PROCESSES AND PATTERNS OF DIALOG
BETWEEN DEAF AND HEARING SIBLINGS DURING PLAY

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

THE FACULTY OF GRADUATE STUDIES

(Department of Educational and Counselling Psychology, and Special Education)

THE UNIVERSITY OF BRITISH COLUMBIA

July 1999

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ABSTRACT

Processes and Patterns of Dialog Between Deaf and Hearing Siblings During Play

The purpose of this study was to examine the processes and patterns of communicative interaction which preschool and elementary school-aged deaf and hearing siblings utilized to initiate, maintain and terminate dialogs during play. Specifically, the focus was to determine if the processes and patterns of communication differed when a deaf sibling interacted with an older hearing sibling who has been exposed primarily to a simultaneous visual-auditory (SimVA) pattern of communication, as compared to when a deaf sibling interacted with a younger hearing sibling who has been exposed to both a SimVA and a sequential visual (Seq V) pattern of communication. Video-taped playbouts were observed between each of two sibling dyads at play within a single family: (a) an older dyad composed of a seven-year-old hearing child and her five-year-old deaf sister, and (b) a younger dyad with the second-born deaf sister and her three-year-old hearing brother. The video-tapes were coded to determine: the kinds of play siblings engaged in; the use and expression of behavioral and communicative elements of attention-getting, exchange of information, and termination processes of dialogs; who initiated and terminated dialogs; the occurrence of turn-taking during message delivery; and the expression of patterns of communication used by siblings during dialogs.

Only three of five possible kinds of play were actually noted, of which social play was the most frequently observed kind of play taking place between siblings within both dyads. In the older hearing and deaf sibling dyad, it was found that the older hearing sister predominately used visual processes and patterns of communicative interaction when conversing with her deaf sister, whereas the deaf sibling relied extensively on visual-auditory processes and patterns of communication when conversing with her hearing sister. In the younger dyad, visual-auditory patterns of communication predominated both hearing and deaf siblings' expression of processes and patterns of communication with each other. New terminology reflecting siblings' behavioral and communicative patterns of communication are introduced.

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This study represents the first known research examining the processes and patterns of deaf and hearing siblings' behavioral and communicative interactions of dialog. The findings are discussed in relation to potential applications to early intervention programs for hearing families with deaf and hearing siblings and to future research directions. Overall, the findings from this study appear to indicate that deaf and hearing siblings communicate in ways largely influenced by developmental maturation and the communicative environments to which each child has been exposed during language acquisition processes. The findings are also consistent with Vygotsky's theory of a sociocultural origin of language development.

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CHAPTER ONE

The relationship between experience and environment is compellingly evident in the phenomenon of childhood deafness (Sacks, 1989). Deaf children's existence is dominated by visual stimulation because these children live in a world devoid of most sounds. Therefore, they lack access to certain kinds of cognitive stimuli from which to mold and model their world knowledge, to build language based on experiences which accommodate and assimilate sounds into schema, and to exist with others where experience corresponds to a sound-filled world. This is not to say that deaf children are cognitively less capable than hearing children. However, it is hardly surprising that the development of cognitive abilities in deaf children may be delayed or even hindered when auditory stimulation, which is key to development within most of the world's population, is partially or completely inaccessible. [1]

Some deaf children have been known to display one or more of a variety of problems. These range from delayed intellectual cognition (Wood, 1984) and language development (Kretschmer & Kretschmer, 1986) to poor academic achievement (Allen, 1986); from depressed social skill growth (Greenberg & Kusche, 1988) to significant behavioral problems (Baker & Cantwell, 1982). However, during the past decade a growing number of researchers (cf., e.g., Jamieson, 1994a; Lederberg, 1991; Marschark, 1993) have suggested that most, if not all, of the difficulties experienced by deaf children are not caused by deafness itself, but rather by the reaction of hearing individuals to children's deafness. Deaf children live in a world where even the simplest of interactive endeavors is quite often beyond most hearing individual's appreciation or comprehension, the most significant of which are language acquisition, language cognition and its evolutionary manifestation and corollaries - speech and communication.

Deaf children can acquire language and learn to communicate effectively with others. Deaf children born of deaf mothers follow a sequential visual pattern of communication in the same way that hearing children follow a simultaneously expressed visual-auditory pattern of communication.

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[1] Demographically, deaf children make up less than 1% of the total population in an auditory world (Schein, 1987).

However, deaf children of hearing mothers show delays in language acquisition, and it has been hypothesized that this delay is at least partially due to a clash in communication modalities between mother and child. The mother expresses a natural visual-auditory approach and the child needs a sequential visual approach. There is a rich body of research which has demonstrated the inherent problems hearing mothers experience in attempting to facilitate and mediate mutual language acquisition with their deaf children. Although some research has investigated what takes place in language development and use between deaf and hearing peers, few researchers have investigated the behavioral and communicative interactions taking place between deaf and hearing siblings. This sibling research represents an arena which offers exciting potential for understanding not only the developmental aspects of language acquisition and use but also the applied and comparative facets which occur as siblings converse. The purpose of this study was to examine the processes and patterns of communicative interaction which are utilized by preschool and elementary school-aged deaf and hearing siblings to initiate, maintain, and terminate dialog during play.

Background to the Research Problem

Historically, most traditional research and educational practice has focused on deaf children's shortcomings in relation to their hearing peers. During the early part of the 20th century, schools resembled psychological laboratories or educational workshops where researchers and educators considered deafness a natural, experimental condition that was observed, manipulated, and interpreted under the guise of advancing developmental theory, linguistics, philosophy, and educational insight (Nelson, Loncke, & Camarata, 1993). Unhampered by objective rules, and to some extent ethics, researchers and educators freely explored their curiosity and speculations. Through decades of misinterpretation and misunderstanding, deaf children were considered cognitively subordinate relative to their hearing peers. Pintner, Eisenson, and Stanton (1941) claimed that deaf children, as a group, were not only qualitatively different from hearing children, but quantitatively inferior as well because they lacked speech, and therefore, a spoken language. A perception prevailed in this era that without language the processes of thought and the

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ability to think were significantly, if not totally, curtailed for deaf people. This was not an idle mid-century misconception. The philosophy has been sustained in many forms for almost 150 years by linguists, psychologists, psycholinguists and educational theorists alike (e.g., Bell, 1906; Luria, 1961; Myklebust, 1960; Peet, 1851; Skinner, 1957; and Vygotsky, 1993). The goals of most research and educational inquiry from the mid- to late-1800s into the early 1970s were dedicated to making these *defective* children as much like or as close to hearing children as possible through such interventions as speech therapy, oral skills development, memory enhancement, increasing the strength of grip, tapping and rhythm enrichment, and perception enhancement (Sacks, 1989).

Works by Furth (1966), Lewis (1968), Myklebust (1964), and others did much to alter a century's worth of negative perspectives of deaf children and their perceptual and conceptual functioning and reasoning skills and abilities. Myklebust (1964) stated that deafness permeates the essence, the spirit of deaf children, and that deafness is an all-encompassing determinant of their cognitive development. Furth (1973) summarized this historical facet by stating that theoretical misunderstanding of the deaf child's exhibited development is rooted in the hearing world's misconception of the nature of children's understanding.

During the 1960s and early 1970s there began a recognition that deafness not only affected hearing but also pervaded the child's entire being. Nevertheless, this altered viewpoint still harbored a sublimated bias which linked accepted theoretical views between language and mental abilities to the assumed conclusion that sensory deprivation impairs language acquisition, mental growth, and intellectual functioning. Therefore, the conjecture prevailed that cognitive development of deaf children does not parallel that of hearing children; more precisely, the notion continued to prevail that deaf children were still limited to a concrete world without the developing ability to abstract, as occurs with hearing children.

Previously described perspectives are significantly different from many of those which are found in current theory and research about deafness (e.g., Moores & Meadow-Orlans, 1990; Wood, 1991). Many of these perspective changes are important, and some perspectives are even moving away from traditional research paradigms, incorporating a sociocultural view. This

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viewpoint posits the interrelationship among social and contextual aspects of individual experience, all of which serve to foster cognition and language development in children (Leont'ev, 1981; Vygotsky, 1978). Consistent with this perspective, some researchers recognize language development as an experiential, holistic process taking place where language behavior, acquisition and its cognition are manifested spatially and temporally through social and cultural interactions with others (Bakhtin, 1986; Cyrulnik, 1993; Lave & Wenger, 1991; Vygotsky, 1978; Wertsch, 1991). It is within this philosophical perspective that a few researchers are beginning to explore deaf children's communicative development, not merely their educational and linguistic abilities or comparative inabilities. It is also within this framework that this current research was approached.

The Problem Situation

The parenting or caretaking dyad, the earliest interactive social bond between any child and another, is critically important for that child's development (Chapman, 1981). Tamis-LeMonda and Bornstein (1986) noted that mothers are the key instigator to their children's active participation in environmental and social interactions. Similarly, Hofer (1987) found the components of mother-child interaction to represent the primary stimuli, regulators and reinforcers of an infant's developing communication modalities. Thus, reciprocal social interaction seems to be a key facet to language acquisition and communicative competence for any child.

As Lederberg (1993) pointed out, parent-child interactions are one of the most investigated areas of research in deafness. The literature is replete with studies on the communicative processes occurring between mother and child across all linguistic modalities and populations with seemingly comparable findings. Hearing children of hearing parents and deaf children of deaf parents seem to exhibit similar positive language acquisition curves, language development stages, and communicative growth patterns (Klima & Bellugi, 1974).

Yet, in hearing families with deaf children, the child's deafness becomes a handicap to all individuals due to the initial difficulty of communicating (Marschark, 1993). When a deaf child is born into a hearing family, a dramatic shift occurs in social and linguistic processes, patterns and

behavior of parent-child interaction. Here many aspects and facets of child-raising which occur naturally for hearing mothers of hearing children (Hm/hc) or deaf mothers with deaf children (Dm/dc) manifest themselves differently for hearing mothers (Hm) and their deaf children (Dc).[2] In contrast to hearing families, which share an easily accessible simultaneous visual-auditory communication system (Sim VA)[3] (Erting, 1987), and deaf families, which share a natural, sequential visual approach (Seq V)[4] (Nienhuys & Tikotin, 1983), hearing mother/deaf child relationships are, in most instances, confronted from the earliest moments of interaction with obstacles to communicative competence and social interaction (Lederberg, 1993). Examples of problems resulting from these contrasting information-processing approaches include, but are not limited to, difficulty in gaining and holding the deaf child's attention (Jamieson, 1994b) and maintaining visual orientation during interactions or a continuance of SimVA communication patterns by the mother even though her child is deaf (Spencer & Gutfreund, 1990).

These problems affect and impact not only mother-child social interactions but subsequent processes associated with language development and related cognitive capabilities and capacities (Vygotsky, 1993; Wedell-Monnig & Lumley, 1980). In addition, as the child matures, the general impact of differing communication modalities between mother and child seems to be to enhance didactic relations (Brinich, 1980), heighten maternal behavior directiveness (Goss, 1970), reduce coordination in communication modalities (Lederberg & Mobley, 1990), restrict communicative intersubjectivity (Jamieson & Pedersen, 1993), and truncate significant dyad discourse during interactions (Schlesinger & Meadow, 1972). It also appears to increase maternal stress, family problems, and parent pessimism (Lederberg, 1988; cited in Lederberg, 1993).

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[2] Throughout this document I will use the terms hearing mother (Hm), hearing child (Hc), deaf mother (Dm), deaf child (Dc), hearing sibling (Hs) and deaf sibling (Ds) as reference terms indicating the various participants within the study. Syntax within this document forces an interchangeability of these terms. The sequential use of upper and lower case in dyad notation is my choice; i.e., e.g., Ds/hs refers to a deaf sibling/hearing sibling interaction. I have made this choice not because of any literature standard but because of personal esthetics.

[3] Simultaneous visual-auditory (Sim VA) communication occurs when dialog is initiated by gaining another's attention either vocally or visually and then following this attention-getting processes by an exchange of information. Sim VA is discussed in further detail in Chapter 2.

[4] Sequential visual (Seq V) communication occurs when dialog is initiated by gaining another's visual attention and maintaining the other's attention during the course of information exchange and then directing the other's visual awareness at or on the focal point of the conversation. Seq V is discussed in further detail in Chapter 2.

If hearing mothers experience challenges in communicating with their deaf children, what occurs in language development and acquisition within families with hearing children when a deaf child is born into the family or when hearing children are born into environments with a deaf sibling already present? It is unclear whether the same communication obstacles or others are experienced by deaf and hearing siblings during developmental and communicative interactions as occur in Hm/dc dyads. However, it appears reasonable to assume that many obstacles which deaf mothers encounter with their deaf children may be minimized between hearing and deaf siblings based on what is known about hearing children's interactions with hearing siblings. For example, hearing siblings in general:

(a) are usually close in age and maintain similar levels of developing cognition (Cicirelli, 1976; Lamb & Sutton-Smith, 1982);

(b) have fewer barriers to communicative interactions than do parents and their children (Azmitia & Hesser, 1993);

(c) because of their differing age structures, sibling interactions offer ideal contexts for the acquisition of a variety of cognitive and linguistic skills (Hartup, 1989);

(d) readily observe and imitate each other, younger siblings more so than their older brothers and sisters (Dunn & Kendrick, 1982);

(e) are effective teachers of play and physical skills to younger siblings (Weisner, 1989);

(f) know the state of each others' knowledge (Azmitia & Hesser, 1993) and are aware of each others' strengths and weaknesses as learners (Cicirelli, 1976);

(g) are more resistant as well as resilient to disruption by antagonistic behaviors than occurs in parent-child interactions (Pepler, Corter, & Abramovitch, 1982); and,

(h) are not only fundamentally different from adults, but also perceive their world differently than adults do (Piaget, 1971).

In addition, Mannle and Tomasello (1985) found that pragmatic communication of hearing siblings one to three years old differs from that of mothers and their children. Yoshima-Takane, Goodz, and Derevensky (1996) found that older siblings provided younger siblings with a varied language environment, which facilitated language development. In addition, Azmitia and Hesser's

(1993) research illustrated a unique influence of older siblings on their younger siblings' cognitive development. Yet, unlike the vast research literature on hearing siblings, very little is known about the social, behavioral, or linguistic relationships and communicative processes occurring between deaf and hearing siblings or about the cognitive processes and patterns that facilitate deaf and hearing siblings' movement into the spectrum of social communication and shared dialogs.

An examination of the processes and patterns which preschool and elementary school-aged deaf and hearing siblings engage in during dialog is critically important to a comprehensive understanding of the behavioral and communicative interactions which occur between them. Here, an important question is raised: What occurs within and between deaf and hearing sibling dyads that fosters effective communication? The question, though, requires one to examine and understand the naturally developing processes and patterns deaf and hearing siblings utilize and express with each other as they interact and converse within and across differing communication modalities.

Theoretical Foundations and Research Rationale

Lev Seminovich Vygotsky (1987, 1993) framed a developmental theory wherein social interactions form the basis for all higher-level forms of psychological development. Vygotsky accepted that a child's reality develops through a composite of interpersonal experiences, whereby each facet of the child's life, every event, encounter, and experience contribute to the child's development and understanding of human interaction and communication (1987). Language, he stated, becomes one of the primary mediators of these developmental events. Vygotsky posited that children's language acquisition and development occur through continuous social and linguistic interactions with more experienced members of the culture. He conjectured that this learning process is a progression of experience in which the initial phases of understanding occur through mutually negotiated, mediated, and facilitated communication and comprehension between individuals.

Vygotsky's theoretical foundation assumes the use of mutually accessible and interactive communication tools between the individuals engaged in dialog, as occurs between hearing parents and their hearing children or deaf parents and their deaf children. Mutually shared language tools facilitate the establishment and maintenance of dialogs as individuals engaged in conversations modify, share and adopt, or adapt to each others' reality of the conversational topic. This process seems to provide awareness or a shared understanding about objects and actions encountered in everyday living (Trevarthen, 1988). As a tool, dialogs are used to express, share, and negotiate ideas through both spoken and nonverbal processes and patterns of behavioral and communicative interactions (Vygotsky, 1962, 1978). In children's developing language, dialogs seem to facilitate interactive communication at all socio-cognitive levels of understanding (Goncu, 1993a), representing pathways where thought is converted into action. Dialogs, therefore, provide pathways to intersubjectivity.

Intersubjectivity follows the development of the child's intrasubjectivity (i.e., self-understanding) where concepts evolve through a series of transformations of personal experiences. This occurs usually through dialog where viewpoints are defined or redefined resulting in an accepted, mutually shared understanding of an ongoing situation or activity. Dialog, for Vygotsky, was the concrete equivalent of the social nature of the mind, human essence, interactions, and relations (Radzikhovskii, 1991).

Vygotsky suggested that children's learning processes and patterns of communication, as well as their cognitive development, are sociocultural in origin and that children play an active role in these developmental processes. Vygotsky also stated that children's developing processes and patterns of communication appear to be developmentally focused as each child initiates and engages in dialog with another child or other children as they play together (Trevarthen, 1989). For as children play, they interact, and they interact largely through dialogs by sharing old and new information, establishing shared agreements, and constructing mutually understood, but not necessarily accepted, notions and ideas about their ongoing play (Göncü, 1993a). The essence of Vygotsky theory suggests that children's learning processes and patterns of communication, as well as their cognitive development, are sociocultural in origin and that children have an active role

in all linguistic and cognitive developmental processes as they play and communicate with each other. Therefore, if one is to investigate children's naturally developing language skills from a sociocultural perspective, then one should focus any examination of language development and acquisition on the most obvious, constant and natural activity of preschool and elementary school-aged children: play (Fagen, 1981; Vygotsky, 1978).

The Purpose of the Study

The purpose of this study was to examine the processes and patterns of communicative interaction which preschool and elementary school-aged deaf and hearing siblings utilize to initiate, maintain and terminate dialog during play.

The Research Questions

The specific research questions developed to investigate the relationship of communicative interactions occurring between hearing and deaf siblings are

What are the processes and patterns of communicative interaction which preschool and elementary school-aged deaf and hearing siblings utilize to initiate, maintain, and terminate dialogs during play? And more specifically, do these processes and patterns differ when a deaf sibling interacts with an older hearing sibling who has been exposed primarily to a simultaneous visual-auditory pattern of communication, as compared to when a deaf sibling interacts with a younger hearing sibling who has been exposed to both a simultaneous visual-auditory and a sequential visual pattern of communication?

The research design was a short-term case study (Yin, 1989, 1997) involving a deaf child and two hearing siblings. Data analyses focused on the kinds of play siblings engaged in and how each child initiated, maintained, and terminated dialogs as they interacted together in two dyads.

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The first dyad (referred to hereafter as the older dyad) included the oldest sibling, whose primary communicative modality was spoken English and who has been raised in a simultaneous visual-auditory (Sim VA) language environment, and the second-born sibling, whose primary communicative modality is Signs and whose language environment is focused around a sequential visual (Seq V) pattern of communication. The second dyad (the younger dyad) included the second-born child and third-born hearing child, who has been raised in a dual-language environment of both spoken English and Signs, an environment to which the child had been exposed since birth. In addition to the specific research questions developed below for this study, these dyads provided a unique opportunity to examine both simultaneous visual-auditory and sequential visual dialog processes expressed in dyad play by deaf and hearing siblings as compared to what is known to occur in deaf mother/deaf child (Dm/dc), hearing mother/hearing child (Hm/hc), and hearing mother/deaf child (Hm/dc) dyads.

The specific investigative questions developed and examined in this study were:
When siblings played together,

    1. What kinds of play did they engage in?

When dialogs occurred during dyad play between older and younger siblings,

    2. What processes of behavioral and communicative interactions took place between siblings as they initiated, maintained and terminated dialogs? Specifically,

        a. Who initiated and terminated dialogs?

        b. What behavioral and communicative interactions were expressed in gaining another's attention?

        c. How was the exchange of information accomplished and maintained?

        d. What behaviors were used in terminating dialogs?

    3. What patterns of behavioral and communicative interactions were expressed as the siblings in each dyad initiated, maintained and terminated dialogs?

It is hoped that the findings from this study will provide an initial descriptive understanding of the processes and patterns of behavioral and communicative interaction by means of which deaf and hearing siblings initiate, maintain, and terminate dialogs during play.

Significance of the Study

There are four reasons why this study may have significance for both research and educational praxis. From an applied perspective, some insight may be gained specific to fundamental processes of positive sociolinguistic relationships between deaf and hearing siblings. In addition, the findings from this research may promote further understanding of the strategies that facilitate a positive communication approach and outcome between deaf and hearing siblings. Second, from a practical reference, the examination of language behavior and sociolinguistic relationships from a Vygotskian perspective may provide more detailed information than is currently available on the mechanisms which influence communicative interactions as well as social behavior of deaf children maturing in hearing families. Third, from a theoretical standpoint, this investigation may add insight to and understanding of processes and patterns that facilitate cognitive and linguistic development occurring between deaf and hearing children. Lastly, methodologically, a study into deaf and hearing siblings' sociolinguistic relationships has not been attempted from a real world perspective, that is, one examining siblings' experience within a qualitative-naturalistic research model, rather than an experimental or quasi-experimental one. It is hoped, therefore, that this investigation will illustrate the strengths and challenges of this type of research.

CHAPTER TWO

Vygotsky's Sociocultural Approach to Cognitive Development

The significant components in Vygotsky's theory are his beliefs that cultural development is superimposed on the processes of growth, maturation and the organic development of the child (Vygotsky, 1965, 1978). Additionally, Vygotsky argued that language and its corollaries - speech and communication - are central to child development. Language, to Vygotsky, is a framework providing insight into the processes of children's cognitive development. These processes are reflected within a child's experiences and are mediated by the tools and sign systems which the child encounters in everyday life. Furthermore, they are tied to the nature, evolution, and transmission of human culture to the child over time, and are linked to communication between a child and other more experienced individuals who are members of the child's sociocultural environment (Vygotsky, 1965).

Vygotsky's sociocultural approach assumes that a child's actions and experiences are mediated by tools and signs, all of which are subsumed within the totality of the environment within which they occur (Wertsch, 1991). For Vygotsky, tools (technical systems, i.e., e.g., computers) and signs (psychological systems, i.e., e.g., languages, diagrams, mathematics) are mediating means which shape the actions, processes, and patterns of individual and social behavior (Wertsch, 1991). This idea contrasts dramatically with many of the prevailing views of Vygotsky's era in which tools and signs (and children) were examined strictly for their structure.

Vygotsky's theory incorporates a basic redefinition of the elements under investigation. The basic unit of analysis no longer represents atomistic elements or specific properties or characteristics of the experience or child under study. Rather, units of analysis represent all "the basic properties of the whole . . . which cannot be further divided without losing them [the properties]" (Vygotsky, 1962, p.4). This sociocultural situatedness relies on three themes. First, the origin and evolution of developmental processes are displayed within a person's phylogenetic and ontogenetic development of higher mental functions (cognitive development), the cultural

history, and the general transformations of cognitive processes occurring during maturation over time. These processes enable individuals to control and regulate their behavior. Second, the origin of cognitive development (i.e., higher mental functions) occurs as a product of an individual's connection to the social environment, wherein every facet of higher order cognitive processes is rooted in and only emerge through social interaction. These processes occur on two planes: a sociohistorical level affecting the overall nature of thinking of the people in a society and a more localized dyadic level between members of a particular society which affects higher mental processes occurring between individuals (intermental [after Wertsch, 1991]) and within individuals (intramental [after Wertsch, 1991]). And third, cognitive development and human actions are mediated by tools and signs (Wertsch, 1985). Here, Vygotsky approached language (and other sign systems) in terms of how it actively mediates and controls human action. He placed particular stress on what he termed "interfunctional" relations: the intricate function of speech and thinking and how speech and thinking are intertwined in human experience.

Vygotsky believed that language is the key to mediating higher mental functions, that is, aspects of development that occur through social dialog, egocentric speech and inner thought. He also believed that language is a predominant means for individuals to reach understanding with each other. Vygotsky's theory provides a research framework within which to approach not only the nature of language development but also the manner in which it is organized into systems, the ways in which it is used in dialog between individuals, how it ultimately determines what is internalized and how it is that individuals are able to interact and think. In presenting a general overview of Vygotsky's theory, only its central themes have been highlighted. There is one specific concept which Vygotsky developed that is critical to an understanding of how this investigation into siblings' behavioral and communicative interactions was approached. That topic is the function of language as a semiotic sign system.

Language Development as a Semiotic Sign System

Vygotsky's approach to language development encompassed the interrelationships of mediated human experiences (1978). He stated that through active participation with others,

children eventually come to use sign systems in the regulation of their own behavior. The key semiotic issue for Vygotsky was how sign systems, specifically speech, controlled children's activities. He believed that it is essential to distinguish between language as a system of abstract signs and the ways that such signs are actually used for communication between individuals. He believed that sociolinguistic interactions between individuals form the nature of thinking within each individual, and that the use of tools and signs in conversation forms the intermediate link between object or task and the individuals' mutually shared understanding of the dialog. This is what he called language in action.

Vygotsky (1993) found that the inclusion of signs as a process of interaction within any sociolinguistic encounter reforms the total structure of communication. He argued that signs form the intermediate link between object, subject, and the action of discourse. Thus, the process of interaction becomes a mediating act reflective of semiotic signs. He also argued that the human mind is tremendously flexible in its capacity for processing different sign systems because the sign systems themselves represent an individual's cultural and social heritage. Semiotic sign systems, therefore, may include culturally spoken and Signed communication systems,[5] that is, spoken languages as well as Signed languages (manual communication), or Signs. Vygotsky (1996a, 1996b) acknowledged the viability of Signs, which he called "genuine languages with all the richness of function of such a language" (1983, p. 215). He also found that a deaf child's development dictated the use of Signed systems as a valid auxiliary communicative system designed to expand the educational process to which deaf children are exposed. Furthermore, Vygotsky claimed that Sign systems, like spoken systems, are first mastered overtly through social interaction and later function intramentally, mediating the complex process of learning and internalizing the foundations of the common culture.

Language to Vygotsky was a social and communicative encounter. Language was viewed as a process wherein children used dialog, in whatever form, to control their own activities, needs, and desires. Vygotsky concluded that language development was temporal, proceeding in a

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[5] Capitalization of Sign refers to sign languages or manual communication; lower-case sign refers to semiotics.

cyclical fashion, whereby different aspects of development occurred in an uneven and non-proportional way (van der Veer & Valsiner, 1991). In the end, the process gave rise to a child who could use sociolinguistic tools in appropriate sociocultural ways.

