deaf, South Africa; Mayberry, 2003, p. 498; personal communication, John Perks, 2003; Watkins, 2004, p. 317, p. 1536). In addition, the use of residual hearing through the wearing of hearing aids, cochlear implants, or FM systems is encouraged and the child's development of listening and speaking skills are held as important goals.