A Current Perspective on Deafness

One perspective has begun to restructure the theoretical approaches and methodologies of research into various aspects of deafness. A sociocultural perspective of language development asserts that the processes and patterns of acquisition that occur during development are inherently tied to children's active participation and interaction with others. Children learn as they engage others in their daily activities, whether during play, school lessons, or activities occurring within their home environments (Vygotsky, 1993). This framework has begun to inspire new and insightful investigations surrounding research into the relationships that occur during language development in deaf children. One key to these investigations is Vygotsky's posit that it is the child's activity that facilitates the child's holistic development. This is a dramatic shift from focusing on just the characteristics of the child where specific characteristics impact the child's development. It is a paradigm fostering the hypothesis that children are active participants in their development, one that focuses investigation on the processes of sociocultural events as well as the activity, and one that acknowledges and recognizes the relationship of the activity to the inherent sociocultural milieu of the child.

This perspective transforms our research methodologies. Rather than separating an observation or event into reductionistic elements, the entire activity is investigated. In this way, the inner workings of events are preserved as observable, holistic units of interaction. A sociocultural approach offers a framework of inquiry within which investigations have the potential to facilitate an understanding of deaf children's cognitive and linguistic development (Bonkowski, Gavelek, & Akamatsu, 1991).

Thus, Vygotsky's sociocultural approach to understanding cognitive development in deaf children has potentially far-reaching, positive implications. An increasing number of researchers

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investigating deafness are opting to engage a sociocultural approach. Several have summarized and applauded the applicability of Vygotsky's theory (cf., Arnold, 1985; Bonkowski et al., 1991). In addition, a few have applied portions or the totality of a sociocultural approach to investigative procedures (cf. Jamieson, 1994a, 1994b; Jamieson & Pedersen, 1993; Howe, Petrakos, & Rinaldi, 1998). Within this framework, investigators are beginning to examine and understand the holistic nature, quality, and interrelationship of a deaf child's surrounding environment and the impact environmental influences have on the child's development, instead of focusing solely on the impact deafness has on the deaf child's abilities.

A sociocultural approach acknowledges that children's conversations occurring in play or in their home environment may be conducive to language acquisition and development, processes which create a shared understanding about objects or topics. Research that is framed within Vygotsky's theory offers an investigative tool to focus on the processes of language use. A sociocultural perspective offers researchers a tool within which to investigate deaf children's behavioral and communicative development with others by melding dialog content and language structure to environmental context.

A Sociocultural Approach to Field Research

Children's social play is an area where the processes and patterns of interactive communication become focused by developing pathways for mutual understanding of affective needs. As children play together, they interact through conversations, sharing old, new, and changing ideas and information about their ongoing play. They establish shared agreements through dialogs about play, and they create mutually understood, but not necessarily accepted, meaning in ongoing play actions.

Although children's play and play behavior were not the specific phenomena under investigation, play was chosen as the arena of investigation of this study for several reasons. As Fagen (1981), Piaget (1962), and Vygotsky (1978) all noted, play is what preschool and early elementary-aged children do. Second, it is during play that children seem to develop interactive

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language and communicative skills through processes of accommodation and assimilation as play becomes more complex and demanding of interpretation (Göncü, 1993a, 1993b). And, as several researchers have suggested, children's developing intersubjectivity seems to evolve as the children play together (Rogoff; 1990; Trevarthen, 1989; Wertsch, 1984). Understanding the behavioral and communicative interactions that occur in children's dialogs during interactive play appears critical to comprehending deaf and hearing siblings' processes of dialogs and patterns of communication as the children strive for mutually understood conversations.

Most research into deafness during this century has been accomplished through an experimental approach following traditional research paradigms. However, in the last 15 years, investigators have begun to focus and incorporate relationships of culture, language, and communication into their research of deafness. Vygotsky's sociocultural approach to deafness research is important for three reasons:

1. A sociocultural approach represents not only a new manner of investigation, but one which offers a finer-grained approach to the analysis of human behavior (Lederberg, 1993), sociolinguistic interaction, learning abilities and their temporal and spatial development than previously accounted for in the literature.

2. A sociocultural approach offers a template which accounts for mental processes, recognizing the essential relationship between processes and their cultural, historical, and institutional settings. In addition, it also acknowledges that children's experiences are inseparable from their social world.

3. A sociocultural approach offers the researcher a tool to investigate the kinds of social activities that occur in everyday life when children interact with others (Minick, 1985).

The course of any sociolinguistic interaction between children depends on what skills they bring to their joint ventures. The skills which siblings possess and how they use them, independently or jointly, largely determine each child's ability to function interactively.

Göncü's (1993a) analysis of the development of communicative understanding in children's social play offers a unique perspective into the processes that occur during the establishment of shared understanding between children, especially when the children interact

without the assistance of adults. Göncü surmised that children play together in order to share and expand their existing knowledge and understanding of both new and old situations.

In another study Göncü (1993b) posited that children seek out friends who posses a certain degree of familiarity with each other, rather than an unfamiliar peer. He based this posit on the assumption that friends (seem to) initiate and maintain longer dialogs in play with each other, especially when the topic of play occurring between them had a shared (growing up together) history. This behavioral trait would not occur between peers who were strangers to each other.

Language Development and Dyadic Interactions
between
Mothers and Their Children

Mother/child behavioral and communicative interactions are one of the most studied areas of deafness (Lederberg, 1993), while studies between hearing and deaf siblings' dialogic interactions are represented by only a few investigations. Because of the scarcity of studies on deaf and hearing siblings, mother/child interactions are discussed in depth in the following sections in order to establish a baseline from which initial interpretations and comparisons of deaf and hearing siblings' behavioral and communicative interactions will be made.

Mothers communicate with their children. With time there occurs a transition from prelinguistic discourse to actual language exchange between the two. It is within this interaction that mother and child develop a means of expression through a fine-tuning of sociolinguistic processes and patterns of dialog. These interactions mediate the child's developing communication skills. The social interactions and patterns of reciprocal reinforcement which occur between mother and child are powerful tools in the process of learning. Mother and child alike quickly develop a capacity to differentiate specific environmental and behavioral interactions which weave a continuous trial-and-error existence between them. This process, with time, facilitates a mutual understanding of needs, desires, and emotions. These behaviors create a dyadic intersubjectivity of communication.

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Prelinguistic Communication Development in Hearing and Deaf Children

A facilitative and mediating facet of children's prelinguistic communication is that mothers seem to have a fine-tuned sensitivity for communicating with their children at this stage of development. There does seem to be an innate disposition within the child to produce and react to both general and specific spoken utterances following birth (Condon & Sanders, 1974). The sounds which a child makes (e.g., babbling) may be related and responsive to specific arousal states such as kinesics, emotion or haptic sensations expressed by the mother (Vihman, 1985). Infants do make certain sounds that function as releasing signals, stimulating social interaction or contact with their mothers (Liberman & Mattingly, 1989).

Children's temporal and developmental play with sounds is mediated to some extent by auditory feedback. Even in the absence of acoustic feedback or acoustic stimulation, deaf infants in the earliest months of infancy articulate verbal babbling sounds (Petitto & Marentette, 1991). However, their use of sounds may diminish because of their inability to perceive the sounds derived from their own babbling or others' reciprocal sound productions. Deaf children born into/or raised in a caregiver's[6] presence where signing is the primary language also babble. However, they babble in a manual mode typifying organizational characteristics of signed languages (Maestas y Moores, 1980; Pettito & Marenette, 1991). In addition, they "produce identical babbling units" (Pettito & Marenette, 1991, p. 1494) which correspond synchronistically, temporally, and developmentally with vocal babbling by hearing infants. Deaf and hearing infants raised by deaf and hearing parents respectively produce their first words, manually and spoken, within the same time period.

As babbling develops in hearing and deaf infants, so does the use of gesture, which seems to have communicative intent, expressing needs, wishes, and states of emotion. These expressions seem to represent dialog between mother and child, often taking the form of ritualized

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[6] The primary caregiver in most parent/child relationships is the child's mother. Therefore, the notion of caretaker will be expressed as the child's mother with a recognition that others may fulfill this role, such as, father, aunt, grandparent, adopted parent, or others.

actions which are developed in response to discourse exchanges between mother and child (Caselli, 1983). This entire process eventually results in the production of single-word utterances (spoken or in sign), each of which contains the child's "world" of meaning (Vygotsky, 1962). All of this eventually gives way to paired-word sentences and then "suddenly, and in the most dramatic way . . . a spectacular ability, a genius for language [develops] . . . [in] deaf as well as hearing [children]" (Sacks, 1989, p. 86).

The Processes and Patterns of Language Development and Hm/hc and Dm/dc Dyads

Mothers are active participants in their children's language development. They play an active role in providing frameworks, scaffolding, and linguistic models during communicative and social exchanges as their children mature (Bonvillian & Folven, 1993). Hearing mothers of hearing children and deaf mothers of deaf children facilitate and mediate emerging sociolinguistic behavior by defining and interpreting their child's linguistic intentions and interpreted meaning within same-modality languages.

Hearing Mother / Hearing Child Dyads.

Hearing dyads (Hm/hc) share a simultaneous visual-auditory (SimVA) communication system (Erting, 1987) whereby they make use of speech in most contact and non-contact situations with their children. The process of discourse follows three components of interaction:

(a) Discourse is initiated by gaining the child's attention through either vocal or visual means. For example, the hearing child's attention may be gained by either calling to the child or by some visual or tactile means such as waving or touch.

(b) This may be followed by an exchange of information.

(c) The third step is termination of the exchange.

Dialog proceeds through spoken words without the need for visual contact. For example, the child may be in another room while discourse proceeds and concludes.

Deaf Mother / Deaf Child Dyads.

In contrast to the SimVA approach, deaf dyads (Dm/dc) share a sequential visual approach (SeqV) to communication where a shift in visual attention from object to speaker occurs before communication is shared (Wood et al., 1986). A sequential visual approach relies to a much greater extent on physical contact between mother and child than occurs between hearing mother-child pairs (Meadow, Greenberg, Erting, & Carmichael, 1981), a product of their efforts and needs to gain mutual attention prior to communicating.

> (a) The process of communication used within these dyads begins with gaining the child's visual attention. For example, deaf mothers may reach out and gain their deaf child's attention by touch or a wave of the hand, thereby gaining the child's attention.
>
> (b) This may be followed by directing the child's gaze toward an object and then back so that visual attention is re-established, during which time an exchange of information (dialog) may take place. Also, deaf mothers often actively and physically take part in their child's language acquisition by such strategies as molding their child's hand into the correct sign (Bonvillian & Folven, 1993).

Children raised in deaf/deaf or hearing/hearing dyads are exposed to a mode of communication facilitated by their natural linguistic environment.

In these two dyadic situations (Hm/hc and Dm/dc) what does occur is a facilitation and mediation of interactive language development and language cognition. These processes and patterns are aimed at achieving intersubjectivity within a dyad; that is, they are aimed at achieving a process of initiating and maintaining dialog, a sharing of information, and a termination of the dialog. Although the processes for attaining these interactions are the same, the specific patterns of interaction are different for Hm/hc and Dm/dc dyads.

The patterns of establishing and maintaining dialog within Hm/hc and Dm/dc dyads may be expressed as a generalized process wherein patterns of communication are dependent on the same modality of communication (Chapman, 1981; Gibb-Harding, 1983). Mothers react to their child's dialog with the highest level of interactive communicative competence available between them and their child. These interactive sociolinguistic behaviors are important to interpretive and reactive

advancement of dyadic communication and to the development of mother-child intersubjectivity. In same-modality communication, mothers seem to possess an uncanny ability to interpret or infer their child's intentional behavior, a process which requires a dependency on interactive reciprocal communication. In addition, mothers display a consistency of reaction to their child's vocalizations or signs, gesture, and eye gaze in relation to conversation flow and its maintenance.

Communicative behaviors and the ways they are used in sociolinguistic interaction between mother and child are significant factors affecting linguistic competence and the development of mutual intersubjectivity. Even though these mothers, hearing and deaf, share a wealth of similar traits in the patterns of establishing and maintaining dialog with their hearing and deaf children, there are significant differences in their language modalities.

Hearing Mother / Deaf Child Dyads.

Ninety percent of deaf children have hearing parents (Schein, 1987) and these parents, for the most part, have little or no knowledge or understanding of deafness at the time of their child's diagnosis. Furthermore, most parents have little, if any, concept of Signed languages or the pedagogical relationships of language development and the visual-motor requirements most deaf children have for acquiring language. As noted above, Hm/hc dyads share a SimVA communication system, but in contrast, Dm/dc dyads share a SeqV approach to communication. Hearing mothers and their deaf children share neither of these modalities (Meadow, 1980). As a consequence, many aspects and facets of communication which occur naturally in Hm/hc and Dm/dc dyads are manifested differently in Hm/dc dyads. Deafness renders a child visually dependent, yet it appears natural for hearing mothers to utilize a SimVA approach to communicate with their deaf child even though the child requires a SeqV approach to sociolinguistic interaction (Spencer & Gutfreund, 1990). This dichotomy in modalities has the potential to impede or hinder reciprocal and developing communication between mother and child. For example, when the patterns of communication used in Hm/dc dyads do not result in anticipated responses, mothers often take control of communicative interactions with their deaf children. Wood (1991) stated that the most common trait which inhibits language development and evolving intersubjectivity in

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Hm/dc dyads occurs when mothers control dialog. For example, hearing mothers often increase their communicative turn-taking (Musselman & Churchill, 1991), use behavioral directives (Brinich, 1980), exert a form of dialog control where the actions of their deaf children are not supported, or use a high percentage of referential gestures (e.g., giving, showing, directing) to communicate intentions or purposes (Chapman, 1981; Wood & Middleton, 1974). Dialog control has the potential to limit conversation to objects or actions, a process which provides little or no stimuli to support children's experiences with the world (Karmiloff-Smith, 1979; Power, Wood, Wood, & MacDougall, 1990). As Lederberg stated, through dialog control the mother becomes "wrapped up with getting information into the child and does not pay attention to the child's informational needs" for establishing intersubjectivity (Lederberg, 1993, p. 105). What has been learned from research investigating the relationships occurring within Hm/dc dyads indicates that impeded sociolinguistic interactions impact early constructive communication, knowledge sharing, mutual perceptual awareness, and intersubjectivity (Marschark, 1993).

There is little debate that language acquisition is hindered or delayed when language modalities clash. Yet, when an examination is made of the overall generalization of current research findings (i.e., 1980 to 1998), one finds that much of the focus has been on individual characteristics of the problems, concepts which focus on the characteristics of problems themselves, rather than the holistic environment of the problem. In one of the first studies to examine aspects of deafness within a defined sociocultural framework, Jamieson and Pedersen (1993) studied mothers' responsiveness to their child's need for assistance during dyadic (Hm/hc, Dm/dc, Hm/dc) problem-solving tasks. They examined mothers' instructional behavior as a dependent factor mediated by and contingent upon their child's efficiency or needs for assistance during a puzzle construction exercise. By framing their research approach within Vygotsky's (1978) zone of proximal development and Bruner's microanalytical concept of scaffolding (Wood, Bruner, & Ross, 1976), the researchers gained the ability to examine sociocultural influences as a series of manageable subgoals (e.g., contingent instructions, maternal initiations) subsumed within the larger task performance goal, a process which facilitated a holistic perspective of mother/child

interactions. In addition, this approach allowed them to examine developing intersubjectivity and facilitated insight into the establishment of patterns and processes of sociolinguistic interaction.

The microanalysis of mother-child interaction provided Jamieson and Pedersen (1993) the opportunity to examine the relationship between mother/child and the processes of scaffolding. This relationship was expressed as a mediating activity, that is, as a strategy fostering cognitive development of the child. The mother in each dyadic interaction did not function simply as a facilitator, but clearly performed a mediating role of interaction, knowledge sharing and cognitive instantiation. The Jamieson and Pedersen study also exposed the difficulties inherent within the establishment of intersubjectivity when teaching is controlled, and not mediated or facilitated. Jamieson and Pedersen's findings are somewhat similar to other research noted earlier on Hm/hc, Dm/dc and Hm/dc dyads. However, the significance of their findings was not that they found similar patterns of interaction occurring within each dyad, but that they were able to interpret many of the "How" processes occurring within these sociolinguistic interactions. For example, hearing mothers (Hm/hc) and deaf mothers (Dm/dc) were more skilled in scaffolding their children's performance and learning, were more responsive teachers, and were more focused on the process than the product of the interaction with their children, than the Hm/dc.

Jamieson and Pedersen's study is important to the proposed research for several reasons. By focusing on a specific unit of analysis and employing fine-grained descriptions of mother/child interactions, they were able to describe not only what specific sociolinguistic patterns and processes take place between mothers and their children, but they were also able to address and explain how specific elements within patterns and processes of discourse impact developing intersubjectivity between mother and child. In addition, Jamieson and Pedersen's study, framed within Vygotsky's sociocultural theory, has provided one of the first examples of a fine-grained tool appropriate for investigating sociolinguistic patterns and processes of communication.

Jamieson's (1994b) study offers further insight into the significance of a sociocultural approach to investigating sociolinguistic interactions between mothers and children. Following a Vygotskian framework on the progression from other-regulation (where a child's activity is guided by a more knowledgeable peer or adult) to self-regulation (where the child performs an activity

alone, and the peer or adult facilitates only as needed), Jamieson focused on the use of semiotic mediation (i.e., inter-individual communication) and the development of intersubjectivity within mother/child dyads. Her analyses were based on audiovisual recordings and coded transcriptions of mothers teaching their children to assemble a 21-piece wooden block pyramid. Three sets of dyads representing three combinations of deaf and hearing mothers and their deaf and hearing children, who were of normal intelligence and four to five years old, comprised Jamieson's matched participants (four mother/child pairs in each of the three dyads: Hm/hc, Dm/dc, Hm/dc).

Jamieson focused on three facets of communicative behavior: attention-getting, delivery of message, and direction of gaze. These three units of analysis were "assumed to represent the dimensions of greatest difference in the communicative behavior of deaf and hearing mothers" (p. 437). Analyzing dyadic interaction at both the participant and individual level, Jamieson examined audiovisual recordings frame-by-frame, identifying, cataloging and delineating each unit of analysis and the processes of semiotic communication occurring within them between mother and child. Jamieson measured the occurrence of each communicative behavior, pattern of interaction, and the process of shifts dyad participants made as the pyramid building episode progressed. The study was descriptive without control of variables; thus, Jamieson felt that causality could not be inferred. However, by approaching interactive responsiveness between mother and child as patterns and processes of communication, Jamieson was able to interpret the complexities of sociolinguistic interaction and the mediative discourse patterns and processes which occurred within and between dyads. This fostered insight into the qualities of individual expression throughout the dialectical interaction. Thus, the whole behavior was delineated, as were the specific elements and subfunctions of the interaction between mother and child.

Jamieson's study confirmed several characteristics of effective semiotic mediation. When semiotic or communication tools are employed in same-modality sociolinguistic interactions (Hm/hc, Dm/dc), the results may be the same, even if the mediating processes used to achieve goals are different. This conclusion validates the notion that different delivery systems, which are reflective of a cultural context, accomplish the same goal if there is an ability to establish intersubjectivity through or within mediated discourse in dyadic encounters. In addition, Jamieson

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showed that the natural communication modality, which individuals develop and possess as a process of their own sociolinguistic development, is difficult to change or unlearn when faced with communicative encounters requiring a modality shift. Thus, Jamieson corroborated Spencer and Gutfreund's (1990) conclusion that hearing mothers, whose habitual communication is through a SimVA pattern, often continue to use this communication pattern with their deaf children, despite their child's hearing loss.

Göncü and Kessel (1984) noted that typically developing children develop dialogs by negotiating their ideas and experiences through play activities where they alter and coordinate goals and intentions within or through discourse. In Jamieson's study, when Hm/dc dyads did not achieve a mutual reciprocity of interaction, often the mother changed the goal in order to keep the interaction going. The question which arises here is: Do deaf and hearing siblings utilize, facilitate, and/or mediate the establishment and maintenance of discourse with each other through shared dialogic processes of communication? Overall, the importance of Jamieson's research to the proposed study is that it identifies specific units of analysis which facilitate the examination of specific semiotic tools, patterns of interaction, and the processes by means of which these tools are used to achieve intersubjectivity between mother and child.

Research Implications

Parents impact their children's overall cognitive, social and linguistic development. As a consequence many aspects and facets of raising children, which occur naturally in Hm/hc and Dm/dc dyads, are manifested differently in Hm/dc dyads. Much of the research into the relationships of language development and deafness has examined and compared language acquisition within and between Hm/hc, Dm/dc and Hm/dc dyads. What is known and fairly well accepted is that mutually accessible and interactive communication tools must exist between mother and child for language and higher levels of cognitive development to occur naturally. When they do not exist, communication problems arise. In dyadic interactions, where mothers display linguistic unity with their children, dialog soon acquires synchronistic patterns of mutual sociolinguistic interaction and intersubjectivity. The interaction, though, is reciprocal, for much of

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the mother's linguistic, social and behavioral activity is shaped by the child's reciprocating interaction. Insofar as the child is concerned, sociolinguistic interactions have to be sufficiently rich and consistent to facilitate the child's linguistic development.

Thus, any disruption that occurs in the linkage between mediating language and sociocultural context impacts the components delineating dialogic processes. What is unclear, however, is whether similar requirements and communication obstacles exist or are experienced in other hearing/deaf dyadic situations, specifically within the sociolinguistic interactions occurring between deaf and hearing siblings. It appears that siblings may be especially adept at achieving mutually understood dialogs (Azmitia & Hesser, 1993; Cicirelli, 1976; Dunn & Kendrick, 1982; and Mannle & Tomasello 1985 [reviews follow in next section]). Therefore, using a Vygotskian perspective and the fine-grained analysis approach, an investigation into the processes and patterns that deaf and hearing siblings use to mediate and facilitate the development of dialogs seems appropriate.

Language Development and Sibling Relationships

Siblings play a major role in each others' cognitive development, a role which may be even more influential in certain situations than that of their parents (Weisner, 1989). For example, siblings spend a significant amount of time together. They generally experience positive quality in their interactions and the high degree of mutual imitation shared between them suggests that they enjoy each others' company. Although siblings maintain sequentially developing levels and stages of cognition (Cicirelli, 1976; Lamb & Sutton-Smith, 1982), the natural mismatch between siblings' competencies, a product of their age structure, provides an ideal context for the acquisition of a variety of cognitive and linguistic skills during shared sociolinguistic interactions occurring in dialog (Hartup, 1989; Vygotsky, 1978).

<u>Sociolinguistic Interactions in Hs/hs Relationships</u>

Collaboration between individuals attempting to accomplish a task or to carry on discourse is more conducive to cognitive development than that which occurs during solitary activity (Wood, 1988). The key to discourse quality does not relate so much to specific verbal abilities as it does to the quality of sociolinguistic feedback (Tudge & Winterhoff, 1993) and to the fact that social interaction requires a common frame of reference (Vygotsky, 1978). This common frame of reference is built and sustained through behavioral interactions that mediate dialog and social interactions.

<u>Siblings as Facilitators to Younger Siblings</u>

In dialog, successful discourse depends on an implied agreement between participants to do and say what is relevant. Using a problem-solving task Cicirelli (1976) investigated whether or not there were differences in mother/child and sibling/sibling interactions on problem-solving tasks (participants were hearing). Typically developing first-grade children were separated into two groups, one aided by their mothers and the other by their third- and fourth-grade siblings. From direct observations, behavioral activities such as gestures, expressions, and non-spoken language of the interactions were recorded. Tape recordings of the vocal interactions were transcribed and coded into a system of 26 interactive behavioral categories. Cicirelli's focus on the difference in the interaction between child and sibling helper, in terms of a family interaction system, offered several interesting results. Older sisters provided a more positive learning environment for the younger child than did older brothers, giving more explanations, feedback and overall communication about the task at hand. In families where the younger child's older sibling was a brother, mothers also gave more help. Cicirelli suggested that siblings monitor and know the state of each others' knowledge and are, therefore, more cognizant of each others' strengths and weaknesses as learners than are parents. The fact that by the age of eight or nine children can be effective teachers is an important advantage for younger siblings, especially when older siblings have the ability to adjust teaching styles or strategies appropriate to the needs or demands of a younger sibling with whom they are interacting (Cicirelli, 1974). These processes contribute

greatly to the establishment of a mutually shared understanding of tasks and activities taking place between siblings.

Siblings' Adjustment in Communicating with Younger Siblings

Reflecting on Cicirelli's research, one should briefly consider Dunn and Kendrick's (1982) investigation, comparing children's sociolinguistic interaction with mother/child (sibling) and sibling/sibling hearing dyads. Although the siblings were younger (a two- to three-year-old conversing with a one-year-old), Dunn and Kendrick provided additional insight into physical and cognitive activities occurring between siblings as they interacted and adjusted communicative styles with younger brothers or sisters. They found that modifications occurred most regularly during play and directed interaction. This is important when considering the notion that access to language is most facilitative to the younger child when it challenges the younger sibling but does not extend beyond the siblings' interactive zone of proximal development. Older siblings readily made adjustments or clarification with their younger brother or sister. These adjustments were influenced by two sources: pragmatic and emotional differences. In addition, the frequency of specific linguistic behaviors (e.g., asking questions, facial features) were related to the differences in the quality of the siblings' relationships. From Cicirelli's and Dunn and Kendrick's studies one might make the assumption that children who interact regularly in constructive communicative processes with facilitative and interactive sociolinguistic patterns may have opportunities to learn elements about interactive dialog which children in mother/child(ren) dyads do not. For example, Searcy and Eisenberg (1992), examining specific elements of sociolinguistic interaction such as prompting and teasing, suggested that younger siblings may have more opportunity to learn how to use language for a multitude of purposes because of their older siblings' linguistic influences, a facet potentially contributing to dialog flow and the establishment of intersubjectivity between siblings.

Siblings as Agents of Cognitive Development for Younger Siblings

Azmitia and Hesser (1993) posited that hearing siblings appear to have fewer barriers to the instantiation or establishment of communicative intersubjectivity than occurs between them and their peers. They examined the hypothesis that siblings are unique agents of cognitive development by observing the processes through which siblings exert influences on each other, as compared to those which would occur with peers. Specifically, they looked at the similarities and differences in the teaching strategies older siblings and peers employed with younger children and siblings and how those elements affected subsequent learning and sociolinguistic patterns in triadic interactions. They also examined younger siblings' behavior and how it contributed to sociolinguistic influences between siblings. They rejected a traditional path of research inquiry (i.e., family constellations - e.g., birth order, personality development) and focused instead on processes of sociolinguistic interaction by means of which siblings exerted influences on each other. Azmitia and Hesser reported that young children do observe and imitate older siblings and that older siblings do adjust their teaching strategies to the demands of the task and skill levels of younger siblings. In addition, siblings did so by providing more explanations and positive feedback in dialog, giving the younger sibling more control of the problem situation than did older peers. Azmitia and Hesser focused on the processes which first-grade children and their same-gender third-grade siblings used to influence cognitive development rather than traditional variables or individualized characteristics (family constellation variables) which they claimed have failed to capture behavioral activities influencing strategies of communicative interactions. Azmitia and Hesser identified the specific processes siblings expressed during interactions and how each process appeared to influence siblings' interactions with each other. Azmitia and Hesser's approach facilitated both macro level (processes and patterns) and micro level (from elements of interaction to specific behaviors) analyses of siblings' interactions.

Siblings as Models of Patterns of Sociolinguistic Interaction with Younger Siblings

Mannle and Tomasello (1985) stated that early in the process of communication, older hearing siblings often modeled patterns of sociolinguistic interaction in dialog with their younger

hearing siblings, as they themselves gained and improved their communication skills. Specifically, they noted processes whereby older siblings seemed to provide a bridge between unintelligible or nonexistent sociolinguistic interactions and processes which lead to the initiation of mutual understanding about conversational topics. The older children appeared to moderate the degree of familiarity with their sibling, thereby providing dialog feedback and regulation, facilitating, to some degree, their evolving intersubjectivity. This is not to say that siblings are perfect sociolinguistic role models displaying a mutual sense of interaction in dialog. Much of what Mannle and Tomasello found occurred interactively although the older child maintained a degree of egocentricity and quite often lacked any motivation to converse or play with the younger sibling.

Siblings' Adeptness with Younger Siblings' Cognitive Development

Older siblings provide a more positive learning environment in some respects, for a younger sibling, than may occur between parent and child or peers (Azmitia & Hesser, 1993; Yoshima-Takane et al., 1996). Siblings seem to monitor and know the state of each others' knowledge, seem more cognizant of each others' strengths and weaknesses as learners, and readily make adjustments or clarification with their younger brother or sister. Also, siblings appear to have fewer barriers to the instantiation or establishment of intersubjectivity in dialog than occurs between them and their peers or parents. Older children appear to moderate the degree of familiarity with a younger sibling, thereby providing dialog feedback, a fact which contributes greatly to the establishment of a mutually shared understanding of various tasks and activities and facilitates, to some degree, an evolving intersubjectivity. In addition, sibling-directed dialog seems to be important in the process of establishing or constructing mutually shared meanings about the world around them.

Sociolinguistic Interactions in De/hc Relationships

What has been discussed so far establishes somewhat of a baseline understanding of the sociolinguistic interactions occurring between hearing siblings. It is more difficult to address similar interactions occurring between deaf and hearing siblings, or between deaf and hearing

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children because of the sparseness of published research. However, there is some literature documenting these interactions between deaf and hearing children.

Using a multi-element baseline design Esposito and Koorland (1989) made detailed observations on the social play of two deaf children (three and five years old) during free play periods as they interacted with hearing children (ages unknown) in one of two school settings: integrated (private day care) and segregated (public self-contained classroom). Naturalistic observations of free play of the participants were made as they alternated between schools. Eight play categories were used during coding to catalog free play as a combination play/cognitive behavior or, simply, non-play. Analyzing data based on play kinds and types, Esposito and Koorland found that the two children engaged in parallel play (independent of the child but similar in context) in their segregated setting and associative play (play with others without subordinating individual interests to the group interests) in their integrated classes. In both settings functional play (motor active, manipulative play), whether parallel or associative, was the predominant form of play activity. One child, considered outgoing, engaged in more social activity, that is, associative play, than did the other child, who was considered less competent. During the study, Esposito and Koorland found that hearing children engaged in similar play activities with similar frequencies. They ended their study without an in-depth analysis of the interactions between the deaf and hearing peers but concluded that it is important to understand how peer interactions may contribute to the development of social interactions among deaf and hearing peers.

Examining a wide range of variables from social play, non-social play, sociolinguistic interactions, communication modalities, and communication environments of peers (three to five years old) who had been schooled together for six months to three years, Minnett, Clark, and Wilson (1994) analyzed audiovisual records of participating children's play activities both inside and outside classrooms. Using four research questions as the foundation of the study, Minnett, Clark, and Wilson found: first, that children played, interacted and conversed with classmates of other hearing status; that deaf and hearing peers engaged in similar amounts of social activity, play and discourse at school; that, given a choice (i.e., away from school), deaf peers sought out deaf peers, hearing peers sought out hearing peers at all levels of social play and communication; and

that children's social interactions, non-social interactions and discourse did not vary across language modality or educational context settings. What is striking from a sociolinguistic perspective about Minnett et al.'s study is the overall generalization of findings: hearing and deaf children in integrated settings readily interacted with each other in both social and non-social activities, play and dialog, but when given the choice, preferred to interact, play and communicate with same-hearing status peers.

In an earlier study, Vandell and George (1981) found that preschool-aged deaf children initiated interactions with their deaf peers more often than they did with hearing playmates, yet, their initiations were less likely to be acknowledged from a deaf peer than a hearing child. Children (three and five years old) in both homogeneous (Hc/hc or Dc/dc) and mixed dyads (Dc/hc) were observed and videotaped. These audiovisual recordings were transcribed, coded, and analyzed for dialogic initiations and rejections. Vandell and George's findings, although not directly contradictory to Minnett et al.'s (1994) study, offer several insights key to the frameworks of the proposed research. Deaf children, even though they lacked language skills equivalent to those of their hearing peers, showed interest and skill in heterogeneous interactions, and even displayed a greater persistence in initiating sociolinguistic interactions than did their hearing peers. Moreover, deaf children seemed to develop alternative language skills and interaction strategies appropriate to their sociolinguistic needs.

Deafness appears to affect the types of communication and social interactions occurring between peers, deaf or hearing. Lederberg et al. (1986) found that when hearing and deaf children were acquainted with each other, they exhibited improved sociolinguistic interactions. In addition, interactions between deaf and hearing peers seems to improve when deaf children have good oral skills (Brackett & Henniges, 1976).

The ability to carry on positive or sustained dialog requires that children coordinate their behavioral and sociolinguistic interactions as well as their focus of attention with others. If this process is unlearned or hindered, then there is a significant potential or possibility that language interaction between deaf and hearing peers, or deaf children with differing levels of hearing or language abilities, may be affected. The inability to initiate and maintain dialogs has the potential to

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lead to difficulty in understanding the perspective of others or in facilitating an awareness of the self and the effects one has on one's own activities (Wood, 1991). According to Wood, deaf and hearing peers may not seek each other out as playmates or develop sustained interactions with each other because of their inability to coordinate attention in play. Deaf children have difficulty focusing their awareness and attention by means of differing modes and patterns of communication at the same time. By contrast, hearing children are continually exposed to parallel worlds of experience which arise simultaneously from the interaction of vision and hearing.

It appears that peers are not effective mediators of sociolinguistic interactions when cross-communication modalities are involved. Vygotsky postulated that children are guided in development by social interaction. His emphasis on dialogical interaction with more skilled partners basically concurs with the notion that peers do not necessarily promote cognitive interactions or advancement.

Sociolinguistic Interactions in Hs/ds Relationships

Clearly, there are sociolinguistic or behavioral elements which influence and affect deaf and hearing peers' sociolinguistic relationships. Brackett and Henniges (1976) found that sociolinguistic interactions between deaf and hearing children improved when the deaf child had good oral abilities which helped sustain play or interactions. In addition, when hearing children knew deaf children, as occurred when they interacted as playmates or as friends in shared home environments where they had learned to use nonverbal communication, they displayed improved sociolinguistic interactions (Lederberg et al., 1986). But do these results and the findings discussed above carry over when one examines deaf/hearing sibling relationships? As noted earlier, the question is difficult to pursue considering the scarcity of literature on the subject.

Kaplan and McHale (1979) observed a 3-year-old deaf sibling/4-year-old hearing sibling dyad to determine how the older sibling's deafness might alter the sociolinguistic interactions characteristically typical of Hc/hc relationships. Observations during children's interactive play periods showed that most sociolinguistic behaviors fell within the range typical of Hc/hc dyad behaviors. Gestures, signaling, and gestural modeling were used by the deaf child, while many

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(~20%) of the younger child's communications efforts were aborted because of his failure to get his deaf brother's attention.

Schirmer's (1991) report on the language and cognitive development of a deaf and hearing twin sister dyad offers interesting insights into sibling interactions. Focusing on behavioral elements which either enhanced or hindered twins' language and cognitive development, Schirmer examined the similarities and differences in the twins' behavioral and sociolinguistic interactions with each other. The deaf twin was observed during two one-hour sessions: first, in a clinical environment with the researcher and then in the child's home in joint interaction with her hearing sister. The first session was designed to establish baseline data on the deaf twin's language skills and capabilities of imaginative play and the second session's purpose was to elicit expressive language and imaginative play between the twins. The girls' (four years old and born into a hearing family) sociolinguistic interactions were analyzed individually and jointly. During their joint hour together, they quarreled over 50% of the time. "During the remainder of their interaction, they requested and demanded things of each other or identified play objects" (p. 207). The deaf twin's discourse during the clinical session included both oral and sign language, with some gestural interactions, and was mostly informative, with little interactive discourse. During the in-home session she used little oral language, few signs and mostly gestures. In Schirmer's analysis of imaginative play, as occurred with language use, there was a dichotomy between sessions. Each child engaged in play, yet, the deaf twin displayed imaginative play only with the investigator during the clinical session and none with her hearing sister during the in-home session.

Each twin displayed language proficiency within a range typical of her age and language modality, but each simplified language use in discourse with the other. Each twin engaged in age-appropriate imaginative play but showed differing levels of play with each other. Schirmer suggested that the mere presence of a communicating partner is no guarantee that children will stimulate language and cognitive development with each other. However, the key finding in Schirmer's research relevant to the current study is that her methodological approach did not allow her to investigate fully the research questions she proposed. By investigating the effects of

variables and characteristics of each child, she overlooked the processes of sociolinguistic interaction which were ongoing between the twins. As a consequence, her investigation forestalled an in-depth understanding of the behavioral activities and the effects which they may have had on the twins' sociolinguistic interactions occurring both in dialog and play interactions.

Evans' (1995) research described the patterns and processes of sociolinguistic discourse and interactions between eight siblings, seven who were hearing (two to 14 years old) and one who was deaf (seven years old). This case study, conducted within a social-semiotics perspective, examined the relationship among conversational text and context and the pragmatic dimensions of language used in discourse by family members, the structural features of dialog, and the functional aspects of language use. Evans identified and then examined the specific communication strategies which promoted intersubjectivity between siblings. Her findings appear to demonstrate that the deaf child utilized appropriate language skills to anticipate unfolding activities. She also found that the child used discourse within a full range of functions, employed a variety of communication strategies to understand and be understood, constructed discourse with turn-taking ability, and used typical structural features of conversation in almost all sociolinguistic interactions. The child's membership in her large hearing family sometimes limited her access to information and inclusion in family communication. However, she did not seem to be hindered in her development and use of language with her siblings.

Research Implications

Dialog develops through mutually shared behavioral and sociolinguistic interactions between conversational participants, but to reach the level of dialog participation, partners in the dialog use different spoken and nonverbal processes and patterns to initiate and maintain dialogs. Thus, the construction of dialogs becomes a dynamic process of communicative interaction and expression of behavioral and communicative characteristics. Based on what is known about the behavioral and communicative processes and patterns that occur in dialogs within same-modality and cross-modality mother/child dyads and what can be extrapolated from the existing research on

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similar peer or sibling dyadic interactions, the questions posed in this study examining and comparing deaf and hearing siblings' communicative interactions are worthy of explication.

CHAPTER THREE

The Field Study Design

The purpose of this study was to examine the processes and patterns of communicative interaction which preschool and elementary school-aged deaf and hearing siblings utilize to initiate, maintain, and terminate dialog during play. The research undertaken to investigate siblings' behavioral and communicative interactions was accomplished in two stages: first, through a pilot study, and then a field study. The purpose of the pilot study was to test proposed field methods, do basic data collection, and to experience in-home visits. The purpose of the field study was to conduct a short-term examination of the processes and patterns of communicative interaction that preschool and elementary school-aged deaf and hearing siblings utilize to initiate, maintain, and terminate dialogs during play. The field study, an embedded case study, followed an investigative and analytic approach developed by Yin (1989, 1997). Within this study design, deaf and hearing siblings' naturally occurring interactive play and dialogs were observed and documented on videotape. These tapes were then examined and analyzed and siblings' playbouts (the unit of analysis in this study), the kinds of play they engaged in, and the processes and patterns of siblings' dialogs occurring during playbouts were identified. Additional analyses were conducted on these specific facets of siblings' play interactions and dialogs.

The Arena of Investigation

Numerous classification systems exist to categorize children's play. Smilansky's (1968) classification system of children's play was selected because of its seminal status and age appropriateness for the children participating in the study. Children between the ages of three and nine years frequently engage each other in the kinds of play Smilansky cataloged (Rubin, Fien, & Vandenberg, 1983). Smilansky's system was also chosen because of its incorporation in studies by other investigators during the last two decades in projects examining and comparing deaf and hearing children's play behavior. The coding system provides a tool to compare and contrast data

on children's play between this and other studies (c.f., Esposito & Koorland, 1989; Gatty, 1990; Higginbotham & Baker, 1981; Levy, 1984; Mann, 1985; and others). Smilansky's five classifications of children's play were used in this study to code siblings' play:

(a) Social play - involves the interactions of children where play occurs simply for the sake of playing together and where ideas, roles, and interactions are shared (fairly) equally;

(b) games - have rules and are usually played for pleasure although competitiveness often occurs;

(c) constructive play - may include one, several or all of the following facets: manipulation of objects, repetitive activities, creation or construction of a product, problem-solving and may include some aspect of symbolic representation of play;

(d) symbolic play - occurs as role playing by pretending to be another person or a make-believe entity, often including objects to represent another object or entity as play progresses; and

(e) practice play - where children use repeated actions or behaviors which facilitate physical or mental mastery of an activity or a coordination of skills required for that activity.

Participants

Through the cooperation of the Deaf Children's Society of B.C., two hearing families with deaf and hearing children were recruited from the province of British Columbia to participate in the study. The letter of inquiry for volunteers for the field study and the request for volunteers to participate in the field study are included in Appendices A and B. One family was recruited to participate in the pilot study and another family was recruited for the field study. The following criteria and rationale were established for family participation in the field study:

1. There are three children in the family. Three children represent the simplest combination of siblings' play dyads that responded to the research question.

2. The first-born child was no more than 8.0 years of age (yoa) and the last-born child was no younger than 3.0 yoa at the onset of data collection. The reason for this criterion was that children between these ages typically engage in the kinds of play represented in Smilansky's (1969) classification system (Piaget, 1962).

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3. The first-born child is hearing, uses spoken English, and has been exposed to Signs to communicate with the second-born deaf child. Justification for this criterion focuses on the potential that the first-born child's language modalities may represent what is typically expressed by hearing mothers within Hm/dc dyads (utilization of naturally acquired spoken English and learned use of Signs), thereby offering the potential to compare and contrast data from hearing sibling/deaf sibling dialogs to studies on Hm/dc dyads.

4. The second-born child is deaf, has an aided hearing level of no better than 70 dB in the better ear (this level is frequently used by researchers to indicate children who are primarily visual processors of information as compared to children who are also auditory processors) and no additional educationally significant disabling conditions, and primarily uses Signs to communicate within the family. Justification for this criterion focuses on the fact that the second-born deaf child's communication modality created the sibling dyads sought for investigation within this study.

5. The third-born child is hearing, uses spoken English to communicate within the family, and had been introduced to Signs for communication with the second-born deaf child since birth. This child's naturally acquired spoken English and use of Signs facilitated comparison to and contrast of communicative behaviors used by this child to that of the first-born hearing child's as they both communicated with the second-born deaf child during dyad play.

6. The family has been involved in an early intervention program where Signing has been used. The reason for this criterion is that such a family-based early intervention program would have exposed all family members to a visual means of communication.

The Participants

The participants in the field study were Alicia, (seven years old), Katy (five years old) and Zack (three years old) Anderson.[9] Alicia and Zack have normal hearing. Katy is deaf with an aided hearing level of no better than 70 dB in the better ear. She has been fitted with and occasionally uses hearing aids; however, these were never worn during the field study. Otherwise, Katy is a typical, normally developing five-year-old child with no other educationally significant disabling conditions or disabilities. Katy used Signs as her primary form of communication within the family, whereas Alicia and Zack used spoken English as their primary means of communication along with Signs when communicating with Katy and within many family interactions.

Family History

This middle-class, intact family had resided at the location where the field study was conducted for approximately four years at the time of data collection. The parents are both hearing adults. At the time of the study, the father's profession was white-collar within the health profession, while the mother was responsible for full-time care of their three children. English was the first language used in the home environment by both parents. Dual language communication (Signs and spoken English) was used extensively within the home by both parents, between themselves, and with their children, even when Katy was not immediately present. At the time of data collection the family had been involved in an early intervention program in which they had been exposed to a visual means of communication since Katy's diagnosis at four months of age.

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[8] The Anderson family history detailed in this section comes primarily from discussions with Mrs. Anderson (mother). The information presented here summarizes a subjective, paraphrased synthesis of her reflections of Alicia, Katy and Zack and the family's accommodation and assimilation of dual-language communication patterns (Signs and spoken English). Each parent shared their personal history of ASL acquisition.

[9] Pseudonyms.

Alicia was 22 months old when Katy was born into the family. Approximately four months after Katy's birth she was diagnosed with Cytomegalovirus (CMV) to which her mother had been exposed and was carrying during her pregnancy with Katy. As a consequence of Katy's contracting this disease, she underwent a battery of medical tests examining not only basic physiological functions but also her hearing. Four months after her birth, Katy was diagnosed as deaf. The parents were informed of and directed to three centers in the greater Vancouver area which offered early language intervention programs for hearing families with deaf children. These were the Elks, the Vancouver Oral Center (VOC), and the Deaf Children's Society of British Columbia (DCS). The philosophy and language intervention programs of each of these centers are different. The Elks program uses Total Communication approach which "endorses the right of every child who is hearing impaired to communicate by whatever means are found to be beneficial" (Moore, 1996, p. 13). The Vancouver Oral Center's focus is on the acquisition of a spoken language and use of residual hearing. Deaf Children's Society focus is on the acquisition of American Sign Language (ASL) within the family as the primary language for the deaf child and the secondary language for all hearing individuals within the family. The Andersons initially became involved with both the Elks and VOC. After a period of time, however, the parents sought out and became involved with the program offered by DCS and began to focus on the incorporation of ASL into the language environment within their home, along with spoken English. The philosophy of the DCS program at the time of the field study was that first, a deaf child is a typically developing child and second, a child who is deaf. The focus was on altering the language environment Katy was exposed to within the family, rendering language interactions accessible to Katy through ASL.

When the field study commenced the family had been involved with DCS for approximately five years. During this period the family worked with three sign language tutors who conducted weekly in-home visits. The first tutor was born deaf to parents who were both deaf. This tutor worked with the Anderson family for three years. The second and third tutors each spent a year working with the family. They were both born deaf into hearing families but attended residential schools for deaf children where ASL was acquired as their primary language.

The family's first three years of introduction to ASL were focused on the foundations of a visual language and grammar expression. At the end of this period of time the parents made a decision move into a more intense curriculum-focused use of ASL within their home for all members of the family.

The parents' acquisition of ASL occurred at individual paces. Initially the mother, who was the primary caregiver to her children, acquired syntax more readily and more fluently than did the father. The father commanded a greater knowledge of vocabulary and the spatial field within which ASL is expressed. By the time the field study commenced, both parents shared equally in the use and expression of ASL.

Although both parents were tutored in visual processes of communication with Katy, the focus of the program was on mother/child dyadic interactions. During the first two years of the program, Alicia was largely excluded from tutoring sessions taking place between the tutor, the mother, and Katy. Alicia participated as a bystander and practiced Signing with Katy whenever she was alone with her or when she and her mother interacted with Katy. Alicia's mother stated "Alicia was hearing and, therefore, we did not teach her to be a visual signer with Katy." "Alicia was taught Signs but she was not taught how to use them." Furthermore, during the first year in the program, the family experienced mixed emotions about Signing. The early intervention program attempted to foster pride in the use of Signs but the parents, the mother noted in particular, were grieving about Katy's deafness and found it difficult to share with their hearing daughter, as well as with each other, an ability in Signing and the incorporation of a dual-language environment (Signs and spoken English) within the family. In addition to the DCS program, the Andersons participated as a family in the annual Learning Vacation Experience (LVE) conducted in Squamish, British Columbia, each summer. The LVE is a two-week camp in which families with deaf children gather to foster Sign use, language development, acquisition, and expression by all family members and is conducted by both hearing and deaf staff members.

At the time of the field study, Alicia's mother believed that her hearing daughter's loquaciousness in Sign expression was below average and, at times, delivered sloppily and with disinterest. During the field study, a young Deaf woman who was born into a Deaf family was

actively involved tutoring the family. However, her primary purpose was to work with Alicia in acquiring the visual skills required for fluency in communicating with Katy. The tutor worked with each sibling individually and in group play and modeled visual communication processes with Alicia, Katy, and Zack. It was during these months, according to the mother, that Alicia began to become a more fluent user of ASL than she had been in the past.

When Zack was born, three years had elapsed since Katy's diagnosis and the family had moved into an active dual-language environment using both Signs and spoken English to communicate within the family. Thus, Zack was naturally introduced to both a Sim VA and a Seq V mode of communication without the challenge of learning a new mode of communication and experiencing the grief the family experienced over Katy's deafness. Zack was born into a dual-language environment which the family took pride in expressing. Shortly after Zack's third birthday, several weeks prior to the field study, Zack was enrolled in an integrated DCS preschool program where he was the only hearing children among seven deaf children. At school, his experiences with Signed communication were *Voice off* (Signs only, no spoken English). At home with his parents and his sisters, Zack used *Voice off* when the family designated a *Voice off* period of time for communicating. Zack also used *Voice off* with Sign sporadically in Katy's presence. Katy was very active in Zack's life, taking on the role of caretaker, playmate, and older sibling. According to the mother, from the time of Zack's birth, his developing dialog processes were a mixture of Sim VA from his hearing mother, father, and older hearing sister, Alicia, and Seq V with his older deaf sister, Katy.

Equipment

A High-8 camcorder with a 24:1 ratio lens loaded with HS-120 tapes was used to record and document siblings' play interactions during in-home visits. The camcorder was equipped with an autofocus shutter and a time/tape-notation counter. These features facilitated not only high quality recordings and resolution but also continuous time (seconds) and event occurrence notation during all taping sessions and analyses.

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Because children have a propensity to move about and not stay in one play area for any length of time, their movements both within the house and outside were accommodated during each recording session by attaching a quick-release tripod-mount to the bottom of the camcorder. This allowed easy detachment and re-attachment to several tripods set up in the siblings' most-often frequented play areas, both inside and outside the house.

The camcorder's field of view was preset at a focal range allowing as complete and unobstructed coverage of the play area as possible. Camcorder functions were controlled using remote control which allowed on/off/pause activation during recording and focal range adjustments from any location in the children's play area. When possible, all videotaped recordings were made from a minimum distance of 3 m from my observation position to the children's ongoing play. This distance seemed to moderate children's immediate curiosity and desire to interact with me.

Data Collection

In-Home Visits

Prior to initiating the first in-home visit to record siblings' play, I met with both parents to discuss the research. The parents were informed that a study of children's interactions during play would be conducted over a four-month period. Schedules for weekly in-home visits which created minimum interference with established family routines were established. Other topics discussed were participant confidentiality, the right for the family to withdraw unquestionably from the study at any time, and the children's safety. I was then introduced to Alicia, Katy, and Zack. After greeting the children, I explained to them in spoken English and Sign[10] that I would like to watch and videotape them as they played together and as they played with their friends. I then asked each child if he or she would be willing to let me do this. Each child agreed. An example of the

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[10] At the time of the field study my signing skills were simplistic, but functional. I carried on conversations with Katy, understood most of what she said to me, and was able to discuss topics relating to her daily life, activities and play with her siblings and neighborhood peers.

Informed Consent Form between myself and the family participating in the study is included in Appendix C.

The routine established for in-home visits was adhered to throughout the field study. Prior to each visit, parents were contacted and my arrival time was re-confirmed. Arrival was planned for mid-morning to early-afternoon (10:00 a.m. to 1:00 p.m.). After placing audio-visual equipment in the garage, I spent a few minutes with each child talking about his or her activities, joining the play, or soliciting conversation about a special topic or entertaining a discussion the child initiated. I then met with the parent(s) to check on the family's planned schedule of activities for the day or to ascertain if the day was considered free-play time for the children. At this time I also addressed any parent concerns which may have arisen and scheduled the next in-home visit date and time.

Wherever children played, I positioned equipment and myself with an unobstructed view of the play area and their activities. This proved difficult at times because the children roamed freely from the backyard to the front yard, engaged in running play across any one of four other yards around the cul-de-sac, or played from one side of the cul-de-sac to the other. Six locations outside the Anderson's house and four locations inside were routinely used to video tape play. These sites provided the most continuous, unobstructed view of children's play possible. Watching the children from these sites also provided an element of continuity for the children as my presence (after several in-home visits) seemed to be accepted in these areas.

Concluding each in-home visit, I checked with the parent to re-confirm date and time for the next visit. I then sought out Alicia, Katy, and Zack and any other children playing in the area to let them know that I was leaving for that day and to say good-bye before departing.

The Play Environment

Alicia, Katy, and Zack played in 10 areas in and around the Anderson home during the field study. Four locations were indoors and six were outdoors. The play areas were

(a) the playroom,

(b) the siblings' downstairs playroom,

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(c) the kitchen dining table,

(d) the living room coffee table,

(e) the back yard,

(f) the back yard swing-set,

(g) the cherry tree swing in the front yard,

(h) the cul-de-sac,

(i) the front yard, and

(j) the social area immediately adjacent to the front door.

There were two other play areas used by all children. These areas included four neighbors' yards and the front entrance to the Anderson's garage. Play occurring in neighbors' yards was usually too far away to be videotaped and was rarely sibling-specific. Siblings' play occurring around the entrance to the garage was excluded from data analysis because my presence and close proximity to the children's activities seemed to influence or affect ongoing play; that is, the children played together but frequently included me in their play activities and dialogs.

Behavioral Observations

Within the Anderson home environment, the children were watched as they went about their daily routines. Collection of data entailed observing and videotaping the children as they played. Field notes were also made during the field study. Field notes were referred to for corroboration during descriptive analyses of siblings' behavioral and communicative interactions.

Data were collected over a five-month period from late-April through mid-August, 1996. Visits occurred at least once a week (the shortest span between visitations was four days; the longest was eight). A total of 27 in-home visits was made during the field study. Each in-home visit began no earlier than 10 a.m. and no later than 1:00 p.m., a window of time linked to children's daily initiation of outdoor activities with each other and their neighborhood playmates. A total of 56 hours was spent during the field study at the Anderson home. Visits lasted an average of 2.1 hours (range: 1.3 to 3.2 hrs).

Although sibling-specific interactive play was the focus of all video-tape recordings, anytime Alicia, Zack, or Katy played together or with peers, video recordings were made of all play interactions because I never knew when siblings would break away from peer play and engage each other in some form of interactive play. Over 30 hours of videotaped interactions were made on children's play with an average of 70 minutes recorded per visit (range: 50 to 78 min). Of the 30.1 hours of children's play recorded during the field study, 19.6 hours were cataloged as sibling-peer play,[11] 4.8 hours were cataloged as dyad-specific sibling play, and 0.6 hours involved play among all three siblings.[12] Of the 4.8 hours of dyad-specific sibling play, 3.5 hours (73% of total dyad-specific sibling play) occurred between Alicia and Katy and 1.3 hours (27%) between Zack and Katy. There were no dyad play interactions observed or recorded during the field study between the two hearing siblings, Alicia and Zack. The balance of video-taped interactions (5.1 hrs) was labeled as other activities (e.g., children out of sight, parent interaction or intervention).

Habituation to the Camcorder and Researcher's Presence

Nicolopoulou (1993) and Goldman-Segall (1995) addressed researcher contamination and concluded that a researcher's presence as an observer does affect children's ongoing activities at times, but minor interference is part of the holistic approach to observing naturally occurring play behavior. Parten (1932) stated that children seem "quite oblivious to the presence of adults and pursue their activities as if no grown-ups were around" (p. 248). All in all, adults appear to be insignificant entities to children because children are socially situated to play amongst themselves and tend to ignore adults (Vygotsky, 1967).

My initial concern that observations or equipment may distract or bias siblings' interactions appeared to be unwarranted. By introducing each child to the equipment used during the field

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[11] Sibling-peer interaction video recordings documented during the field study were not coded nor analyzed in this thesis.

[12] Triad play interactions and dialogs occurring between all three siblings were coded, but were not analyzed in this study.

study (camcorder and tripods) during the first few in-home visits, their initial curiosity seemed satisfied, and they readily appeared to habituate to these items as well as to my presence in their play areas. On occasion throughout the field study, a child would visit me where I was seated. Although these visits were infrequent, the child's curiosity about the camcorder, questions or desire to talk was accommodated by allowing him or her to examine the camcorder and peer through the viewfinder, answering questions or spending a few minutes in conversation on topics the child initiated. Usually, after a few minutes of visiting, the child would leave and return to play activities with the other children.

The Field Study Design - Data and Coding System

Recognizing that children's play is behaviorally layered with action and is, therefore, context-sensitive to analyses (Eibl-Eibesfeldt, 1973, 1989) three steps were undertaken to examine how siblings' behavioral and communicative interactions occurred during play. The first was the identification of a unit of analysis which represented the holistic expression of siblings' interactions. The second was the analysis and identification of embedded behaviors of play and embedded communication elements layered in siblings' processes and patterns of communicative interactions occurring with playbouts. The third was the examination of communication patterns siblings expressed and used with each other as they went through processes of dialog initiation, maintenance and termination. Embedded elements were defined as the specific traits and behaviors used in dialog; these included, for example, gestures, Signs, and non-linguistic sounds. Processes are the characteristics and attributes of dialog. A process includes the expression of elements which have both order and form, and represent a specific act of communication as occurs during attention-getting, message delivery and termination of dialog. Patterns are the arrangement of traits (elements) and characteristics (processes) manifesting the arrangement and flow of communicative interactions from initiation through termination. The methodological steps developed for accomplishing these multi-layered tasks are reported in this section.

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Unit of Analysis

A unit of analysis represents the primary activity under investigation in a study reduced to specific key traits and characteristics, all of which still retain the integrity of the activity or behavior under investigation (Vygotsky, 1962; Yin, 1997). The playbout was identified as the unit of analysis in this study representing the totality of siblings' play and communicative interactions. A playbout was defined as the period of interactive play behavior occurring between siblings from the time any play activity or encounter was initiated by any means by any sibling for whatever reason until it was terminated or a break in the flow of activity occurred for more than one minute without any form of the previously ongoing play resuming. In addition, if siblings were playing and a playmate entered into siblings' ongoing play, then the sibling-specific playbout was considered terminated. If play was initiated by siblings but was terminated before 15 seconds elapsed, the interaction was not considered a playbout.

Embedded Behaviors

In the process of examining a unit of analysis, Yin (1997) acknowledged that a unit may have multi-levels of embedded behaviors (or elements), where each level may again be represented by a hierarchy of subelements depicting finer-grained behaviors expressed as specific traits and characteristics of the unit of analysis. The number of levels of embedded behaviors identified as coding categories in this study was dependent on the traits and characteristics expressed by each sibling as the children interacted and conversed together in dyad play.

Embedded Behaviors - Siblings' Play

Siblings' play within a playbout was composed of a single embedded element and its associated subelements: play and kinds of play. Play was defined as any interaction occurring between siblings which met the definition of one of Smilansky's classifications of children's play categories. Kinds of play were cataloged according to Smilansky's (1968) five categories of play interaction: social, games, constructive, practice, and symbolic play. Siblings' play, once cataloged and coded, was analyzed for percent frequency occurrence in minutes of each kind of

play expressed as a proportion of the total playtime documented in each of the two dyads: (a) the older dyad with Alicia (first-born, seven years old, hearing) and Katy (second-born, five years old, and deaf) and (b) the younger dyad with Katy and Zack (third-born, three years old, and hearing).

Embedded Behaviors - Siblings' Dialogs

Dialogs are composed of three processes (Taylor, 1990), each of which facilitates the flow of conversations from beginning to end. The processes are initiation, maintenance, and termination. Dialog initiation consists of one individual attempting to gain another's attention, which is termed *Attention-Getting*. Maintenance occurs when information is delivered by one individual to another while maintaining that individual's attention during information delivery, which is termed *Exchange of Information*. *Termination* occurs when one member of the exchange ends the dialog. Initial examination of siblings' dialogs resulted in the identification of embedded elements and subelements occurring within each dialog process. These embedded behaviors included behaviors and traits specific to or generalized across ongoing dialog processes. In order to effectively catalog and analyze embedded behaviors utilized in siblings' dialogs, a chart tabulating the sequential occurrence of expressed traits (referred in this study as a flow map) for each dialog was developed.

The procedures used to identify, catalog, and map the flow of embedded elements and subelements of siblings' dialogs were borrowed, in part, from Jamieson's (1994b) study of mother/child dialogs. Jamieson's catalog of embedded behaviors included elements expressed during dialog initiation (attention-getting elements), signals used to deliver messages (Exchange of information), and behavioral traits used to maintain visual contact between mother and child during message delivery (Direction of gaze)[13].

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[13] Using the system developed by Jamieson as an initial starting point I examined siblings' dialogs for similarly expressed communicative behaviors. I found some overlap with certain elements in siblings' dialogs but also identified communicative behaviors not coded by Jamieson. In addition, I found that I was unable to use Jamieson's category, direction of gaze. This was due to the nature of siblings' interactive play, the children's propensity to constantly move about, and the distance from camcorder to siblings' interactions. Thus, I could not effectively code siblings' gaze with any reliability. Although Jamieson did not examine dialog termination elements, I did because understanding how siblings terminated dialogs was a facet of the investigative questions developed for this study.

After analyzing siblings' dialogs using Jamieson's codes and identifying those elements which provided communicative behavior matches, I then undertook the task of identifying and cataloging the totality of communicative behaviors expressed by siblings not identified by Jamieson. These analyses resulted in the identification of over 50 embedded traits and characteristics expressed as specific communicative behaviors occurring in the processes of attention-getting, exchange of information, and dialog termination. These elements were then grouped into similarly expressed categories (e.g., touch, tap, hit, pat, and grab were collectively grouped together) and then collapsed into an overall category representative of the specific expressed embedded behaviors (e.g., touch, tap, hit, pat and grab were melded into the category of body contact). Table 1 presents operational definitions and examples of embedded behavioral and communicative elements.

Siblings' dialog initiation was analyzed for four attention-getting embedded elements and five specific traits (subelements) expressed as each child sought to gain another's attention. In addition, three non-specific categories were included in attention-getting: two labeled Ambiguous signals and an Other category. Definitions for each category are presented in Table 1.

During maintenance I examined dialogs for Exchange of Information elements used to convey information between siblings as dialogs progressed through the message delivery stage. These embedded elements included two visual and two auditory exchange behaviors along with two Ambiguous categories (one each for unidentifiable visual elements and one for undistinguished auditory elements) and one for Other exchange elements (see Table 1). In addition to coding behavioral embedded elements, I also identified

    (a) who initiated and terminated message delivery,

    (b) whether the child initiating also terminated the dialog,

    (c) the occurrence, non-occurrence, and length of pauses during message delivery between siblings,

    (d) whether responses were given during delivery, and

    (e) the number of turns occurring in each dialog.

Table 1.

Operational Definitions and Examples of Embedded Elements of Processes of Dialogs Expressed between Siblings.

Processes & Embedded Elements	Operational Definition	Examples
Attention-Getting	One child enticing or causing another child to look at or pay attention, in order to initiate conversation.	
Prolonged Eye Gaze	One child staring intensely at another child for more than 5 seconds.	One child looks at another, gazes intensely, leans forward & stares until the other child notices.
Visual Signals	Any communicative interaction requiring a visual connection between children in order to be effectively expressed.	
Signs	Standardized visual-gestural movements of the hand (ASL) or particular manual signs utilized in combination with standard or invented Signs by siblings (Home signs).	One child looks at another child & Signs that child's name.
Points	Child extends arm, hand & index finger pointing at another child, an object, or in a directional manner.	One child looks at another child & points at an object lying between them.
Handwave	Child extends arm & waves hand up & down. A "waving good-bye" motion.	One child looks at another child, extends arm & handwaves at that child.
Gestures	Any movements of the fingers, hands, arms, legs, body or face conveying a message from one child to another child.	Foot stomping, hand clapping, throwing objects, reaching out toward another with extended arm.
Ambiguous Visual Signals	Visual signals not clearly recognized as a gesture or Sign.	Movement given by a child not clearly recognized as a Sign, Pointing, Handwave or a Gesture.
Other Visual Signal	Any visual behavior expressed by a child to gain another's attention not meeting definitions noted in above categories.	
Auditory Signals	Vocalizations produced by one child directed at another child.	
Non-linguistic Sounds	Any sound made by a child not recognized as spoken English.	Grunts, hoots, screams, shouts, & other sounds including paralanguage utterances (e.g., Uhh huh!).
Spoken English	Any sound uttered conveying meaning in the English language.	One child says to another child, "Hey! Look at this!"

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Table 1 Continued.

Operational Definitions and Examples of Embedded Elements of Processes of Dialogs Expressed between Siblings.

Processes & Embedded Elements	Operational Definition	Examples
Attention-Getting (Continued)		
Ambiguous Auditory Signal	Sounds not clearly understood as spoken English, yet not quite meeting definition of a non-linguistic sound. (An ambiguous interpretation).	One child utters sound to attract another's attention. Utterance may have been the child's name or a non-linguistic sound.
Body Contact	One child physically making contact with another child.	One child reaches out & taps another child on shoulder.
Other	All behaviors expressed during Attention-Getting not meeting definitions noted in above categories.	One child tries to gain another's attention but fails. Gains Mother's attention. Asks Mother to gain other child's attention & focus that child's attention towards first child.
Exchange of Information	One child sharing information with another child verbally or non-verbally. Message shared is acknowledged as received by the subjective attention of either child or both children.	
Visual Exchanges	See Visual signals defined in Attention-Getting.	
Signs	See Signs defined in Attention-Getting.	
Gestures	See Gestures defined in Attention-Getting. Examples are specific to Exchange of Information but may include elements noted in Attention Getting that are not formal or home signs.	Shoulder shrugs, head nods 'Yes,' head shakes 'No,' frowns, smiles, facial expressions, body posturing.
Ambiguous Visual Exchange	See Ambiguous Auditory Signal defined in Attention-Getting.	
Auditory Exchanges	See Auditory Signals defined in Attention-Getting.	
Non-linguistic Sounds	See Non-linguistic defined in Attention-Getting.	
Spoken English	See Spoken English defined in Attention-Getting.	
Ambiguous Auditory Exchange	See Ambiguous auditory exchange defined in Attention-Getting.	

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Table 1 Continued.

Operational Definitions and Examples of Embedded Elements of Processes of Dialogs Expressed between Siblings.

Processes & Embedded Elements	Operational Definition	Examples
Exchange of Information (Continued)		
Other Auditory Exchanges	All auditory utterances or behaviors expressed for the purpose of exchanging information not meeting definitions noted above.	
Termination	One child physically ending a dialog with another child.	
Visual Terminators	See Visual signals defined in Attention-Getting.	
Looks Away	One child physically looking away from the face of another child by shifting gaze or moving head.	One child looks from other child's face, slightly turning head so gaze is directed behind other child.
Turns Away	One child physically turning head & body away from other child.	One child turns head & body perpendicular to other child.
Leaves	One child leaves the immediate vicinity of the other child.	One child walks away from other child.
Other Terminators	All behaviors expressed for the purpose of terminating a dialog not meeting definitions noted above.	Mother interrupts & terminates siblings' dialog by walking between them.

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Turns (or turn-taking) are defined as specific exchanges between locutor (initial deliverer of message) and interlocutor (initial receiver of message) during information exchange where one child delivers a message to another child and that child responds to the message delivered. For example, after gaining the attention of a sibling (child B), child A Signs to sibling B. Child B responds with both Sign and spoken English to child A. Child A then responds with a gesture to child B. Child B terminates the exchange by turning away from child A. The delivery by child A and response by child B represent one turn, or turn-taking exchange. When child A responded to child B's response, a second turn occurred. Thus, this dialog contained two turn-taking episodes.

When siblings ended conversations, I focused specifically on three embedded behavioral and communicative cues expressed by each sibling as they terminated dialogs. Termination also included the category Other.

Pattern-Matching

Pattern-matching facilitates repeated comparisons of embedded behaviors of units of analysis allowing a researcher the potential to determine the occurrence of activities, to determine the sequence of activities, and to compare and contrast similarities and/or differences in expressed behaviors of an activity under investigation (Yin, 1997). I used pattern-matching to sequentially code the temporal flow of behavioral and communicative elements of attention-getting, exchange of information, and termination. These charts, or flow maps of elements (one for every dyad dialog) were then examined for recurring expression of individual or specific elements or groups of elements. Siblings' use of single (Non-linguistic sound) or grouped elements (Non-linguistic sound with gesture) was then analyzed by comparing how each element's use contributed to the establishment, maintenance and termination of dialogs. Through comparative examination of embedded dialog elements and subelements, I identified specific expressions of single elements and combinations of elements. In addition, I was also able to trace patterns of embedded elements both within and across conversational dyads between siblings during play.

Pattern-matching also facilitated the identification and analysis of dialog traits and characteristics expressed by and between siblings in the overall flow of their play. This facilitated

the identification and charting (mapping) of behavioral and communicative interactions as I analyzed dialogs for patterns of behavioral expression. These maps listed simultaneous and sequentially expressed elements by each sibling as dialogs progressed from initiation through termination. For example, Child A delivers information to Child B in single turn-taking episodes and only through auditory elements. However, during one specific kind of play, Child A conducts information exchanges with specific combinations of visual *and* auditory elements expressed in patterns whenever two or more turn-taking events occur. The examination of playbouts using pattern matching analyses facilitated interpretation of the interweaving of behavioral and communicative interactions occurring within and across siblings' dialogs during dyad play.

Narratives

Narratives of siblings' interactions were written for the 54 playbouts analyzed in this study. Each narrative was written in the present tense describing the sequential flow of behavioral and communicative interactions taking place between siblings throughout each playbout. The dialogs occurring in each playbout were not, as a rule, transcribed for detailed message content but were descriptively transcribed for expression of behavioral and communicative elements. Some dialogs were transcribed where an understanding of what was said enhanced the descriptive written narrative. The following is a facsimile (form, font and spacing) of how specific narrative examples of dialogic processes and patterns are presented in Chapters 4 and 5:

> Child A turns to Child B and taps Child B on the shoulder. Child B does not respond. Child
> A taps Child B again and then reaches out, grabs Child B's arm and shakes it. Child B
> slowly turns towards Child A, looks at Child A and Signs, What? to Child B.

Yin (1997) stated that, although narratives as a form of analysis are not well documented in operational terms, they facilitate the building of knowledge to explain events or actions through descriptive and comparative terms both within and between participants in case study research. There are numerous approaches to constructing narratives. Narrative presentation in case study research is a critical component of Yin's (1989) contention that narrative construction reflects the

holistic facet of interpretive interaction between observer and that which was observed and Nicolopoulou's (1993) argument on the need for narrative explanation based on researcher interpretation in naturalistic studies on children's dialogs occurring in play.

Data Analysis - The Process

The analysis of data collected during the field study followed three separate procedures. The first was the identification of specific data reflective of or responsive to the research questions. All analyses were specific to the two dyads: (a) Alicia and Katy (the older sibling dyad) and (b) Zack and Katy (the younger sibling dyad). Data identified and reported were:

(a) playbouts,

(b) kinds of play occurring in playbouts,

(c) dialogs in playbouts,

(d) dialog initiation and termination,

(e) processes of dialogs,

(f) embedded elements of processes of dialogs, and

(g) patterns of embedded elements of processes of dialogs.

In the second step, I cataloged and coded the occurrence of identified data for embedded elements and subelements. Data analyzed on kinds of play were quantified by percent frequency of occurrence of total play time (mins).

The third procedure involved detailed analyses of data on siblings' dialogs occurring during dyad play. From the data, charts, or flow maps, of sequentially coded embedded elements and subelements were produced for every dialog siblings engaged in. These maps provided a visual tool to examine the flow of siblings' conversations (an example is presented in Appendix D). Maps were also used to determine which child initiated and terminated dialogs and to identify sequences of elements used during each dialog process. Maps of expressed elements of dialog processes were then examined, analyzed, and compared, dialog by dialog, for recurring patterns of expressed elements. If patterns emerged they were mapped according to the flow of elements. Expressed patterns occurring within dyad dialogs were then examined to determine if they were

also expressed across dyad dialogs. The patterns expressed in Alicia and Katy's dialogs were compared to those documented from Zack and Katy's dialogs. These data are reported in Chapter 4.

Validity and Reliability in the Research Design

This investigation was designed as a descriptive study examining, analyzing and reporting on the processes and patterns of communicative interactions occurring between deaf and hearing siblings during naturally occurring play. Because this study was not only qualitative and descriptive in nature, but also the first known study to investigate and describe deaf and hearing siblings' communicative interactions, its overall trustworthiness must be established, demonstrated, and proven. As Yin (1997) stated, the validity and reliability of any qualitative study is often challenged in Social Science research; therefore, a qualitative study must meet and exceed not only internal and external construct measures but reliability tests as well. Validity and reliability facets of this study are discussed and reported in Chapter 5 and Appendix E.

CHAPTER FOUR

The purpose of this study was to examine the processes and patterns of communicative interaction which preschool and elementary school-aged deaf and hearing siblings utilized to initiate, maintain and terminate dialogs during play. The specific questions underlying this study were:

When siblings played together,

1. What kinds of play did they engage in?

When dialogs occurred during dyad play between older and younger siblings,

2. What processes of behavioral and communicative interactions took place between siblings as they initiated, maintained and terminated dialogs? Specifically,

a. Who initiated and terminated dialogs?

b. What behavioral and communicative interactions were expressed in gaining another's attention?

c. How was the exchange of information accomplished and maintained?

d. What behaviors were used in terminating dialogs?

3. What patterns of behavioral and communicative interactions were expressed as the siblings in each dyad initiated, maintained and terminated dialogs?

Findings on these research questions are reported in Chapter 4.

Siblings' Playbouts

Playbouts were identified as the unit of analysis in this study. A total of 258 playbouts were cataloged from the 30.1 hours of videotape recordings made during the field study on interactive dyad play occurring between Alicia, Katy, Zack, and neighborhood playmates. Eighty-five playbouts were cataloged as sibling-specific play interactions. The other 173 playbouts were cataloged as sibling/peer play and were not analyzed in this study. Ten of the 85 sibling-specific playbouts were not analyzed because they involved play among all three siblings (triad play).

Surprisingly, there were no sibling-specific playbouts documented during the field study between Alicia and Zack. Alicia and Zack did initiate and conduct dialogs together but conversations occurred either when Alicia initiated dialog with Zack while he was playing with Katy, or when siblings were interacting together in triad play. Twenty-one of the remaining 75 sibling-specific playbouts were not analyzed because each bout either lacked dialog, or was of poor viewing quality. That is, the play interactions or dialogs occurring between siblings were visually hindered when one or both siblings turned or faced away from the camera, visually blocked when one sibling stood between the camera and the other sibling, or out of the camera's field of view during ongoing play. Fifty-four sibling-specific playbouts were analyzed in this study: 32 bouts in the older dyad between Alicia and Katy and 22 in the younger dyad between Katy and Zack. The playbouts between sisters lasted an average of 6.6 minutes each (range: 4.1 to 14.2 min; total, 210 min). The playbouts between Katy and Zack averaged 3.5 minutes (range: 0.75 to 6.9 min; total, 78 min).

Siblings' Play

The first research question which examines the kinds of play siblings engaged in together is reported in this section. Data on the kinds of play are presented for each of the two dyads: (a) the older dyad with Alicia (first-born, seven years old, hearing) and Katy (second-born, five years old, and deaf), and (b) the younger dyad with Katy and Zack (third-born, three years old, and hearing). The kinds of play and play interactions occurring between siblings documented in this study are tabulated and presented in Table 2. In summary, social play was the most frequently observed kind of play ongoing between siblings in both dyads. Social play was followed in occurrence by game play, then constructive play in both dyads. Symbolic and practice play were not observed.

Table 2.

Frequency and Percent Occurrence of Kinds of Play Occurring in Siblings' Playbouts.

	Sibling Dyad			
	The Older Dyad		The Younger Dyad	
Kinds of Play	Alicia & Katy		Zack & Katy	
	N	%	N	%
Social Play	19	59.4	13	59.1
Games	8	25.0	7	31.8
Constructive Play	5	15.6	2	9.1
Symbolic Play	-	0	-	0
Practice Play	-	0	-	0
Totals	32	100.0	22	100.0

Note: N is the total number of playbouts documented in kinds of play.

Playbout Interactions and Kinds of Play Occurring in the Older Sibling Dyad[14]

As shown in Table 2, social play predominated the play interactions of Alicia and Katy. Social play included the setting up and maintaining of interactions and activity together on a 20 m plastic waterslide covered with soapy water, the cherry tree swing, the rocking chair, and the backyard swing-set. Social play also occurred when Alicia and Katy played together while drawing scenes on the cul-de-sac with colored chalk. Game play, second in frequency occurrence, was limited to games created while playing on the waterslide or to videogame play and a board game. In board game play, Alicia controlled the flow of play action as she appeared to understand how the game was played better than Katy did. In videogame play, Alicia again controlled game action with her higher level of expertise in manipulating on-screen play action with a hand-held joystick. Katy's level of expertise appeared less than Alicia's, and consequently her turns at active on-screen play were shorter than her sister's. Constructive play, the least frequently observed kind of play between sisters, included the setting up and running of a lemonade stand and the cooperative drawing of scenes with sidewalk chalk on the cul-de-sac.

Playbout Interactions and Kinds of Play Occurring in the Younger Sibling Dyad[15]

Social play, the predominant kind of play between Zack and Katy (see Table 2), was usually short in duration. Swinging together on the cherry tree swing or the backyard swing-set accounted for most of this dyad's active playtime. Zack and Katy also played together in the downstairs playroom. Game play, which was observed with less frequency than social play, included videogame play and follow or chase interactions. In videogame play Zack always joined Katy, who was engaged in solitary play. Zack rarely controlled videogame play for any length of time (<30 sec average for each video-game turn). Zack was not a proficient videogame player and

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[14] Alicia and Katy initiated playbouts between them almost equally ($N = 15$ & 13, respectively) when they played together. Four playbouts were created when the siblings' mother provided sidewalk chalk or set up a board game for play. Although the ratio of playbouts initiated between sisters was almost equal, Katy terminated almost every bout ($N = 28$) while Alicia ended four.

[15] Zack initiated playbouts with Katy almost as frequently as she did with him ($N = 10$ & 12, respectively); however, Katy terminated playbouts more often than did Zack ($N = 14$ & 8, respectively).

this placed him in the role of game-watcher. Follow-the-leader took place indoors and the game of tag went through four turns before abruptly ending. Constructive play, the least frequently observed kind of play occurring between Zack and Katy, consisted of building sand structures in or around the sandbox or on the back yard swing-set slide.

Siblings' Dialogs

This section reports the primary focus of this study, examining the second of the three research questions, What processes of behavioral and communicative interactions occurred between siblings as they initiated, maintained and terminated dialogs? Analyses focused on examining three facets of dialog processes: how siblings used behavioral and communicative tools as they sought to gain each other's attention, exchange information, and terminate dialogs. Data are presented for the three dialog processes. For each dialog process, data on the older dyad (Alicia & Katy) are presented first, followed by data on the younger dyad (Katy & Zack). Data presentation in this section includes those elements expressed with a frequency occurrence greater than 10%. Data reported in this section include siblings' expression and use of the embedded elements presented and described in Table 1. In addition to these elements, additional data are reported when siblings simultaneously used elements in combinations to express behavioral and communicative interactions when frequency occurrence was greater than 10%. For example, the simultaneous expression of hoots and grunts while stomping on the ground is reported as a separate category of communicative interaction labeled non-linguistic sounds with gestures.

Attention-Getting Processes of Siblings' Dialogs

As shown in Table 3, body contact, pointing, gestures, and handwaving predominated Alicia's methods for initiating dialog with her deaf sister. On the other hand, Katy relied mostly on non-linguistic sounds expressed alone and in combinations with gestures and body contact to gain her hearing sister's attention. Of the 128 dialogs documented between Alicia and Katy, Alicia initiated half as many dialogs as did Katy (n = 44 and 84, respectively). The presentation of

Table 3.

Frequency and Percent Occurrence of Embedded Elements Expressed Individually and in Combinations in Attention-Getting Processes.

	Sibling Dyad							
	The Older Dyad				The Younger Dyad			
Embedded Element Expressed	Alicia		Katy		Zack		Katy	
	N	%	N	%	N	%	N	%
Prolonged eye gaze	5	7.8	2	1.3	0	-	1	1.4
Visual Signals								
Signs	1	1.5	0	-	0	-	0	-
Signs w/ Sound	0	-	1	0.7	0	-	0	-
Points	14	21.2	6	4.0	1	1.2	1	1.4
Points w/ Sound	3	4.5	14	9.4	6	7.1	5	7.1
Handwave	7	10.6	8	5.4	0	-	0	-
Handwave w/ Sound	0	-	13	8.7	0	-	0	-
Gesture	11	16.6	29	19.5	6	7.1	0	-
Gesture w/ Sound	0	-	25	16.8	21	25.0	25	35.7
Other Visual Signal								
Throws object	3	4.5	3	2.0	4	4.8	2	2.9
Auditory Signals								
Non-linguistic sound (Sound)	0	-	24	16.1	16	19.0	16	22.9
Spoken English	3	4.5	0	-	9	10.7	0	-
Ambiguous Auditory Signal	0	-	1	0.7	0	-	2	2.9
Body contact	19	28.8	15	10.1	17	20.2	13	18.6
Body contact w/ Sound	0	-	8	5.4	0	-	1	1.4
Body contact w/ Spoken English	0	-	0	-	4	4.8	4	5.7
Other	0	-	0	-	0	-	0	-
Totals	66	100.0	149	100.1	84	99.9	70	100.0

Note 1. Percentage of columns do not always add up to 100.0 due to rounding.

Note 2. The column totals are the tabulation of percent totals for one child.

attention-getting elements for each dyad is reported sequentially, beginning with the most frequently expressed trait.

Zack and Katy conducted conversations quite differently than those which occurred in the older sibling dyad. Gestures expressed simultaneously with non-linguistic sounds dominated both Katy and Zack's dialog initiations. Katy also used sounds as a single trait in addition to body contact. Zack used both of these traits, but his frequency of use was opposite of Katy's. That is, Zack used body contact more often than non-linguistic sounds. Zack also used spoken English, whereas Katy did not use spoken English (without a combination to other elements) to gain her hearing brother's attention. Of the 90 dialogs documented occurring between Katy and Zack, frequency of initiation between them was almost equal (n = 46 and 44, respectively). Attention-getting behaviors expressed by Katy and Zack are tallied in Table 3.

The Older Dyad (Alicia & Katy)

Predominant Attention-Getting Processes Used by Alicia with Katy.

Body Contact.

Body contact elements expressed by Alicia included specific behaviors such as reaching out and tapping or patting Katy, grabbing her, or hitting her with a closed fist. Grabbing Katy was used only when Katy ran past Alicia. Hitting Katy, as a tactic to gain her attention, was used only after other element expressions had failed. Alicia's hitting was not aggressively administered even though she used a closed fist. Katy never reacted with hostility towards Alicia when Alicia used this method to initiate dialog with her. Alicia initiated almost a third of her dialogs with Katy by using body contact elements to attract or gain her attention.

Body contact
Alicia and Katy are playing a board game. Katy is holding her game marker and is moving it around the board. Alicia has finished her game turn and looks up at Katy. She watches Katy for several seconds then reaches out and pats her on the arm twice. Katy turns and looks at Alicia. Alicia pats her again and then looks towards the board, moves her hand away from Katy, reaches out, picks up the dice and then places it in Katy's hand.

Points.

Pointing, as a method of gaining Katy's attention, occurred most often when Alicia was some distance away (3 to 6 m) from her sister. Alicia expressed this element by pointing at Katy and then waiting for a response. Following acknowledgment by Katy, Alicia would drop her hand and either immediately begin her message or pause a few seconds while either she or Katy walked closer to each other before beginning her dialog. Alicia initiated almost a quarter of her dialogs using this element.

Pointing
Alicia appears frustrated with Katy. With her index finger stiffly projecting out in front of her arm and outstretched hand, Alicia looks at Katy's face and, without looking down, points downward to the dice lying on the game board. She holds the point until Katy looks from Alicia's face to the board, then Alicia begins jabbing at the dice with a repeated pointing motion. She then delivers her message as Katy continues looking down at the game board.

Gestures.

Gestures used by Alicia included but were not limited to foot stomping, slapping hands down on a table top, shaking her head 'No,' non-Sign hand movements, posturing, kicking, reaching out towards Katy, and 'follow me' waving of an arm. Overall, Alicia's expression of gestures was subdued. Rarely did she express a gesture with any intense body movement or action unless she appeared to be angry, frustrated, or impatient with Katy.

Gestures
Alicia and Katy have been playing together for several minutes in a rocking chair in the downstairs playroom. The purpose of their play was to rock the chair hard enough to flip it over backwards. Alicia gets up from the chair, which is still standing, runs out of the room and returns 20 seconds later. She walks up and stands in front of Katy, who is still sitting in the chair looking up at Alicia. Alicia looks at Katy and then suddenly gestures to her. Alicia's hand movements indicate that she wants Katy to get out of the chair. The gesture is a closed fist with thumb extended. Katy continues to sit looking at Alicia and shakes her head, 'No.' Alicia then reaches out, grabs Katy by her shoulders, shakes her, steps back and gestures 'Get out,' again.

Handwave.

Handwaving accounted for about one-tenth of Alicia's dialog initiations with Katy. Handwaving consisted of extending an arm and waving the hand up and down as if waving good-bye to someone. Handwaving varied in intensity of motion, from simple wave movements to exaggerated flapping of her entire arm up and down.

Handwaving
Alicia has just given up using prolonged gaze to gain Katy's attention. She stands about 4 m from Katy and waves her hand at Katy. Katy is turned almost directly away from Alicia but it appears that Katy still has peripheral vision of Alicia over her right shoulder. Alicia continues to wave her hand up and down, then stops. Looking at Katy, she raises her arm again and this time waves it along with her hand with exaggerated emphasis (up and down with at least a meter spread). Katy suddenly turns towards Alicia giving Alicia the opportunity to immediately initiate an exchange.

Predominant Attention-Getting Processes Used by Katy with Alicia.

Gestures and Gestures with Sound.

Katy initiated over 35% of her dialogs with Alicia using gestures as a single element (solo) or simultaneously expressed with sounds. Her most frequently used gestures were body posturing, victory salutes, 'Oh darn' body expressions (e.g., mock frowning combined with clinched hands or a foot stomp), repeated motioning of the hand and arm *Come here*, head nods 'Yes' and 'No', foot stomping, hand slapping on a hard surface, and kicking objects. Katy also used gestures combined with a wide range of non-linguistic sounds. The most frequently used sound she expressed with her gestures was the specific attention-getting sound described in Non-linguistic sounds.

Gesture
Katy stands in the cul-de-sac looking at Alicia who is no more than 2 m from her, kneeling and drawing with chalk on the pavement. Katy stomps the ground with her left foot. Repeats this six times. Stops. Then stomps again. Stops. Stomps. Then quits and goes back to her own drawing. Alicia ignored her gestures even though the sound could be heard at least 30 m away. As Katy kneels down to draw, Alicia looks up and looks in Katy's direction. Katy hesitates, then begins her message to Alicia.

Gesture as body posturing
Alicia is intensely angry at Katy. Katy sits looking across the table at Alicia with drooped shoulders and a sad look on her face. An instant later she stiffens, bolts upright

and leans forward towards Alicia, staring into her face. Alicia leans back watching. Katy looks at Alicia, waits, leans still closer and then begins dialog with Alicia in Signs.

Gesture with non-linguistic sound
The cherry tree swing is a round seat with a rope threaded through a hole in the center of the seat. The rope is tied to a branch about 4 m from the ground. The seat floats about a meter above the ground. Dual swinging occurs with one child sitting atop the lap of the other child. Katy and Alicia have been swinging together. Alicia was on the bottom. Play has stopped and Alicia is walking away from the swing. Katy sits back on the swing. As she loops around the swing area she tries to look at Alicia, who is walking away. Katy starts making intense, loud non-linguistic sounds (her attention-getting sound) trying to attract Alicia's attention. Alicia ignores her and continues walking away. Katy begins to scissor-kick her feet so that her feet strike the ground making tapping sounds while she still makes her other sounds. Alicia stops and looks over her shoulder at Katy.

Non-linguistic sounds.

The use and expression of non-linguistic sounds with and without other elements was Katy's second most frequently expressed means of gaining Alicia's attention. Some of Katy's non-linguistic sounds seemed to carry meaning, being atonal in quality while seemingly expressing feelings (whines, moans, snuffles, complaints, wails, howls). Some sounds were flat and carried no subjective interpretation. Non-linguistic sounds expressed by Katy were numerous and varied. They ranged from soft whispers to high-pitched screams, which carried considerable distances. Katy's most frequently vocalized sound was an intense rising pitch, multi-tonal sound that lasted less than a second and was uttered in almost two-thirds of her attention-getting attempts where non-linguistic sounds were used with Alicia (and Zack). The sound was used almost exclusively during attention-getting. When used during exchange of information, it appeared to be a stimulator for reconnecting a waning conversation. In attention-getting, duration of sound was often extended if Alicia did not respond to Katy's first sound and usually increased in volume if a third or more sounds were emitted as she tried to gain Alicia's attention. If Alicia failed to respond to Katy's initial attempt to gain her attention, Katy often repeated the sound, increasing its volume, while walking toward Alicia as she vocalized.

Non-linguistic sound
Alicia is sitting on the low end of the backyard slide eating strawberries. Katy is sitting at the top of the slide, feet dangling over the sides. She looks down at Alicia and grunts. Then grunts again. Alicia turns and looks up at Katy.

Non-linguistic sound

Katy and Alicia are playing together on the waterslide in the backyard. Alicia has just turned and left Katy, walking towards the opposite end of the slide. Suddenly, Katy wants to share something with Alicia and starts after her, uttering her attention-getting sound. As she slips and slides down the plastic she continues to utter the sound to Alicia's back, while reaching out towards her sister with outstretched arms. She repeats this sound six times before reaching Alicia. Alicia started to turn on the fourth delivery, but slipped and turned back in the direction she was headed. The moment Katy makes physical contact with Alicia she ceases her attention-getting sound and begins message delivery, even before Alicia is completely turned towards her.

Body contact.

Body contact, as an individually expressed element, was frequently used by Katy with Alicia. Although the specific behaviors she used were similar to Alicia's, patting, tapping, grabbing, and hitting, there were differences in expression. Katy persisted with patting and tapping longer than did Alicia, increasing in intensity if Alicia tended to ignore Katy's initial attempts at gaining her attention. Katy grabbed Alicia less often, probably because Alicia walked, rather than ran, past Katy. Katy's hitting was physically delivered with more intensity. This behavior often elicited unexpected results as Alicia turned and struck back at Katy or left the area without responding to Katy's attempt at dialog.

Body contact

Katy and Alicia are at one the end of the waterslide and are beginning to turn around to walk back to the other end. Katy stops, reaches out her left arm and slap-pushes Alicia's shoulder. The instant Alicia turns towards Katy, Katy begins Signing to her.

Body contact as hitting

Katy walks slowly up behind Alicia, stands there a few seconds, then reaches out and hits Alicia on the arm - hard. Alicia quickly turns around, reaches out with both hands and grabs Katy by the shoulders and begins shaking her. Katy makes noises, sounds, and tries to Sign to Alicia but she cannot because of Alicia's continued shaking. Alicia lets go of her. Katy continues Signing.

The Younger Dyad (Katy & Zack)

Predominant Attention-Getting Processes used by Katy with Zack.

Gestures with Non-linguistic sound.

Katy did not use gestures with Zack without simultaneously using non-linguistic sounds, as she did with Alicia. Every gesture, including stomping on the ground, rattling a tree branch,

posturing, or making a 'Follow me' movement with her arm, was expressed with a variety of non-linguistic sounds with her attention-getting sound used most often .

> *Body posturing and animated gestures with non-linguistic sounds*
> Katy wants to swing with Zack and walks up to the outer limits of the cherry tree swing looping area and stands there looking at him. A few minutes before, Zack had successfully pushed Katy off the swing and took it over. Now Katy stands looking at him and Signs "Please", while continuing to stand looking at Zack. He sits on the round seat looking back at her with his stocking cap pulled down almost covering his face and shakes his head, 'No'. She leaves. Comes back about 20 seconds later and reaches out her arms in an 'I want' Sign/gesture, bends her knees and utters a very plaintive sound to Zack. He continues to look at her. Then very slightly shakes his head, 'No', again. She turns and leaves again only to return a minute later. As she walks up to Zack she scrunches her entire body down into what can only be described as a crouched fetal position and pleads with outstretched arms and a long, drawn out wail. Zack watches her and once more shakes his head, 'No'.

Non-linguistic sounds.

Katy used non-linguistic sounds extensively with Zack. As an individually expressed element, sounds contributed to over 20% of her dialog initiations with Zack. And when use is tallied in combinations with other elements, over three-quarters of Katy's attention-getting episodes were expressed with sound. Katy's use of non-linguistic sounds was expressed in several different ways than that which she used with Alicia. First, volume was often more intense. Second, the number of sounds linked and uttered in tandem with Zack were more numerous. Third, more diverse sounds and numbers of sounds were attached to gestures. Fourth, if Zack did not respond to an element combined with sound within several attempts, Katy would either switch to another element while still retaining the sound in combination or quit her initiation attempt. Overall, Katy was louder and physically more animated in her attention-getting behaviors with non-linguistic sound with Zack than she was with Alicia.

> *Non-linguistic sounds*
> Katy is standing in the middle of the cherry tree swing circle untangling the swing rope. Zack reaches out and jerks the rope from her, turns away and walks quickly up to the top of the circle getting ready to swing. His back is turned to Katy. She looks at Zack then starts a high pitched sound, low in volume which slowly gets louder and louder. Zack turns, stands and watches her. He then shakes his head 'No' and goes into a loop with the swing as Katy runs to get out of his way.

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Body contact.

Katy used body contact almost twice as frequently with Zack as she did with Alicia. Katy's expressions included hitting, patting, toe tapping, and grabbing Zack. When Katy hit Zack to get his attention, he usually complained but remained in place and received her message. Grabbing Zack was similar to the actions which Alicia used with Katy: reaching out and grabbing him as he ran past her. Katy seemed to expect quick responses to her use of body contact so not much repetition was observed in element expression.

Body contact - tapping and patting
Katy walks up to Zack who is walking from the swimming pool with a cup of water to throw on to the backyard fence. As Katy reaches him, she reaches out and pats at his back. He keeps walking towards the fence without acknowledging her actions. She follows and pats again, this time with more intensity. Zack does not respond. As he reaches the fence she reaches out and pats at him with one hand while grabbing at his shirt with the other. He turns and looks up at her.

Predominant Attention-Getting Processes Used by Zack with Katy.

Gestures combined with Non-linguistic sounds.

Besides using the same gestures noted for Alicia and Katy, Zack expressed two unique behaviors. The first was chin pointing and the second was intense body posturing. In chin pointing Zack jutted out his chin towards Katy, waited and then stuck out his tongue and made a 'raspberry' (a sound caused by blowing air across vibrating lips and tongue). Zack's body posturing began with a stiff stance, hands on hips, and intense leaning forward towards Katy (almost to the point of losing his balance and toppling over). Zack seldom used gestures without non-linguistic sounds. On several occasions when initiating dialogs with Katy, Zack started with a single element gesture but quickly combined sound to the element when there was no initial response from Katy even though Katy could not hear the sounds he was expressing.

Gestures with intense posturing
Although making a 'raspberry' was usually cataloged as part of message delivery if it contained sound, at times Zack used the behavior to elicit Katy's attention. He and Katy have been playing together in the social area. Katy is standing looking at several vases of potted flowers. Zack stands directly behind her: she appears to know he is standing behind her. Zack looks at Katy's back, chin points and then makes his 'raspberry' He repeats this gesture and sound, this time leaning closer, and standing stiffly, he makes

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his 'raspberry', again. Katy suddenly turns around and stares intensely down at Zack, starts to grab at him but stops. He calmly looks at her, gestures 'move', and steps around her picking up a vase of flowers.

Gestures expressed with Body contact
Zack is standing in the cherry tree swing area straddling the swing. Katy has just stood up from the ground where she fell a few moments earlier from the swing when Zack pushed her off. Zack backs up, reaches down and pats his lap and makes a sound (inviting Katy back) while looking at her, looks down to his lap, pats again, looks to the ground, looks up and then watches Katy. Katy leaves the area without acknowledging Zack's invitation to resume play. Not many seconds later, she runs to the swing with Zack, laughing as she joins him.

Body Contact.

Although Zack used body contact almost as frequently with Katy as she expressed body contact with him, Zack's expression was more focused than either of his sisters' use of the element. That is, Zack used patting and hitting almost exclusively in his body contact initiations. He often repeated use of each element, especially patting, several times. Patting occurred when Zack came in close contact with Katy and wanted her attention. He was persistent in his expression of the behavior. He would often stand next to Katy and pat her until she either acknowledged him, rebuffed his actions (pushed him away or hit him), or left his presence. There were occasions when Zack's patting persisted for almost a minute before Katy acknowledged him. Hitting as an element to gain Katy's attention was delivered aggressively with an open hand or a closed fist. The message which often followed this form of attention-getting seemed associated with Zack's anger or frustration toward Katy.

Body contact
Katy is playing *Super Mario Brothers* with Zack. She has control of the game and Zack is sitting on the floor watching her until it is his turn to play. Katy's concentration on the screen is intense. She has just made it to a new level which she and Zack celebrated with victory salutes. Zack wants to ask her something about the play on the screen. He points at the screen while looking at Katy, but she ignores him. He makes a sound and points at the screen again, turns to look at the screen and back to Katy, but still she ignores him. He gets to his knees, scoots over to where she is sitting on the coffee table, and begins patting her arm while looking up into Katy's face. He is very close to her while doing this. He pats her arm. Seven seconds later he is still patting her arm. Katy still has not acknowledged Zack's attempts to gain her attention with so much as a glance in his direction. Zack, who has been alternating his gaze between Katy's face and the screen, looks down at Katy's arm, back up to her face, then down to her arm again where he lifts and moves his hand off her arm. He then looks back up into her face. He looks down again at Katy's arm. As he does this he takes hold of a hair and jerks it out

of her arm. She acknowledges him with a quick reflex movement, pulling her arm back quickly and making a hostile facial expression, but she does not hit him. This acknowledgment was enough to show Zack that Katy was responding to his initiation attempts for dialog, and so he quickly scoots around in front of her and begins Signing.

Non-linguistic sounds.

Zack imitated, mimicked and utilized the same sounds in the same ways with the same tonal qualities in similar manners and in similar situations as did Katy. Zack also expressed an attention-getting sound similar to the one made by Katy along with a second set of sounds which he used with Katy as frequently as the first.

Non-linguistic sound
Katy has just left Zack after a bout of swinging. No more than 30 seconds have lapsed. Zack is standing on the very edge of the cherry tree swing play area. He stands watching Katy, who is sitting in the social area talking with Alicia. Alicia has her back to Zack. Katy sits so her gaze could be directed in Zack's direction. He looks at Katy, turns and looks at the swing, and, turning back towards the social area, he begins making attention-getting sound while looking in Katy's direction. He does this three times, repeating the sound with little variation in volume or pitch (louder and higher). The fourth time, Zack increases volume and pitch. He repeats this sound seven times before giving up trying to get Katy's attention, turns and looks out into the cul-de-sac. Neither Katy or Alicia gave Zack's sounds any notice. Several seconds later Katy runs down the driveway and rejoins Zack in play actions where they left off only minutes before.

Spoken English .

Zack used spoken English on occasions and received positive responses from Katy in return. When Zack used spoken English and gained his sister's attention he was not in close proximity to her on half of the his attempts to initiate dialog. (In examining dialogs between Katy and Alicia where spoken English occurred, it appeared that the siblings' close proximity may have enhanced the success of spoken words as an attention-getting element.) Katy may have physically felt the sound and responded accordingly. Yet, dialogs were also successfully initiated with spoken English when Zack and Katy were several feet apart. Katy's awareness of her brother's body language and facial expressions may have contributed to initiation success when spoken English was used to initiate a dialog.

Spoken English
"Hey!" Zack stands looking at Katy and then points to where he wants her to walk.

"No! Katy!" Zack then reaches out hitting at Katy as she stands in front of where he wants to be.

"Don't want that there! Here. Here where I want that!" Zack looks up from where he is pointing to look at Katy.

Exchange of Information Processes of Siblings' Dialogs

Alicia and Katy carried on short and lengthy, as well as simple and complex, dialogs. Their conversations ranged from sharing thoughts through a shrug of the shoulder to exchanges in Signs, spoken English and gestures. As shown in Table 4, Signs, gestures and spoken English combined with Signs expressed simultaneously predominated Alicia's exchanges with Katy. In the 128 dialogs she and Katy carried on, Alicia used spoken English at the onset of many of her exchanges with Katy but quickly switched to Signs and gestures. Similarly, Katy relied predominantly on Signs but also used non-linguistic sounds expressed with and without Signs, and gestures during message delivery. Katy did use spoken English with Alicia but frequency of use was low. Exchanges between Alicia and Katy were diverse. They ranged from single expressions where messages were delivered with immediate dialog termination to simple expression/response dialogs and to complex exchanges where numerous turns and exchanges involving mixed elements and combinations of elements took place.

Katy and Zack conducted conversations quite differently than those which occurred between Alicia and Katy. Conversations were usually short and succinct. Single turns were the norm. There were few complex sentences. Zack's message delivery was composed mostly of gestures and spoken English; however, Signs and non-linguistic sounds were also used. Katy utilized gestures and Signs almost equally with non-linguistic sounds expressed both as a single trait and in combinations with other elements. Exchange of information elements expressed by Katy and Zack are tabulated and presented in Table 4.

Table 4.

Frequency and Percent Occurrence of Embedded Elements Expressed Individually and in Combinations in Exchange of Information Processes.

	Sibling Dyad							
	The Older Dyad				The Younger Dyad			
Embedded Element Expressed	Alicia		Katy		Zack		Katy	
	N	%	N	%	N	%	N	%
Visual Elements								
Signs	106	43.3	122	43.6	31	14.1	60	28.2
Gestures	53	21.6	30	10.7	76	34.5	55	25.8
Gestures w/ Sign	0	-	3	1.1	0	-	1	0.5
Ambiguous	9	3.7	6	2.1	11	5.0	3	1.4
Auditory Elements								
Non-linguistic sound (Sound)	6	2.4	33	11.8	22	10.0	28	13.1
Non-linguistic sound w/ Sign	2	0.8	44	15.7	11	5.0	18	8.5
Non-linguistic sound w/ Gestures	1	0.4	8	2.9	6	2.7	19	8.9
Spoken English	18	7.3	5	1.8	49	22.3	8	3.8
Spoken English w/ Sign	37	15.1	14	5.0	0	-	1	0.5
Spoken English w/ Gesture	4	1.6	2	0.7	0	-	1	0.5
Ambiguous Auditory Element	9	3.7	13	4.6	4	1.8	9	4.2
Other	-	-	-	-	10	4.5	10	4.7
Totals	245	100.0	280	100.0	220	99.9	213	100.1

Note 1. Percentage of columns do not always add up to 100.0 due to rounding.

Note 2. The column totals are the tabulation of percent totals for one child.

Predominant Exchange of Information Processes used by Alicia with Katy

Signs.

Alicia and Katy readily exchanged messages in Sign with each other. Alicia's use of Signs as a single element occurred in over 40% of her exchanges and when combined with other elements, accounted for an additional 16% of her dialog exchanges with Katy. Alicia's Sign use and expression took place in five manners of expression. The first occurred as pauses prior to Signing. After gaining Katy's attention, Alicia paused before she Signed to Katy. Pauses also occurred prior to Alicia's response to a comment made by Katy. Speculatively, pauses may have provided Alicia time to switch from message delivery through spoken English to Sign, or they may have offered Alicia time to focus on what she wanted to say to Katy through Sign. The second expression occurred as simple sentences followed immediately by dialog termination. These exchanges occurred when Alicia either gave directions to Katy, commanded her to do something, or expressed a single statement with no (apparently expected) response from Katy. The third occurred after Alicia used spoken English. Here, it appeared that Alicia was aware that she had used spoken English in message delivery and rectified the situation by re-stating her message in Sign. Fourth, Sign use and expression occurred when Alicia and Katy were not involved in fast-paced, energetic play or play action where Alicia's concentration appeared to be focused elsewhere as typically occurred in social and video game play. In these instances, Signs were usually combined with another element. And last, Signing to Katy occurred in the same manner with turns typical of Katy's normal expression and Sign use with Alicia.

Signs
Alicia and Katy are standing together on the outer limits of the cul-de-sac (where the cul-de-sac meets the main street running past the Anderson home). They have set up a lemonade stand there. Alicia and Katy have been carrying on an ongoing discussion about the whereabouts of a certain amount of money. Alicia walks up to Katy and begins Signing to her. Katy responds with Sign. Nine turns take place between these two before the conversation is over. All turns were conducted in Sign as a single element by Alicia and Sign or Sign with sound by Katy.

Signs with other elements
Alicia and Katy are playing a board game. Katy has made a move which, according to the rules Alicia is trying to explain to her, was not a proper move. Alicia taps Katy on the hand as Katy is moving her game piece. Katy looks up. Alicia points to the dice then

to the game piece and then begins Signing to Katy. Katy responds. Alicia continues Signing and adds several gestures to her Signs. Katy again responds. Alicia repeats what she had just Signed to Katy and then makes an emphatic head nod, 'Yes' to add affirmation to her explanation of the rules she has told to her sister.

Gestures.

Gestures frequently expressed by Alicia in exchanges consisted of shoulder shrugs and shoulder droops, arms extended with palms turned up in combination with a shoulder shrug, staring, head tilting, wrinkling of the nose, eyebrow raised, smiles, frowns, shifting of eyes left or right with a slight head tilt in the same direction, pursing of lips, the shuffling of feet, and other gestures. Alicia used gestures to acknowledge comments made by Katy, to shift direction of conversations, to indicate turn-taking, as pauses (seemingly) to reflect on Katy's comments to her, and as pauses before terminating a dialog. The gestures 'Yes', 'No', and 'Come on - follow me' were also used in messages to Katy. Gestures, with few exceptions, were rarely combined with non-linguistic sounds or spoken English. The few exceptions documented occurred when Alicia appeared frustrated with Katy and used these element combinations in her dialogs, possibly to emphasize something being said to Katy.

Gestures
Katy has asked Alicia if the move she made in the board game they are playing was correct. Alicia looks at the board, looks at the dice, looks back at the board and then shakes her head, No.

Gestures with other elements
Katy refuses to remove herself from the rocking chair she and Alicia have been playing in. Alicia Signs to her, "Move over." Katy refuses to move over, shaking her head, 'No', in response to Alicia's Signs. Alicia continues the dialog by Signing again and then reaching out and grabbing Katy by the shoulders and violently shaking her, stepping back and frowning down at her. She then makes a 'Hurrumphh' gesture/sound (i.e., breath in, shoulders raised, eyes widened, grimaced face and then expulsion of air and sharp dropping of shoulders - all with sound) and stomps her foot on the ground. Standing there, Alicia then jumps on top of Katy.

Spoken English with Signs.

Alicia rarely used more than several spoken words strung into sentences with Katy. Dialogs with multiple-word sentences occurred when she was frustrated with Katy and seemed to

digress to spoken words as a means of expressing her anger about a play situation or Katy's behavior. On several occasions when Alicia used spoken English to express herself, she reiterated what she previously had spoken to Katy with Signs. Spoken English phrases combined with Signs occurred frequently. Expression of this combination occurred most often in outdoors play when social interactions were occurring at a fast pace or when Katy was ignoring Alicia and Alicia used this combination (seemingly) to regain Katy's attention even though Katy could not hear the words spoken. Alicia expressed a behavioral trait in Sign use with Katy that was not cataloged but needs to be introduced in this section. Alicia appeared to silently mouth most words she Signed to Katy. She did this simultaneously as she Signed. This trait was only expressed when these two played board games, videogames, or when Alicia was explaining something to Katy during play or directing her behavior. Spoken English with and without combined elements during exchange of information was documented in almost a quarter of Alicia's expressions.

Spoken English with Signs
"These are mine! These are all mine!" She Signs simultaneously, as she says these words to Katy. Alicia is speaking to Katy, telling her in spoken words where she cannot draw in the cul-de-sac. She stands looking at Katy, who stares back at her without response. Alicia Signs, "Mine!", then gestures with her hand in an arc outward from where she and Katy are standing. Katy turns and walks away.

Silent mouthing of words with Signs
Alicia is sitting on the coffee table in the play room with Katy standing almost in front of her. The game, *Rabbit Rabbit* is on hold. Alicia is explaining game-play to Katy. As she Signs to Katy, she also silently mouths the English words she is Signing to Katy. She pauses after every Sign set, then goes on to her next explanation. This progresses through several turns as she and Katy discuss how to play the game.

Spoken English
"See, see, see, see, SEE!" Alicia says to Katy as she attempts to teach Katy the rules of the game they are playing. She says these words as she smacks down Katy's game marker on each square of the game board that Katy was supposed to move according to the roll of the dice she just made.

Predominant Exchange of Information Processes used by Katy with Alicia.

Signs.

Katy's use of Signs as a single element with Alicia occurred in almost 45% of her exchanges, and when combined with other elements, contributed to another 22% of her exchanges

with Alicia. Katy's use and expression of Signs occurred in two ways. The first was a direct and unimpeded expression of the message and the second involved pauses before delivery. Katy's pauses appeared to be intentional at times and may have provided Alicia time to pay attention to her sister prior to Katy's message delivery.

Signing as a single use element was used by Katy when the two sisters maintained attentive and focused conversations. When conversations deviated from this pattern, Katy used Signs in combinations with non-linguistic sounds (as reported in *Non-linguistic sounds*).

Signs
"Now, now, now, turn, mine!" Katy has just pushed Alicia in order to get her attention and the moment Alicia turned towards her sister, Katy began Signing.

Katy and Alicia are playing together near the cherry tree. Katy turns and moves closer to Alicia, hesitates in front of her and then begins Signing, all before Alicia completely focuses on Katy's presence. Katy Signs a lengthy sentence, looks over her shoulder, turns back to Alicia and Signs again a short sentence. Alicia watches Katy while she Signs. Katy Signs again. Alicia makes no response. Katy turns and runs back up the driveway towards the house. Alicia does not even follow Katy's departure.

Non-linguistic sounds with Signs and Non-linguistic sounds.

Katy's expression of non-linguistic sounds in message delivery was very different than that which occurred during attention-getting. The sounds Katy made are more subjectively termed "sounds with meaning." They were variable in tone, had fluctuations in pitch, and (at times) contained paralanguage qualities. When used with facial expressions, body language, and other gestures, non-linguistic sounds had the potential to convey considerable information to Alicia (and Zack). Non-linguistic sounds used alone and combined with Signs accounted for over a quarter of Katy's exchanges with Alicia. Katy's expression of sounds in combination with Signs occurred most often in three situations:

1. When Alicia's attention appeared to wander as Katy delivered her message, an interesting use of sound emerged. It appeared that Katy used sounds (combined with Sign) to re-attract Alicia's attention prior to continuing with message delivery in Signs (without sound).

2. When Katy appeared to want to emphasize a particular point or statement in her dialog and Alicia's attention was directed towards her, Katy would Sign with non-linguistic sound.

3. When Katy wanted to introduce a new topic into an ongoing conversation, she often used non-linguistic sounds with Sign as she changed the topic of conversation.

Non-linguistic sounds
Alicia has just corrected a move made by Katy in the game they are playing by explaining to her what she did wrong. Katy responds with a single turn and then leans back, looks at Alicia and grunts at her, a throaty, raspy grunt.

Non-linguistic sounds in combinations
Katy is controlling a game of *Super Mario Brothers*. Alicia is telling her what to do with her controls (a combination of spoken English, gestures and Sign). As Katy keeps the game going she squeals, groans, whimpers and sighs while watching her on screen action figure - as it continues to survive her on-screen play action. As she watches and controls the game she (seems to) catch Alicia's comments to her. When the game ends, she sighs, drops her shoulders and then suddenly squeals with delight and gives a 'high-five' victory slap to Alicia.

Non-linguistic sounds with Signs
Katy is trying to explain to Alicia the rules she has created for an activity they are engaged in together on the waterslide. Alicia responds to Katy's initial message, but is waning in interest. Katy Signs, combining her attention-getting non-linguistic sound (expressed with less emphasis and lower in volume) to what she is Signing to Alicia. Alicia barely responds, turning slightly to watch Katy and then turns away, walking down the slide.

Gestures.

Gesture expression in exchange of information by Katy included 'Yes' and 'No' nods of the head, shoulder shrugs, facial expressions, hand gestures, head tilting left or right, body posturing, and other gestures. Surprisingly, Katy used gestures half as often as did Alicia in exchanges of information.

Gestures
Alicia has just told (Signs) Katy the rules to the action they are going to engage in as they make body outlines of each other with chalk in the cul-de-sac. Katy looks at Alicia and nods her head 'Yes'.

Gestures combined with non-linguistic sounds
Katy and Alicia are playing on the waterslide. Katy has just suggested to Alicia that they should have a competition: who can slide the furthest down the slide from one end to the other. Alicia comments on her suggestions and agrees. Katy then gives a double thumbs up gesture to Alicia, turns and takes off for the starting end of the slide. When she gave the thumbs up gesture, she also squealed with glee.

Turn-taking in Exchange of Information between Alicia and Katy.

Turns, or turn-taking, in exchange of information between Alicia and Katy varied in number and appeared to be dependent on the type of message delivered (e.g., statements, questions, commands, directives, etc. [16]) at the onset of exchange between sisters. Turn-taking ranged from exchanges with a single presentation resulting in one turn episode, because the child delivering the message immediately terminated the dialog, to exchanges culminating after nine turns from initial message delivery through response and discussions between locutor (delivery, three responses, and response with termination) and interlocutor (four responses).

Alicia initiated 44 dialogs with Katy. Ten of these dialogs were one turn exchanges; that is, Alicia presented her message and then terminated the dialog. Nine of the exchanges between sisters included message delivery by Alicia and response by Katy followed by an exchange termination (two turns). Eighteen exchanges contained three turns: delivery by Alicia, response by Katy, and a final response by Alicia before termination. There were four exchanges with four turns, one exchange with five turns, and two exchanges with eight turns.

Katy initiated 84 dialogs of which 29 exchanges were message delivery (by Katy) followed by an immediate dialog termination. In 36 exchanges, Alicia responded with a single turn before the dialog was terminated. Ten exchanges contained three turns, five contained four turns, two were of five-turn duration, and one message exchange between Katy and Alicia contained nine turns before Alicia terminated the dialog.

The Younger Dyad (Katy & Zack)

Predominant Exchange of Information Processes used by Katy with Zack.
Signs.

As shown in Table 4, Katy used Signs during message delivery with Zack almost half as often as she did with Alicia. In most of Katy's Signed responses to Zack which she initiated, as

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[16] Sentence structure and semantics were noted throughout siblings' dialogs without in-depth analyses. Data on the expression of statements, questions, commands, directives, etc. were subjectively recorded and used only superficially to track turns and turn-taking between siblings. These data are not reported in this thesis.

she delivered her Signed message, she often appeared to ensure visual contact was established with Zack prior to Signing. This was not a typical behavioral trait she exhibited with Alicia.

Signs

"Here! Again. This. Do this." Katy Signs to Zack after she has gained his attention so she could deliver her message. Zack watched her Sign then turned away. She reached out, grabbed his shoulder, turned him around, and Signed, "Now. Do now!"

"No?" Katy signs to Zack after he told her to do something. She stands looking at him and Signs again, "No" and adds "Why?" combining a non-linguistic sound (which carries a strong non-linguistic sound of 'Why') in her query.

"(Zack) go there, do this, there!" Katy Signs to Zack. Telling him to move from where he is standing to another location and to do what they were doing a moment before in their play actions.

Gestures.

Katy also expressed a high diversity in gesture use in messages shared with Zack: shrugs, head tilts, mouth shapes, tongue extrusions, finger snapping, body movements (tilting, bending), posturing, foot stomps, and pointing along with other gestures were used extensively in exchanges. Non-linguistic sounds were combined in about a quarter of the gestures Katy used with Zack. Gestures were the tools which Katy used to express almost a third of her messages with Zack.

Gestures

"No, do it this way, Katy!" These words were spoken to Katy by Zack. Katy watched Zack as he told her what to do, then shrugged her shoulders, shook her head 'No' but still did what Zack told her to do.

Non-linguistic sounds.

Non-linguistic sounds were an important tool used in message delivery to Zack. When sounds were combined with other elements and used in message delivery, frequency in occurrence of sound expression trebled. Katy's diversity and range of sounds in message delivery with Zack were greater than those she expressed with Alicia.

Non-linguistic sounds
Zack is talking (spoken English) with Katy as he sits on the slide telling her to leave his sand pile alone while giving directions to her about how to build the sand pile she is constructing. As Zack carries on his conversation with Katy, she grunts and sighs occasionally, thus creating a dialog with turns.

Non-linguistic sounds - variation in exchange
Katy has just asked Zack to join her on the swing, but Zack hesitates about leaving the social area and rejoining Katy in swing play. In their previous playbout on the cherry tree swing, Katy physically beat him up. As Zack hesitates but still watches Katy, Katy goes into a looping swing in which she emits a sound rising in pitch then falls over the next several seconds until it is barely audible. It is a high-pitched gleeful sound. She makes this sound almost as a part of her conversation with Zack because as she swings she constantly turns to keep him in view. He stands watching Katy. The tones *seem to carry meaning* to Zack which he (seems to) acknowledges by running down the driveway to the tree to rejoin Katy in another bout of swinging. (A subjective interpretation)

Predominant Exchange of Information Processes used by Zack with Katy.

Gestures.

Gestures dominated Zack's tactics for exchanging information with Katy. Over a third of his dialogs with Katy took place with an assortment of gestures expressed as solo elements. Shrugs, facial expressions, hand movements, mouth shapes and tongue extrusions, feet shuffling, along with head nods, shakes and finger motions, and others were all used to convey meaning between Zack and Katy.

Gestures
Katy has just asked Zack if he wants to get some more buckets of sand from the sand box in the back yard to continue their ongoing play in the cherry tree swing area. Zack, who is standing over Katy, looks down at her and shakes his head, 'No.' Katy then shakes her head, 'Yes.' Zack continues looking down at Katy and then shakes his head, 'Yes.' Katy, still looking at Zack, gestures 'Come' with an index finger extended towards Zack. Zack continues looking at Katy as she turns and begins running towards the backyard. Although Katy has, in effect, ended the dialog, Zack adds one additional turn to Katy's closure by shrugging his shoulders and sticking his tongue out at her. He then looks in the direction she ran and follows her into the backyard.

Spoken English.

Zack freely carried on discussions with and without turns with his deaf sister using spoken English combined occasionally with gestures and Signs. Almost a quarter of Zack's messages with Katy consisted of spoken words. Interestingly, over half of all messages delivered to Katy in

spoken English, after he had achieved dialog initiation with her, were expressed without face-to-face contact. That is, after Zack had established dialog initiation with Katy, he often turned his head or his body away from her, moved away, looked away, or generally negated visual contact with Katy as he spoke his messages. Although most of his messages were simple one and two word sentences, they were still delivered without visual contact. Surprisingly, Katy responded with a dialog turn in almost half of these non-visually delivered, spoken exchanges, usually with non-linguistic sounds or gestures combined with sounds.

Spoken English
Katy gives a thumbs up gesture to Zack in response to a question he has just asked her. "OK? Now, is it OK?" he asks and then says, "My turn, now it's my turn" while turning away from her.

Spoken English and Signs interspersed during exchange
Zack and Katy are on the cherry tree swing. Zack is on the bottom and is giving the impression of discomfort with his continual whining and whimpering. Katy is pushing them around in circles. She is also making sounds, but Katy's are giggles. Zack keeps letting go of the rope with one hand, pushing against Katy and saying, "No, Katy, No!" He repeats this several times. Katy is looking into Zack's face, so she is aware of his words. Zack says, "Don't want this, Katy. No. Don't want, Katy." Katy stops the swing, Zack slips off the seat, stands and looks at his sister and says, "No, Katy, don't want this." Zack then Signs 'No' to her. She giggles, nods her head, 'Yes,' grabs the swing rope and tries to pull Zack back onto the seat with her. He runs away.

Spoken English and gestures interspersed during exchange
Zack and Katy are playing in the downstairs playroom. Zack is standing on top of a desk. Katy walks over and stands next to the desk Zack is standing on. She looks up at him and then moves around the desk to climb up on top of it with him. He reaches down, pushes her away and, pointing, says, "No, go over there!" She looks where he points. Zack again says, "There, go there." She walks to where he is pointing, but not before he says again, "Go there Katy, don't want you here."

Signs.

Zack Signed to Katy in numerous exchanges. His sentences were usually one or two words, but rarely three or more linked together. He delivered Signs slowly, always making sure that he had consistent visual contact with Katy, and that she was attending to his dialog as he delivered his messages. On occasion, if Katy's gaze strayed from Zack's face, he would reach out, take her face in his hands and physically turn her head so she was looking in his direction again. Surprisingly, as vocal as Zack was with spoken English and non-linguistic sounds, he

never combined his Sign use with spoken English and rarely combined it with non-linguistic sounds. He was virtually silent in his Sign expression with Katy.

Signs
Zack and Katy have been swinging on the cherry tree swing. Zack has been complaining, whining, and fussing for over a minute. He wants the swing to himself. He stops their looping and stands high enough to dislodge Katy from his lap. As she stands, he steps back, looks at Katy, gestures to her, and when she attends to him, he Signs, "Ice cream cone". He Signs it once, then again. Each of these expressions is a slow, exaggerating licking of an imaginary ice cream cone. Just before Signing a third time he shifts his gaze towards the social area where his mother is sitting. While looking in that direction, he Signs a third time and then a fourth. As he finished the fourth sign he looks back at Katy and Signs, "Man", and then Signs, "Now". Just as he begins to Sign "Ice cream cone" for the fifth time Katy turns away from him. Zack continues with one more ice cream cone sign, then says aloud the words, "Ice cream", while watching Katy walk away from him towards the social area.

Non-linguistic Sounds.

Non-linguistic sounds carrying information in messages from Zack to Katy included grunts, atonal sounds, and paralanguage. One in five of Zack's dialogs with Katy contained some form of non-linguistic sound. Examining the occurrence of these sounds, I found that most were given as responses (a turn-taking episode) to something Katy had said to him or were used as an indicator that he was about to terminate a dialog.

Non-linguistic sounds as paralanguage
Zack turns and looks back over his shoulder at Katy as she continues looking out into the cul-de-sac. Zack has just walked away from Katy after asking her to come and look at what he was doing. As he looks at her, he crooks his index finger and curls it back and forth and makes a sound meaning 'Come on.'

Turn-taking in Exchange of Information between Katy and Zack.

Turns between Zack and Katy were low in number in most exchanges. Similar to what was reported for Alicia and Katy, turn-taking episodes between Zack and Katy seemed dependent on the type of exchange occurring between siblings.

Katy initiated 46 dialogs of which 17 exchanges were single-turn exchanges. In 18 exchanges Zack responded once before the dialog was terminated (two turns). Four exchanges

contained three turns, five contained four turns, and two were of five-turn duration before the dialog was terminated.

Zack initiated 44 dialogs with Katy. Twenty of these dialogs were one turn exchanges. Twelve of the exchanges between siblings included message delivery by Zack and response by Katy (two turns). Seven exchanges contained three turns. There were two exchanges with four turns and one exchange with five turns.

Termination Processes of Siblings' Dialogs

The Older Dyad (Alicia & Katy)

Although Alicia's total initiations were half those of her sister's (n = 44 and 84, respectively), Alicia terminated six of every ten dialogs which took place between her and Katy (n = 76 and 52, respectively). As important as these data are in representing the relationship of initiations and termination taking place between Alicia and Katy, they report only total occurrence of dialog termination. Therefore, in order to examine the overall picture of initiations, termination and dialog control, I asked the question, Did the sibling initiating the dialog also terminate that dialog? Alicia initiated 44 conversations with Katy of which she terminated 29 (66%), while Katy ended 15 of Alicia's starts (34%). Katy began 84 conversations with Alicia but terminated only 37 (44%) of her own starts, while Alicia terminated 47 of hers (56%). Thus, Katy terminated less than half of the conversations she initiated with Alicia. Alicia, though, terminated a much larger portion of the dialogs she initiated with Katy.

All three siblings' dialogs were terminated with one of three visual elements: looking away, turning away, or leaving. Termination elements used by Alicia and Katy are reported in Table 5. Four narrative examples of Alicia's dialog termination behaviors and three of Katy's are reported by frequency of occurrence in the following sections.

Predominant Processes of Termination used by Alicia with Katy.

Alicia's expression of these elements was dominated by looking away from Katy, followed by turning away and then walking away (leaving) from Katy. Alicia looked away from Katy to

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Table 5.

Frequency and Percent Occurrence of Embedded Elements Expressed Individually and in Combinations in Termination Processes.

Embedded Element Expressed	Sibling Dyad							
	The Older Dyad				The Younger Dyad			
	Alicia		Katy		Zack		Katy	
	N	%	N	%	N	%	N	%
Visual Signals								
Looks away	39	51.3	16	30.8	11	29.7	21	39.6
Turns away	19	25.0	17	32.7	7	18.9	16	30.2
Leaves	18	23.7	19	36.5	17	45.9	14	26.4
Other	-	-	-	-	2	5.4	2	3.8
Totals	76	100.0	52	100.0	37	100.0	53	100.0

Note 1. The columnar totals are the tabulation or percent totals for one child.

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terminate dialogs twice as often as she did by either turning away or leaving Katy's presence. There were several occasions after Alicia terminated a dialog with Katy, that she (Alicia) turned back and re-initiated the conversation on the same topic or with a slight variation.

Looks away.
Alicia has just told Katy that she (Alicia) is going to run to the other end of the waterslide and wait for her to run toward her as she (Alicia) shoots a water spray from the hose over her head as Katy runs by. Katy continues to look at Alicia who shifts her gaze away from Katy's face to the other end of the waterslide.

Looks away with variation - dialog re-initiation.
Alicia has just looked away from Katy after telling her how to pour water down the backyard swing-set slide. She continues to look past Katy who is beginning to move away from Alicia. Alicia suddenly looks back at Katy and adds another comment to her previous dialog then looks away again.

Turns away.
Katy has infringed on Alicia's drawing area in the cul-de-sac. After explaining to Katy the boundaries (a second time) Alicia stands looking at Katy, sighs (breath in and breath out with shoulder droop) and then pauses before any further movement. Alicia then turns her body away from Katy without moving from where she stands and looks out into the cul-de-sac.

Leaves.
Alicia appears angry with Katy. After a three-turn dialog Alicia makes a grimacing face and walks quickly past Katy, almost knocking her down as she leaves her deaf sister's presence.

Predominant Processes of Termination used by Katy with Alicia.

Katy's expression of termination elements was the reverse of Alicia's. She left dialogs more often than she turned away and turned away more often than she looked away from Alicia. However, the differences in her use of these elements was insignificant as each behavior was expressed with almost equal frequency.

Leaves.
Alicia has just told Katy about an activity they could do on the waterslide. Katy made a return comment and then very quickly ran past Alicia heading for the other end of the slide to begin play action.

Turns away.

"No!" Alicia says to Katy. Katy looks at Alicia and then slowly turns away without further comment.

Looks away.

Dialog initiation and delivery of information lasted no more than five seconds and then Katy slowly shifted her gaze away from Alicia's face looking past her.

The Younger Dyad (Zack & Katy)

Katy and Zack initiated and terminated a total of 90 dialogs (Katy, n = 46; Zack, n = 44) during their play activities. Each child initiated almost equal numbers while the ratio of total termination was skewed towards Katy who terminated 53 dialogs. Zack terminated 37 dialogs. Analyzing the totals and, again addressing the question, Did the sibling initiating the dialog also terminate that dialog? I noted an interesting facet of initiation and termination between Katy and Zack. Zack terminated only 13 (30%) of the 44 dialogs he began with Katy. Katy terminated the other 31 (70%). Thus, in the conversations that Zack initiated with Katy, she terminated at least two of every three dialogs he began with her. This was a curious finding and one which became even more interesting when I examined who terminated the 46 dialogs Katy initiated with Zack. Katy ended 22 (48%) dialogs, almost half of her own initiations, while Zack terminated the other 24 (52%).

Termination elements used by Katy and Zack are tabulated and presented in Table 5. Three narrative examples of both children's dialog termination behaviors are presented by frequency occurrence in the following subsections.

Predominant Processes of Termination used by Katy with Zack.

Katy's dialog terminations with Zack were fairly equally distributed in occurrence. Looking away from Zack was used most often. Turning away from Zack was followed by walking away from him in frequency of occurrence.

Looks away.

Katy has just invited Zack to follow her into the backyard to swing. He looks at her, nods his head. Katy shakes her head 'Yes' also and then looks away from Zack.

Turns away.

Katy looks down at Zack laying on the ground where he fell when she jerked the swing out from under him. As she looks at Zack, she tells him the swing is now hers and that she wants to play on it - alone. As he looks up at her from his position on the ground she abruptly turns her body away from him.

Leaves.

Zack has just told Katy that the Ice Cream Man is coming down the street. He has told her this to get her away from the cherry tree swing so he can have it for himself. Katy looks at Zack and then quickly walks past him moving up to the social area where she can ask her mother about what Zack has just told her.

<u>Predominant Processes of Termination used by Zack with Katy.</u>

Zack left Katy's presence more often than he looked away and he looked away more often than he turned away. Zack's behavior after ending dialogs by leaving Katy's presence included a variation on a behavior which Alicia expressed with Katy. Often, after he was several running steps away from Katy he would hesitate, stop, turn around and look back at his sister, then he would run back to rejoin her in play. Here though, Zack re-initiated play whereas Alicia re-initiated dialogs.

Leaves.

Zack has just told Katy (spoken English) that he doesn't want her to swing with him anymore. He stands up, looking at her with his chin thrust out - posturing. He then sticks his tongue out at Katy while shifting his gaze from her face looking out into the cul-de-sac. He looks back, makes his 'raspberry' sound, then quickly walks up towards the tree, away from Katy, leaving her standing and staring after him. He carries the swing with him so she cannot use it.

Looks away.

Katy has just pulled the cherry tree swing from Zack. He looks at her, gestures that he wants back on her lap, she shakes her head 'No.' Zack stands in front of Katy and begins to say something in return, but looks past her instead into a neighbor's yard.

Turns away.

Katy runs up to Zack and tells him to follow her to the slide. He looks at Katy, looks at the slide, nods his head 'Yes', turns away from Katy and goes back to doing what he was doing before she ran up to him. He ignores Katy's further invitation to a change in ongoing play.

Patterns of Embedded Elements Expressed in Siblings' Dialogs

This section presents data analyses focusing on the third, and arguably the most significant, research question, namely: What patterns of behavioral and communicative interactions were expressed as the two sibling dyads initiated, maintained, and terminated dialogs? The specific focus was whether the processes and patterns which siblings used and expressed differed when the deaf child (Katy) interacted with her older hearing sister (Alicia), who had been exposed primarily to a simultaneous visual-auditory (Sim VA) pattern of communication, as compared to when Katy interacted with her younger hearing brother (Zack), who had been exposed to both a Sim VA and a sequential visual (Seq V) pattern of communication. The patterns reported in this section are the expression of embedded elements siblings used simultaneously and/or sequentially throughout dialogs. In this discussion of patterns of communication I have collapsed the embedded elements into representational auditory and visual components in order to compare and contrast pattern expression to other dual-language dyads (specifically, Hm/hc, Dm/dc, and Hm/dc dyads in Chapter 5). For example, during dialog initiation sibling A sought sibling B's attention by stomping a foot on the ground while combining non-linguistic sounds with the expression; once sibling B's attention was gained, Sibling A exchanged information with Sibling B through the use of gestures; following message delivery sibling A terminated the dialog with sibling B by walking away. These elements, when examined and collapsed into visual and auditory components, are expressed as a Visual/Auditory → Visual → Visual pattern. In this section, only the predominant patterns (≥10% frequency occurrence) of siblings' dialogs are discussed. Frequency and percent occurrence of each pattern are expressed as a proportion of the total dialogs initiated by each sibling in each of the tables introduced in this section. Following a brief introduction to each pattern, a narrative description representative of each pattern expressed by a sibling is then presented.

The Older Dyad (Alicia & Katy)

As shown in Table 6, Alicia's predominant pattern of gaining her deaf sibling's attention and exchanging information with her was through a sequential expression of visual components. Alicia did simultaneously use visual and auditory elements during initiation, as well as during

Table 6.

Frequency and Percent Occurrence of Patterns of Communication Expressed by Siblings in the Older Dyad.

Patterns

	Attention-Getting		Exchange of Information		Termination	N	%
			Process of Dialog				
Alicia (hearing, 7 years old)							
1	Visual	→	Visual	→	Visual	19	
	Visual	→	Visual	→	* (Visual)	8	61.5
2	Visual	→	Auditory then Visual / Auditory	→	* (Visual)	5	11.4
3	Visual	→	Visual then Visual / Auditory	→	Visual	4	9.1
4	Visual / Auditory	→	Visual	→	Visual	3	6.8
5	Auditory	→	Visual	→	Visual	2	4.5
6	Visual	→	Visual / Auditory	→	* (Visual)	2	4.5
	Visual	→	Auditory	→	* (Visual)	1	2.3
					Totals	44	100.1
Katy (deaf, 5 years old)							
1	Visual / Auditory	→	Visual / Auditory	→	Visual	18	
	Visual / Auditory	→	Visual / Auditory	→	* (Visual)	26	52.4
2	Auditory	→	Visual / Auditory	→	Visual	9	
	Auditory	→	Visual / Auditory	→	* (Visual)	10	22.6
3	Visual	→	Visual	→	Visual	5	
	Visual	→	Visual	→	* (Visual)	6	13.1
4	Visual / Auditory	→	Visual then Auditory	→	* (Visual)	3	3.6
5	Visual	→	Visual / Auditory	→	Visual	3	3.6
6	Visual / Auditory	→	Visual then Visual / Auditory	→	Visual	2	
	Visual / Auditory	→	Visual then Visual / Auditory	→	* (Visual)	1	3.6
7	Visual	→	Auditory then Visual	→	* (Visual)	1	1.2
					Totals	84	100.1

Note 1. The asterisk (*) indicates that the other sibling terminated the dialog in this pattern.

Note 2. Percentage of columns do not always add up to 100.0 due to rounding.

message delivery, but the circumstances within which she expressed these elements as patterns were unique. As shown in Table 6, Katy's predominant patterns of dialog initiation and maintenance with Alicia were expressed through visual signals combined with auditory elements. Overall, it appeared that Katy relied on auditory elements as extensively as she did visual elements in her dialogs with both of her hearing siblings.

Predominant Patterns of Dialog used by Alicia with Katy.

Overall, Alicia expressed six patterns of communication in her conversations with Katy. As shown in Table 6, the predominant pattern expressed by Alicia in the 44 dialogs she initiated with Katy was a Visual → Visual → Visual pattern.

Pattern One.

The component expression of embedded elements in the predominant pattern of communication expressed by Alicia with Katy was a Visual → Visual → Visual pattern. This pattern was documented in 61.5% of Alicia's 44 dialogs with Katy.

Pattern One Narrative
Alicia stands looking at Katy, extends her arm and points at her. As Alicia points at Katy, she wiggles her finger up and down slightly, creating almost a circular motion. She makes this gesture while looking at Katy with an intense gaze (but not as intense as that which occurred in *prolonged gaze*). When Katy acknowledges Alicia, she Signs to Katy and then watches her, waiting for a response. When Katy does not respond, Alicia Signs again. She continues to watch Katy and when no response is forthcoming she walks away from her sister.

Pattern Two.

Alicia's second most commonly used pattern occurred with a variation in elements expressed during information exchange. In this pattern, after gaining Katy's attention with a visual element, Alicia again used a visual element during her initial exchange with Katy and followed it with an auditory expression combined to a visual element during turn-taking. This Visual → Visual then Visual/Auditory → Visual pattern accounted for 11.4% of Alicia's patterns in dialogs with Katy.

Pattern Two Narrative

Alicia is in close proximity to Katy and stands next to her, patting her arm. When Katy acknowledges Alicia's attention-getting actions, Alicia gestures to Katy during her initial message delivery. She stands and waits, then responds to Katy's turn with spoken English combined with Signs. When she finishes responding to Katy's next turn, Alicia looks away from her sister, terminating the dialog.

Predominant Patterns of Dialog used by Katy with Alicia.

Katy's predominant patterns of gaining Alicia's attention and exchanging messages were mostly through combinations of visual signals combined with auditory elements (Table 6). Seven patterns were documented with two accounting for 85% pattern expression in the 84 dialogs she initiated with Alicia.

Pattern One.

The component expression for pattern one was a combination of visual and auditory elements expressed during initiation and exchange of information with a visual element terminating the dialog. This was a Visual/Auditory → Visual/Auditory → Visual pattern which accounted for 52.4% of Katy's 84 dialogs with Alicia.

Pattern One Narrative

Katy stands and gestures to Alicia while using her attention-getting sound. As Alicia acknowledges Katy, Katy Signs with sound. The message is quickly delivered and, without waiting for a response from Alicia, Katy terminates the dialog by looking away from Alicia.

Pattern Two.

The second pattern which Katy used extensively with Alicia consisted of an auditory element expressed during initiation and visual and auditory signals combined as she exchanged information with Alicia. This pattern, when analyzed for elements and collapsed into visual and auditory components, was an Auditory → Visual/Auditory → Visual pattern. The pattern accounted for 22.6% of Katy's dialogs with Alicia.

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Pattern Two Narrative

Katy's utters her attention-getting sound several times as she walks towards Alicia. Alicia looks up and then turns to look at Katy when she makes her sound a third time. When Katy sees that Alicia has looked towards her, she (Katy) immediately begins Signing with sound to Alicia. When finished with her message, Katy quickly turns away, apparently not wanting a response from Alicia.

Pattern Three.

The third most frequently expressed pattern in dialogs with Alicia by Katy was one which included only visual elements. Katy's use of this pattern accounted for slightly over 13% of her dialogs with Alicia. The pattern was a Visual → Visual → Visual pattern and mostly included the use gestures during initiation and Signs in message delivery.

Pattern Three Narrative

Alicia is standing at one end of the waterslide. Katy is at the other end. When Katy turns around and notices Alicia looking down the slide at her, she gestures for Alicia to stay where she is standing. Katy then explains to Alicia, in Signs, what they are going to do - run towards each other, slide, and then crash together. She terminates the dialog when she takes off running up the slide towards Alicia.

The Younger Dyad (Zack & Katy)

As shown in Table 7, Zack's predominant pattern of gaining Katy's attention and exchanging information with his deaf sister was through the sequential expression of visual and auditory components mixed in a plethora of patterns. Katy used similar patterns with Zack that she expressed with Alicia but frequency of expression was different. Katy's predominant patterns of dialog initiation and maintenance with Zack, as shown in Table 7, were skewed toward the use of visual elements combined with auditory signals. Overall, Katy relied extensively on the combined use of auditory and visual elements in her dialogs with Zack, more so than she did with Alicia.

Predominant Patterns of Dialog used by Zack with Katy.

Zack's use of embedded elements in the 44 dialogs he initiated with Katy resulted in the expression of 13 communicative patterns (Table 7). Like Katy, he used and relied on sounds combined with other elements extensively. Three patterns predominated Zack's dialogs with Katy.

Table 7.

Frequency and Percent Occurrence of Patterns of Communication Expressed by Siblings in the Younger Dyad.

Patterns

Process of Dialog

	Attention-Getting		Exchange of Information		Termination	N	%
Zack (hearing, 3 years old)							
1	Visual / Auditory	→	Visual / Auditory	→	Visual	7	
	Visual / Auditory	→	Visual / Auditory	→	* (Visual)	5	27.3
2	Visual	→	Auditory	→	Visual	3	
	Visual	→	Auditory	→	* (Visual)	4	15.9
3	Visual / Auditory	→	Visual	→	Visual	1	
	Visual / Auditory	→	Visual	→	* (Visual)	4	11.4
4	Visual / Auditory	→	Visual then Auditory	→	* (Visual)	3	6.8
5	Visual	→	Auditory then Visual	→	* (Visual)	3	6.8
6	Visual / Auditory	→	Visual / Auditory	→	Visual	2	4.5
7	Auditory	→	Visual	→	Visual	2	4.5
8	Visual / Auditory	→	Visual / Auditory	→	* (Visual)	2	4.5
9	Visual	→	Visual	→	* (Visual)	2	4.5
10	Visual	→	Auditory then Visual	→	* (Visual)	2	4.5
11	Auditory		Auditory	→	* (Visual)	2	4.5
12	Auditory	→	Visual / Auditory	→	Visual	1	2.3
13	Visual	→	Visual then Visual / Auditory	→	* (Visual)	1	2.3
					Totals	44	99.8
Katy (deaf, 5 years old)							
1	Visual / Auditory	→	Visual / Auditory	→	Visual	8	
	Visual / Auditory	→	Visual / Auditory	→	* (Visual)	14	47.8
2	Visual / Auditory	→	Visual	→	Visual	3	
	Visual / Auditory	→	Visual	→	* (Visual)	4	15.2
3	Visual	→	Visual / Auditory	→	Visual	3	
	Visual	→	Visual / Auditory	→	* (Visual)	3	13.0
4	Auditory	→	Visual / Auditory	→	Visual	2	
	Auditory	→	Visual / Auditory	→	* (Visual)	3	10.9
5	Auditory	→	Visual	→	Visual	3	6.5
6	Visual / Auditory	→	Visual then Auditory	→	Visual	2	4.3
7	Visual	→	Auditory then Visual	→	Visual	1	2.2
					Totals	46	99.9

Note 1. The asterisk (*) indicates that the other sibling terminated the dialog in this pattern.
Note 2. Percentage of columns do not always add up to 100.0 due to rounding.

Pattern One.

The collapsed element expression for pattern one is a visual and auditory element combination which Zack used frequently throughout dialogs he initiated with Katy. The pattern, a Visual/Auditory → Visual/Auditory → Visual one, was found in 27.3% of Zack's 44 dialogs he engaged in with Katy.

Pattern One Narrative
Running fast towards Katy, Zack gestures towards her while making his attention-getting sound until Katy acknowledges him (four repeats). As he watches her acknowledge him, he gestures with non-linguistic sounds in message delivery and then, immediately, looks away from Katy, terminating the dialog. He barely slowed down through this entire exchange.

Pattern Two.

The seconded most commonly used pattern which Zack expressed with Katy was one of solo elements. The pattern, Visual → Auditory → Visual, was documented occurring in 15.2% of all dialogs which Zack initiated with Katy.

Pattern Two Narrative
Zack stands looking at Katy. As he stands he gestures to her - flapping his hands up and down - his imitation of handwaving. When Katy responds, Zack uses spoken English in message delivery, pauses briefly while watching Katy, when she does not respond he looks away.

Pattern Three.

The element expression in pattern three was Visual/Auditory → Visual → Visual. This pattern was documented as occurring in 11.4% of Zack's dialogs.

Pattern Three Narrative
Zack stands very close to Katy and pats her arm while using spoken English (saying her name very softly, over and over) to gain her attention. When Katy turns and acknowledges Zack, he pauses, looks at her (making sure she is attending to him) and then Signs. He watches Katy after his message delivery for a response. She responds with a shrug of her shoulders. Zack then walks away from Katy without looking back.

<u>Predominant Patterns of Dialog used by Katy with Zack.</u>

As shown in Table 7, Katy used seven communicative patterns in the 46 dialogs she initiated with Zack. As she did with Alicia, Katy's use of visual and auditory components predominated her element expression in conversations with Zack. Of the seven patterns which Katy used in dialog with Zack, four accounted for almost 90% of her pattern expression.

Pattern One.

Pattern one was used in almost half of Katy's conversations with Zack. The pattern was an expression of visual and auditory elements used sequentially as she sought to gain his attention and then exchange information with him. The pattern, Visual/Auditory → Visual/Auditory → Visual, accounted for 47.8% of her dialogs with Zack.

Pattern One Narrative
Katy stands looking at Zack and gestures toward him with non-linguistic sound (her attention-getting sound). When he acknowledges her, she immediately Signs to him, attaching a different component of sounds to her message. Then, without waiting for a response from Zack, she looks away, terminating the dialog.

Pattern Two.

Pattern two, again, encompassed visual and auditory elements during dialog initiation. After initiation though, Katy switched to visual signals during message delivery. This pattern, a Visual/Auditory → Visual → Visual pattern, was used in over 15% of Katy's dialogs with Zack.

Pattern Two Narrative
After gesturing with sound to attract Zack's attention, Katy delivers her message in gestures. After her initial delivery she continues to look at Zack, apparently waiting for a response. When he does not respond to her inquiry, she looks away and ends the dialog.

Pattern Three.

The third pattern was a Visual → Visual/Auditory → Visual pattern. This pattern accounted for 13% of all patterns expressed by Katy with Zack.

Pattern Three Narrative
Using exaggerated handwaves, Katy gets Zack's attention and then uses Signs combined with sounds in her message delivery. She stands looking at Zack, as if waiting for a reply. When he doesn't respond, she turns towards the swing she wants Zack to join her on, ending the dialog.

Pattern Four.

The element expression in pattern four was sounds in attention-getting and sounds combined with visual signals in message delivery. This pattern, which accounted for over 10% of Katy's dialogs with Zack, was an Auditory → Visual/Auditory → Visual pattern.

Pattern Four Narrative
Katy's attention-getting sound and several other sounds are used to get Zack's attention. Katy repeats the sounds several more times, varying pitch and volume and tonal quality. When Zack finally acknowledges Katy, she nods her head, 'Yes', and makes what sounds like the paralanguage, 'Uh-huh'. She then continues to stand waiting for Zack to respond. When he does, she gestures again with sounds and then terminates the dialog by looking away.

CHAPTER 5

The Purpose of the Research

The purpose of this study was to examine the processes and patterns of communicative interaction which preschool and elementary school-aged deaf and hearing siblings utilized to initiate, maintain, and terminate dialogs during play. There were three specific questions employed to examine whether the processes and patterns of dialogs siblings used and expressed with each other differed when a deaf child interacted with an older hearing sibling who had been exposed primarily to a simultaneous visual-auditory (Sim VA) pattern of communication, as compared to when the deaf child interacted with a younger hearing sibling who had been exposed to both a Sim VA and a sequential-visual (Seq V) pattern of communication from birth. The first question, an examination of the kinds of play engaged in by siblings, set the stage for analyses of dialog processes and patterns by establishing a format within which to examine siblings' dialogs. The second question, an assessment of the processes of behavioral and communicative interactions which took place between siblings as they sought to gain each other's attention, exchange information and terminate dialogs, yielded descriptions of embedded elements of dialogs expressed between siblings as they played and conversed in two dyads: (a) an older dyad composed of a seven-year-old hearing child (Alicia) and her five-year-old deaf sibling (Katy), and (b) a younger dyad with Katy and her three-year-old hearing sibling (Zack). The third question, which examined the behavioral and communicative patterns expressed by each child as each child initiated, maintained, and terminated dialogs, facilitated the identification and description of behavioral and communicative elements as patterns of dialogs.

The methodological design of this study and the comprehensive analyses of field data facilitated descriptive interpretation of the behavioral and communicative interactions taking place between deaf and hearing siblings. The overall significance of this study is that these findings contribute to an initial understanding of the processes and patterns of communication that take place between deaf and hearing siblings during naturally-occurring play.

A Discussion on Research Findings

Siblings' Play

Although siblings' play was not the focus of this study, it represented the arena within which I examined the first research question: What kinds of play do deaf and hearing siblings engage in together during dyad interactions? I found social play to be the predominant kind of play taking place between siblings in both dyads. Social play accounted for almost 60% of both dyads' playtime. Games were also an important facet of play in both dyads. Constructive play, the least observed kind play, was documented in 15% of Alicia and Katy's playbouts and was observed in less than 10% of Zack and Katy's playbouts. Surprisingly, I did not observe symbolic play during siblings' playtime, nor did I document practice play.

Comparing and contrasting Alicia, Katy and Zack's dyadic play activities with other studies is difficult because analogous studies are few in the literature. Kaplan and McHale (1979), in their study of communication and play behavior between a four-year-old deaf preschooler and his three-year-old hearing sibling, reported that overall normal patterns of sibling play were altered. The sibling structure in Kaplan and McHale's study (Ds/hs) was analogous to the younger dyad of this study (Ds/hs). Free play (open social interaction) in Kaplan and McHale's dyad was mostly parallel social play with interactions focused on materials. Communication was minimal. Constructive play, which represented a mere 6% of the hearing brother's and deaf brother's total play time, was parallel and focused mostly on play materials. Katy's and Zack's play interactions (as well as their communication, which will be discussed in the next sections) appeared to be different than the findings reported by Kaplan and McHale. The coding of parallel play was not a facet of the present study, and, therefore, direct comparison of siblings' play cannot be made, although most social play between Zack and Katy was interactive, fast-paced, did not occur side-by-side, nor were play actions focused on play materials.

Higginbotham and Baker (1981), comparing deaf/deaf and hearing/hearing children's play, found that deaf children spent considerable time in solitary play, little time in social play, and even

less time in constructive or symbolic play than did hearing peers. These findings contrasted with the frequency of social play observed for both dyads in the present study, but did reflect the low occurrence of constructive play. Higginbotham and Baker suggested that deaf children's lack of social interaction may have been due to difficulties with communication and interaction. As will be discussed in the following sections, communication was not a hindering factor for Alicia and Katy in any kind of play. However, communication may have played a role in the low occurrence of constructive play between Zack and Katy. Esposito and Koorland (1989), looking at the play behavior of two deaf children (aged 3 1/2 and 5 years old) in integrated (hearing and deaf children) and segregated (deaf children only) classrooms, found that interactive social play predominated interactions in the integrated setting while parallel social play was observed most often in the segregated setting. Findings from the present study seem to reflect overall what Esposito and Koorland observed between deaf and hearing peers in the integrated classroom, but does not appear to correspond with what occurred when deaf peers played together. In another study, Spencer and Deyo's (1993) specific focus on symbolic play between deaf and hearing two-year-olds concluded with two remarks pertinent to the present study. First, the level of play engaged in by deaf and hearing peers was a reflection of both the social behavior and overall developmental maturity of the children. Second, communicative interactions between the two-year-olds did not appear to impact ongoing play negatively. Both of these conclusions are discussed and expanded in the following paragraphs.

Although the kinds of play expressed in the older and younger dyads were similar, there were important differences in the context and content of siblings' play. Parten (1932) found that social play was usually spontaneously created between children and, as both Parten and Smilansky (1968) noted, the occurrence, length, and diversity of social play is exponentially reflected in children's ages: the older a child, the greater the expression. Alicia (who was 7 years old at the time of the field study) and Katy (who was 5 years old) developed lengthy play scenarios rich in interactions and diverse in creative ideas. Zack (who had just turned 3 years old at the onset of the field study) and Katy engaged in short playbouts which were fairly repetitive in format with little sharing of new ideas as play progressed from beginning to end.

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In game and constructive play, a child's age influences both the action and outcome of an interaction much more so than that which occurs in social play. Games require rule comprehension or an understanding of the flow of interaction. Both rule-based and constructive play require cooperation if the intent of the play is to be accomplished (Boulton & Smith, 1992). Alicia and Katy, whose games and constructive play were either mutually created or occurred when one child joined the other, typified what is fairly well documented in the literature about game and constructive play for children seven and five years old (Geller, 1982; Piaget, 1962). That is, their games were intense and competitive while constructive play interactions were elaborate, organized, and shared.

Zack and Katy's game play was simple tag or follow play, or video-game play in which Katy dominated on-screen play action. Constructive play in this younger dyad was not elaborate and occurred as siblings interacted side-by-side with each other. Parten (1932) found parallel play typical of three-year-old children interacting with peers and older playmates. Parallel play seems to represent a transitional stage from solitary to active social interactions. Zack's age appears to have contributed not only to his and Katy's side-by-side play, but also, in part, to the low incidence of constructive play interactions occurring between them, to his inability to engage in game play more elaborate than follow-the-leader or tag, and to the high incidence of social play with his sister.

The play interactions ongoing between all siblings appeared to be accounted for by developmental maturation and age differences within the dyad. However, there is a possibility that these differences may also be accounted for, in part, by the patterns of communication they shared. Alicia and Katy's diversity of play interactions was facilitated by their strong communicative interactions. Alicia used visual patterns to communicate with Katy. Although Katy used mixed visual patterns (Signs and gestures), she included a strong auditory component of non-linguistic sounds and spoken English . Moreover, when dyad play was examined I found that each child communicated effectively with the other and that play was enhanced and expanded through dialog.

Katy and Zack played differently than did Alicia and Katy. Play in this younger dyad may have been influenced by each child's dual use of spoken English and Signs, but I do not believe this was a factor negatively affecting play. Both Zack and Katy used communicative behaviors

with each other which effectively carried dialogs through the processes necessary to exchange information. The factor limiting play diversity was, more than likely, Zack's age. Göncü's (1993b) study adds support to this statement. He found that children's play becomes shared with respect to its purpose, its meaning, and to the communication which takes place between children as they share and develop their play interactions after four years of age.

Siblings' Dialogs

The primary focus of this study was to investigate the processes and patterns of communication which deaf and hearing siblings used to initiate, maintain, and terminate dialogs with each other. The second research question examined in this study and discussed in this section focused specifically on describing the behavioral and communicative interactions which siblings used to gain each other's attention, exchange information, and terminate dialogs.

Attention-Getting Processes Occurring Between Siblings

What were the behavioral and communicative interactions Alicia, Katy, and Zack used and expressed with each other as one dyadic member sought to gain the other's attention in order to initiate a dialog? This was the first subpart of the research question examining dialog processes. Dialog initiation included the use of both visual and auditory elements expressed alone or in combinations. In the older dyad, Alicia rarely used words or sounds to gain Katy's attention. Instead she relied almost totally on visual signals. Katy used sound and visual signals almost equally with Alicia. On the other hand, in the younger dyad, Zack relied extensively on sounds, gestures and body contact to make his initial connection with Katy, whereas Katy used sounds combined with visual elements extensively with Zack. This was a change in element expression compared to the processes Katy used to gain Alicia's attention.

The Older Dyad (Alicia & Katy).

As I noted in Chapter 2, the communicative elements most frequently expressed by hearing mothers to gain the attention of their deaf children are auditory signals - signals typically expressed

in a simultaneous visual-auditory pattern of communication. Alicia's predominant method of gaining Katy's attention was through the use of visual signals, primarily body contact, pointing, handwaving, and other gestures. Alicia's consistent use of visual cues to gain her sister's attention reflected behaviors typically expressed by deaf mothers with their deaf children (Meadow et al., 1981). That is, when in close proximity to Katy, Alicia used body contact. When separated by distances, she used gestures to create strong visual cues to attract Katy's attention. Alicia's use of visual prompts both mediated and facilitated the establishment of dialogs with Katy. As Chapman (1981) noted, in order for effective communication to occur between deaf and hearing children, the use of communication tools reflective of the modality within which both children are trying to communicate must be expressed; dialog success is highly dependent on same-modality tool expression. Alicia rarely used spoken English and never used non-linguistic sounds alone to gain Katy's attention. The few times she used spoken words occurred during (what appeared to be) extreme frustration with Katy. When Alicia did use sounds, which was rare, she combined them with pointing.

Alicia and Katy's attention-getting interactions were representative of what has been reported in the literature for hearing and deaf children dyads as well as non-typical. Lederberg et al. (1986) stated that deafness impacts the interactions and communication between deaf and hearing peers. Yet, it appears that deaf and hearing siblings seem to communicate differently than do hearing adults with deaf children or deaf and hearing peers do together (Evans, 1995). As Vygotsky (1993) stated, children learn about language as a communication tool and how to use that tool to effectively communicate with each other in contextual situations. Alicia was taught how to use attention-getting elements to gain Katy's attention and expressed the appropriate processes (initiation and maintenance of visual attention prior to and during message delivery) most of the time. But she did use two elemental components in ways which are typically expressed within Sim VA pattern use in Hm/hc and Hm/dc dyads. The first was pointing, a visual element, which does not have the same visual impact as other gestures and the second was when she used visual elements in place of auditory components as she tried to get Katy's attention.

Unless Alicia moved her finger when pointing, the gesture appeared to be hard to detect by Katy. Although the data are not part of this study, Alicia's failure rate at gaining Katy's attention using this element was high. Pointing is a semiotic tool, which Vygotsky (1979) stated is a most fundamental element used in (spoken) speech, especially in its use as an attention-getting device. The function of pointing is to indicate, but its expression is directly connected to spoken words. When Alicia used pointing, she did not combine its use with non-linguistic sound or spoken English.

Alicia's second variation occurred when she used visual elements in place of auditory components as she sought to gain Katy's attention. A narrative example best sets up discussion of this communicative behavior.

> Alicia is concentrating on moving her game marker. She counts the moves, stops and
> then reaches her hand out towards Katy and pats at her, missing her arm. She extends
> her arm a little farther and pats again, still missing Katy. Katy is focused elsewhere
> and does not notice Alicia's attempts to gain her attention. Alicia pats at Katy again.
> During each of these movements she is concentrating on the board and not looking at
> Katy. She shifts her body, pats again, this time making contact. Katy turns and looks at
> Alicia.

Alicia's use of gestures and body contact without looking at Katy to gain her attention poses a problem of interpretation. The expression of visual signals without visual connection appears analogous to the expression of auditory elements typically expressed in Hm/dc dyads (Meadow, 1980; Waxman, 1996). However, the question of how Alicia utilized visual elements without a face-to-face connection with Katy and appeared to know when the visual connection was made in order to carry on with her dialog, is an important query. First, even if the process is analogous to a Hm/hc dyad pattern, Alicia still expressed attention-getting elements normally used in Dm/dc dyads. She used the appropriate modality, but mixed the process. Speculatively, it may have been that Alicia was aware of Katy through her peripheral vision and made use of this possible connection during her attention-getting processes with Katy before proceeding with message delivery. At present, I will reserve further comment until the section on exchange of information, where I will continue this discussion.

Katy's primary methods of gaining Alicia's attention were through both visual and auditory elements expressed alone or combined: gestures, gestures with non-linguistic sound, sounds and body contact. Katy's predominant attention-getting expressions were split between visual and auditory elements where visual elements were combined with sounds or expressed alone. This was in contrast to her attention-getting techniques used with Zack where she relied extensively on auditory components combined with visual elements (discussed in the next section).

There are several possible explanations for this split use of visual and auditory elements by Katy with Alicia. First, Alicia always appeared to be aware of Katy's presence during their play (more so than Zack was of Katy) and, therefore, Katy may have found less need to use auditory elements alone or combined with visual signals to attract her sister's attention, relying instead on visual elements. Second, Alicia rarely ignored Katy's attempts at dialog initiation (as Zack did with Katy) and, therefore, Katy used a wider variety of attention-getting elements with Alicia. Third, and probably the most significant factor, Katy and Alicia have a longer history of communicating together (than do Katy and Zack). This fact alone has important mediational significance affecting Katy's attention-getting processes with Alicia and may easily be used to subsume the first two explanations. In an early study Greenstein, Greenstein, McConville, and Stellini (1977) found longitudinal evidence that hearing mothers and their deaf children assimilated and accommodated dialog processes which facilitated communication. This facet of learning tool use in dialog has been demonstrated in other studies, most recently by Waxman (1996). Another important facet of Alicia's and Katy's attention-getting processes was that learning how to use communication tools was reciprocally expressed between them. That is, Alicia appeared to learn from Katy and Katy appeared to learn from Alicia. For example, Alicia used a process of gaining Katy's attention that I termed *prolonged eye gaze*. Katy seemed to have learned the behavior from Alicia. In the third month of the field study, I observed for the first time Katy using the element with Zack. Katy's use occurred within minutes after Alicia had used the element with her. Although Katy's use throughout the rest of the field study was minimal, she did use it with both Alicia and Zack with some success in dialog initiation. That siblings are effective models of each others' development and that they contribute to each others' learning is fairly well documented in

the literature (c.f., Azmitia & Hesser, 1993). Thus, it was not surprising to observe changes in communicative behaviors expressed between Alicia and Katy which each child possibly learned from the other.

The Younger Dyad (Zack & Katy).

Zack and Katy's predominant means of gaining each others' attention was through gestures combined with non-linguistic sounds and the expression of non-linguistic sounds alone. In addition, both siblings used body contact almost equally. Looking again at Kaplan and McHale's (1979) study of the communication and play behaviors taking place in a deaf brother (age four years) and a hearing brother (age three years) dyad, the behaviors which Zack expressed with Katy appear to be quite different than what was reported by Kaplan and McHale. Overall, dialogs between the brothers were minimal and seem to have been impacted by the inappropriate use of communication tools by the younger hearing child. Zack initiated and carried on numerous dialogs with Katy. Zack's use of communication tools was effective, for the most part, and his ability to initiate dialogs with Katy contrasts with the findings of Kaplan and McHale's findings. Schirmer (1991), in a study on deaf and hearing twin sisters (four years old), reported that each twin initiated dialogs with the other in manners typical of her communicative modality. About 10% of Zack's dialog initiations with Katy took place through spoken English. He relied extensively on visual and auditory elements combined, auditory elements alone (expressed as non-linguistic sounds) and body contact.

The finding that sound played an important role in Zack's attention-getting with Katy was surprising. Developmentally, these two siblings (especially Zack) were not only learning about the content of dialog processes but also how to use the communication tools they both possessed in those dialog processes. Raised in a dual-language environment (ASL and spoken English), Zack had been exposed to both a Sim VA and a Seq V pattern of communication from birth. Therefore, it seemed only natural for a three-year-old hearing child who had spent a significant portion of his free time in play with his deaf sister to express similar processes of communication as Katy. Overall, Zack's expression of attention-getting processes almost mirrored Katy's expression of

elements. Yoshima-Takane et al. (1996) reported that an older sibling readily provides a younger sibling linguistic environments which both facilitate and mediate the younger child's language acquisition and expression. It also seemed natural to expect Zack to display traits typical of visual-auditory processors of information. That is, Zack used spoken English to gain Katy's attention without any visual contact with her. Zack also used body contact to gain attention but primarily when he was in close proximity to Katy. On occasion, though, I observed him running from long distances (e.g., across the full length of the backyard or cul-de-sac) to reach Katy and then pat her on the shoulder in an attempt to gain her attention. This action may have been used, in part, because of his reliance on the success he had when using body contact to gain Katy's attention. When Zack used gestures as attention-getting tools, his attempts at attracting Katy's attention often went unnoticed or were ignored. Zack appeared to be in a constant state of experimentation in his use of dialog processes, especially attention-getting elements, with Katy.

Katy's use of auditory elements combined with gestures, her expression of non-linguistic sounds, and her dependence on body contact to gain Zack's attention were strikingly different processes than she used with her hearing sister. Katy, for the most part, did not attempt to attract Zack's attention without the aid of sound when she was out of physical contact with him. Zack had a propensity for ignoring Katy's dialog attempts and she appeared to rely on sound as an attractor to gain his attention. In a study on communicative interactions between deaf and hearing peers, Vandell and George (1981) found that deaf children developed alternative strategies to initiate (and carry on) dialogs appropriate to the sociolinguistic environment in which they were situated. That is, deaf children adapted their processes of dialog initiation to the needs of their hearing peers. Katy's use of sound, both alone and in combinations, appeared to reflect her possible awareness of Zack's hearing abilities. Katy used a diversity of sounds throughout her attention-getting bouts with Zack. Katy did use spoken English to get Zack's attention and her use of this element, even though occurrence was low, offers several interesting insights into her pragmatic use of communicative tools. Two narratives provide insight into her adaptability to Zack's primary mode of communication and to the contextual situations within which she used spoken English.

Zack is controlling video-game play. Katy is holding her controls out in front of her so that Zack can see her hand movements (button pushing). She is attempting to show Zack when to push the jump button. His control is just behind the action. Zack lifts and tilts his own control pad showing it to Katy as he continues to play, focusing on the screen. Katy says, "Jump!" pointing at the screen with one hand while button-pushing with the other. Zack shift's his gaze down to Katy's pad then back up to her face. Looking at the screen, she gives a slight head nod, 'Yes.' Zack turns back to the screen and continues playing. Still looking at the screen Katy points again, saying, "Jump!"

Zack and Katy are in the social area. Zack is playing with the door bell. Katy has picked up a stocking cap, placed it on her foot, turns, and looks up at Zack - who is facing the wall of the house staring intently at the doorbell as he pushes it over and over. Katy stands looking at Zack, pats him on the back and says to him before he turns to acknowledge her gesture, "Look, Zack, look down!"

The fact that Katy verbalized in spoken English with Zack offers insight that she was capable of using a communication system which (as exemplified in the two narratives) mediated the play situation she was engaged in with Zack and reflected her use of language in the regulation of her own behavior. Vygotsky (1978) believed that sociolinguistic interactions and tools of conversations shared between individuals forms the immediate link between mutually sharing and understanding dialog expressed between individuals. He called this "language in action."

Exchange of Information Processes Occurring Between Siblings

How did Alicia, Katy and Zack use and express exchange of information elements in message delivery with each other? This was the second subpart of the research question examining processes of dialogs. A discussion of the process which each sibling used in exchange with each other is presented in this section. Sign predominated Alicia and Katy's message sharing. In addition, both sisters also used gestures with Alicia expressing them more often than did Katy. Auditory elements also contributed significantly to the diversity of element expression during exchanges between Alicia and Katy. Alicia used spoken English combined with Signs, while Katy relied extensively on the expression of non-linguistic sounds alone and in combination with Signs.

Zack and Katy's exchanges were very different in element expression than what was documented in the older dyad. Zack relied on gestures and spoken English to share information with Katy. Zack's expression of Signs was low in occurrence, but important in the overall context

of the exchange process. Half of Katy's exchanges with Zack were dominated by Signs or gestures. She also relied on non-linguistic sounds expressed alone and in combinations with Signs and gestures as she conversed with Zack. Overall, Katy's exchange processes with Zack were quite different from those which she expressed with her hearing sister.

The Older Dyad (Alicia & Katy).

Alicia and Katy engaged in dialogs frequently, sustained exchanges through numerous turns, and interacted in a mature conversational manner typical of interactions described by Meadow et al. (1981) for Hm/hc and Dm/dc dyads. Message exchanges between Alicia and Katy were dominated by Signs for both children. Signing by the sisters followed, to a degree, the processes described by Wood et al. (1986) and was similar to that described by Jamieson (1994b) for exchanges occurring in Dm/dc dyads. The one significant difference that was observed with both children was that they often did not maintain visual contact before Signing began and, at times, lost visual contact with each during the exchange. For example, after initiation had been achieved by Alicia, she would begin Signing to Katy as Katy began to look away from her. Alicia, who was in visual contact with Katy, would continue Signing to her sister without the visual connection re-established between her and Katy. Both children exhibited this behavior. Whether peripheral vision played a role in the interlocutor's reception of the locutor's delivery is unknown. Rarely did I observe the locutor repeating the message delivered in this exchange context. Meadow et al. (1981) showed the importance of visual connections in Dm/dc dyads for comprehension of message delivery. In addition to this inattentiveness to Katy's visual awareness, Alicia often Signed with visual contact established between sisters, but would turn her head aside just as she finished her delivery and would sometimes miss part or all of Katy's response (if there was a response). Besides mirroring communicative processes expressed in Hm/dc dyads (Brinich, 1980; Waxman, 1996), many of Alicia's exchanges were analogous to those expressed in hearing/hearing dyads (Erting, 1987) except that Alicia used visual components (gestures and Signs) instead of auditory elements during the exchange. In the attention-getting section

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discussing Alicia and Katy, I introduced a narrative describing Alicia's inattentiveness to Katy as she sought to gain Katy's attention. The following narrative is a continuation of that description.

> Alicia finally makes contact with Katy's arm. Katy turns and looks at Alicia. Alicia, continuing to look at the game board, gestures (points to the board), then Signs to Katy (still looking at the board), pauses, Signs again and turns her head looking at the edge of the board (an area opposite and farthest away from Katy) and again Signs. Katy watches her and Signs once in return - a response which overlaps Alicia's second turn. Alicia then shakes her head, No, and then looks back to the area where she was looking before and Signs again to Katy (still not looking at her). Katy acknowledges this last turn with a nod of her head, Yes. Just as Katy begins her response, Alicia reaches out moves her game marker across the board. Katy continues to watch Alicia.

As occurred during the attention-getting stage of the above dialog, Alicia did not look at Katy or make visual contact with her during the exchange. Previously, I speculated that Alicia may employ peripheral vision in her dialog initiation with Katy. Again, she may also have been using peripheral vision during message delivery. When Alicia expressed this novel mixed modality process, she was usually situated in a perpendicular manner to Katy and the possibility that Katy was on the edge of her vision is important to consider. However, there is another piece of information which needs to be introduced here. In every occurrence of this expressed process of information exchange, Alicia connected with Katy and shared her message, but the purpose of the exchange may not have been to enjoin Katy in dialog, but to create, instead, an element of understanding between her and Katy about what she (Alicia) was doing and why she was doing it. Each of these exchanges took place between Alicia and Katy in game play where Alicia was extremely competitive, striving always to win the game. Signing dominated Katy's message delivery with Alicia. Both sisters were adept at using visual cues and visual shifts to and from objects or within topics of conversation and to incorporate visual contact with each other (most of the time) to facilitate message delivery.

The Younger Dyad (Zack & Katy).

Zack used gestures and spoken English predominately in his exchanges with Katy. Zack's expression of gestures may be explained through an examination of the types of gestures he used during message delivery. McNeil (1992) and Kelly and Breckinridge Church (1998) found that

the expression of gestures, conveying representational information in dialogs, is a facet of language acquisition reflecting the demands of the dialog process. Thus, when Zack was faced with making choices in mode of expression (Signs, sounds, spoken English) he may have chosen the least demanding method of communicating, which was through the use of gestures, while still conveying his message.

Zack also used Signs and sounds. His use of sound reflected behaviors typical of Hm/hc dyads in his use of spoken English with Katy. He carried on conversations with his deaf sister while the siblings were visually aware of each other, when Zack was turned away from Katy or when looking in another direction, and when Katy was obviously ignoring him after he had made initial contact. Overall, in almost all of Zack's messages using spoken English, it did not seem to matter to him that his spoken words were often undelivered (i.e., not seen, not heard, nor responded to by Katy). On the other hand, Zack's Sign use with Katy mirrored the processes deaf mothers used with their deaf children to gain the child's attention and, subsequently, to carry on dialogs. Zack's use of Signs with Katy was the most deliberate communicative behavior I observed him displaying throughout the field study. He used very explicit steps when he signed to his deaf sister. Before Signing, Zack usually made sure Katy was visually connected with him. If after gaining Katy's attention, Katy turned aside or looked away, Zack would reach out and physically take her face in both of his hands and turn her face to look back at him, reach out and touch her face on the side closest to him and keep touching until she turned back towards him, pat at her arm, or he would terminate the dialog if he could not regain her attention. On most occasions when he physically connected with her and she turned to look back at him, he would then begin Signing to her. His Signing was slowly expressed while he kept his eyes on his sister's face. Zack would often repeat a Sign, pausing before his second delivery, even if Katy had already responded in turn to his first words. When Zack was finished Signing, he would often stand looking into Katy's face. Zack's expression of communicative behaviors during the exchange of information process supports the concept that his communication with Katy was a mix of naturally learned patterns where visual and auditory cues were expressed simultaneously and/or linked sequentially as he conversed with her. Only during Sign delivery did Zack display

exchange processes typically shared in dialogs between deaf individuals. Accommodation and assimilation are Piagetian terms denoting the learning processes which accompany developmental growth. Wertsch (1991) said, "human action [including dialog] is mediated by tools" (p.19). Vygotsky (1987) stated that thoughts are words expressed but are only expressed when learning leads the ability to express the words. How do these statements relate to Zack's expression and use of Signs with Katy? Zack (at age three years) has acquired Sign expression behaviors typical of Dm/dc dyads. Zack appears to be learning to utilize and express a complex communicative behavior pattern of tool use through contextual interaction which both facilitated and mediated his dialogs with his deaf sister.[17]

Two exchange components predominated Katy's message delivery with Zack: Signs and gestures. She also used sounds alone and in combination with Signs and gestures. Katy used Signs with Zack almost half as often as she did with Alicia. Her Signing with Zack was the same as well as different than that she used with Alicia. First, as occurred with Alicia, Katy's delivery to Zack was usually quick and appeared to be hurried most of the time. When she connected visually with Zack after gaining his attention, she Signed to him, whether he maintained visual contact or not. Rarely did Katy restate a message in Sign which Zack failed to see when he visually connected again with her. If she did repeat the message, she often combined sound with the Sign, a behavior she did not use with Alicia. Katy's use of this auditory emphatic suggests that she has learned to mediate her delivery of messages to Zack, thereby facilitating effective message sharing between them. Vygotsky (1987, 1993) noted this process as being both essential to establishing understanding in dialog and representative of a child's awareness of the tools of language. Overall, in her Signing exchanges with Zack, Katy would either wait for a response and, if none was forthcoming, she would immediately terminate the dialog. An important difference in her Signing with Zack, as compared to how she exchanged messages with Alicia, occurred when she ensured that a visual connection was established between them before Signing.

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[17] In discussion with Zack's mother about the early intervention programs in which he was enrolled (and had just begun attending at the start of the field study), it is possible that he was learning the communication process in his preschool where he was the only hearing child in a classroom of seven deaf children. He was not explicitly taught the process at home by his parents.

However, this only occurred when she had something important (from her perspective) to share with Zack (e.g., the waterslide was going to be set up) or when she wanted him to do something specific (e.g., change the theme of play). In these exchanges she sustained visual contact with Zack in two ways: through repeated body contact or through repeated auditory signals. In general, though, Katy's use of Signing processes with Zack were not reflective of patterns of expression used in Hm/hc, Dm/dc or Hm/dc dyads, nor were they reflective of or analogous to processes discussed in studies on deaf and hearing peer communicative relationships. This is not to say that Katy's processes of message delivery in Signs were unique only to her, but rather that the processes which she used with her hearing brother have not been described thus far in the literature.

Katy's use of sounds, alone and combined with Signs and gestures, was a most important facet in her interactions with Zack. Many of the sounds she used with both of her siblings during exchange of information were labeled sounds with meaning. Sounds with meaning were not paralanguage utterances but rather sounds which seemed to carry affective qualities during an exchange (e.g., changes in tone and volume associated with an emotional state). Katy's expression of sounds with Zack were different in several respects than those she used with Alicia. First, frequency of expression was greater. Second, delivery was more intense. Third, Katy used her specific attention-getting sound more often with Zack then she did with Alicia. Fourth, as Katy used sounds with Zack in dialogs she was physically active and frequently moved around. By using sounds, Katy placed not only her auditory awareness at the forefront of Zack's attention but also her visual awareness as she delivered her messages. Non-linguistic sound use in Katy's exchanges with Zack (and with Alicia) can be interpreted in several possible ways. First, Katy's use of non-linguistic sounds represents a learned communicative behavior which facilitated dialog interaction. Second, when non-linguistic sounds were combined with other exchange elements, Katy's use may have both facilitated and mediated the establishment of dialog intersubjectivity. Third, Katy's use of non-linguistic sounds, used alone or in combinations, constructed a shared communicative environment between her and her siblings, that is, a common ground of

communication incorporating modalities each child used, expressed, and recognized (Krauss & Fussell, 1991).

Turn-Taking in Exchange of Information Processes in Both the Older and Younger Sibling Dyads.

Dialogs involving turn-taking episodes were much more prevalent in the older dyad than in the younger dyad. Meadow et al.'s (1981) study was one of the first to document that communicative interactions between mother and child in Hm/hc and Dm/dc dyads included more turns and elaboration of topic and ideas than that which occurred in dialogs between hearing mothers and their deaf children. Meadow et al. also stated that this interactive dialog diversity reflected each dyad's mature communicative styles, as compared to what was observed within Hm/dc dyads. Meadow et al.'s findings lend support to Göncü and Kessel's (1984) statement that older children use turn-taking more often than younger children to expand ideas or make connections with each other about ongoing play activities. Rodriguez and Lana's (1996) study on dyadic dialog exchanges within Dc/dc and Dc/hc pairs (4 to 5 years old) found the highest frequency of turns and extensions in the Dc/dc dyad when the children knew each other, and the least in Dc/hc dyads when children were unfamiliar with each other. I have shown thus far in these discussions, that, overall, Alicia and Katy's communicative dyadic interactions are more typical of what is known to occur in Dm/dc dyads, than that which occurs in Hm/hc or Hm/dc dyads. There appeared to be a high level of continuity and coherence in Alicia and Katy's exchanges as depicted by the high number of dialogs expressed with multiple turn-taking episodes as they played together. Another factor which contributed to the coherence of turns between these two siblings was that interruptions and sudden dialog terminations before an exchange was completed were rare. As both the locutor and the interlocutor Alicia often extended dialogs between her and Katy. Although the number of dialogs which Katy initiated with both Alicia and Zack resulted in a large number of single-turns, the number of multiple-turns she engaged in with Alicia was considerably higher than that which occurred with Zack.

Katy seemed to be more skilled in the process of extending dialogs through turn-taking with Zack than Zack was with her. Zack did create turns as the interlocutor, but the frequency of turns was considerably lower than that which was documented in dialogs between Alicia and Katy. Zack's skills at turn-taking appeared hampered, in part, by his temperament and how he interacted with Katy. Often when Zack initiated a dialog and delivery resulted in a negative response (from his perspective) he would turn away and fuss, stomp or jump around. When he re-entered the dialog his physical intensity in gestures and/or spoken words was higher than before. Zack's age, as Dunn and Kendrick (1982) noted, definitely contributed to many of the communicative behaviors which he exhibited with Katy, behaviors typical of a three-year-old child communicating with an older sibling. There is another facet to Zack's dialog exchange and turn-taking episodes with Katy, and an important one. When Signs were the element of expression in a dialog, Zack's exchanges were more focused and visually connected. Also, when Zack and Katy were engaged in an exchange in Sign, it was rare if one child or the other interrupted each other.

Termination Processes Occurring Between Siblings

How did Alicia, Katy and Zack terminate dialogs and what behaviors did they express as they ended their conversations? This was the third subpart of the research question examining the processes of dialog and is discussed in this section. Dialog termination included three elements, looking away from a partner, turning away, and leaving. Alicia terminated the majority of her dialogs with Katy by looking elsewhere. Katy expressed no single element more than another with her sister. Zack left Katy's presence more often than he expressed other elements, while Katy looked away from Zack more often than she turned away or left his presence.

The Older Dyad (Alicia & Katy).

Looking away from Katy dominated Alicia's method for ending dialogs with her deaf sister. Turning away and leaving or walking away from Katy were expressed with almost equal frequency. Alicia displayed an interesting communicative behavior with Katy: after she terminated a dialog by walking away from her sister, she would at times return and re-initiate the conversation

with Katy. Although Katy walked away from Alicia several more times than she turned or looked away from her, no single behavioral element predominated her termination of dialogs with her hearing sister.

Termination processes of dialogs as reported in the literature for Hm/hc, Dm/dc, Hm/dc dyads is lacking. It appears from the dearth of reports on the subject that dialog termination is not a focal research topic. This is unfortunate because termination, as I observed it in siblings' dyads, is an important facet of dialog interaction. Lacy (1974) noted that eye-to-eye contact functions in dialogic context by conveying not only grammatical facets of dialog but nonverbal functions as well. Padden and Markowicz (1997) stated that "non-native signers move the eyes away from the other signer's face at *the wrong time* " (p. 421). Were Alicia and Katy aware of any culturally appropriate process or pattern of terminating dialogs, or did they simply end conversations in manners which were most pragmatic? I doubt there was a cultural awareness. Half of Alicia's terminations occurred when she looked away from Katy. Turning away, in reality, was the same as shifting one's gaze but included the behavioral action of body movement along with a shift in gaze. When examined this way, over 75% of Alicia's dialogs were terminated by turning away as were 64% of Katy's dialogs. Leaving a sibling's presence has important implications. First, walking away was the most dramatic manner in which to terminate a dialog. The action appeared to be a final behavioral expression relating to the dialog. The few exceptions occurred when Alicia, who had left the dialog, was 5 to 6 m away from Katy and turned, walked back to Katy and re-initiated the dialog. Second, walking away also (again, with a few exceptions, which took place between Zack and Katy, discussed in the next section) terminated the ongoing playbout. Although somewhat more technical than the emphasis of the research question on termination, there is a third possibility. Leaving a sibling's presence was possibly a statement about the dialog and the interactions ongoing between siblings. Most dialog termination which took place between Alicia and Katy when either sibling left the other's presence, which occurred when one child appeared to be angry or frustrated with the other. Thus, walking away possibly represented an affective locutor gesture more than likely recognized by the interlocutor and, therefore, represented an extension of the dialog just terminated.

Termination of dialogs between sisters was different than dialog termination in the younger dyad. The expression of dialog termination elements in the older dyad facilitated (for the most part) the maintenance of sibling interactions and the continuance of ongoing play. As I stated above, I doubt that either sister was outwardly aware of any culturally significant method of terminating dialogs with each other. However, the fact that both siblings terminated most dialogs by remaining in the other's presence may be a reflection of their developmental maturity.

The Younger Dyad (Zack & Katy).

Leaving Katy's presence was Zack's predominant method of terminating dialogs. This was followed by looking away, then by turning away. As noted in the previous section, there is some indication from the literature that dialog termination for visual processors of information consists of elements associated with shifts in eye gaze. About half of Zack's dialog terminations with Katy (collapsing looks away and turns away) took place in this manner. The other half occurred when he left her presence. Zack's low frustration level with Katy often forced termination of their dialogs when he lost visual contact with her and an ongoing conversation when he became angry or frustrated and suddenly stomped away. As noted in the previous section, there were a few occasions when Zack would, after terminating dialogs by running away, stop, turn and return to Katy, not to reinitiate dialogs (as Alicia did) but to re-enter his and Katy's previously ongoing playbout.

Although looking away from Zack predominated Katy's method of terminating dialogs, there was not much difference in her overall expression of looking away, turning away or leaving Zack. The primary difference was that she remained in Zack's presence more often after dialog termination than she remained in Alicia's and her expression of termination elements was the opposite of that which she used with Alicia.

Dialog termination in the younger dyad was strikingly different than that which took place in the older dyad, primarily because of Zack's propensity to walk or run away from Katy as his predominant expression of ending their conversations. Zack's behavior had the dual effect of not only terminating his and Katy's shared dialog but also ending their ongoing playbout. Was Zack's

expression of this element a product of his age? It is reasonable to assume, in part, that Zack's leaving Katy's presence as a means to end dialog was linked to his developmental age. Interestingly, Katy terminated fewer dialogs with Zack by leaving his presence than she did with Alicia. Was she acting as the older sibling, as Yoshima-Takane et al., (1996) suggested, mediating and modeling a positive language environment for Zack? These are speculations best left for future research.

Patterns of Communication Expressed in Dialogs

What patterns of behavioral and communicative interactions were expressed as the siblings in each dyad initiated, maintained, and terminated dialogs? This third research question, and the most significant in this study, focused on examining the use of behavioral and communicative elements in repeated patterns expressed by each child throughout the processes of initiation, maintenance, and termination of dialogs. As noted in a previous section, the communicative patterns typically expressed in deaf dyads (Seq V) and hearing dyads (Sim VA) are not directly discussed because the facet of direction of gaze was not coded in this study. Nevertheless, patterns of dialog are discussed in relation to auditory and visual element expression through a collapsing of embedded dialog processes (i.e., e.g., non-linguistic sound is an auditory signal or process and handwaving is a visual signal or process).

Six patterns of communication were noted throughout dialogs initiated by Alicia (hearing) with Katy (deaf) in the older dyad. The predominant pattern expressed throughout dialogs with Katy by Alicia was a Visual → Visual → Visual pattern. Katy exhibited seven recurring patterns in dialogs she initiated with Alicia. The predominant pattern which Katy used with her hearing sister was a Visual/Auditory → Visual/Auditory → Visual pattern. Alicia's attention-getting and exchange of information patterns were sequentially expressed visual components, a pattern which is typically expressed in deaf mother/deaf child dyads (Meadow et al., 1981). What appears to have been expressed by both Alicia and Katy in their dialogic interactions was an adaptation of communication modes which facilitated and mediated mutual dialog interaction. Alicia was very adept in her use of Signs with Katy. In addition, Katy's use of non-linguistic sounds as well as

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spoken English in dialogs was expressed in manners appropriate in discourse episodes reflective of any hearing/hearing dyad. At the time of the field study, Alicia and Katy had had had five years of communicative interactions with each other. However, the early intervention programs of Sign use which the family engaged in excluded Alicia until she was almost four years old, at which time the family included her as a functional Signer in all family communication. Her adaptability was remarkable when a comparative examination is made of the language acquisition curves between hearing mothers and their deaf children (c.f., MacTurk, Meadow-Orlans, Koester, & Spencer, 1993). However, the adaptability and malleability of each sibling's patterns of expression with the other are not necessarily remarkable in light of the number of studies which have shown young children's ability to learn and use second languages or adapt their primary language to that of another child (c.f., Petitto & Katerelos, 1999).

Patterns of dialogs expressed between Katy and Zack (hearing) in the younger dyad were dominated by visual components expressed in combinations with auditory elements for both children. Zack's expression of dialog patterns were the most diverse with at least 13 patterns documented. The predominant pattern which Zack used and expressed with Katy was a Visual/Auditory → Visual/Auditory → Visual pattern. Likewise, this was Katy's predominant pattern expressed with Zack. Katy also used six more patterns with her brother. Zack's predominant pattern expression mirrored Katy's use of visual and auditory elements, which was not expected. Zack's age (three years old) was initially thought to be a factor which would hinder his dialogic interaction with Katy, where he would have trouble communicating, sharing his ideas, and carrying on any extensive conversations with his deaf sister. Messenheimer-Young and Kretschmer (1994) and Esposito and Koorland (1989) found children's age to be a hindering factor in communication between hearing and deaf peers the same ages as Zack. Vandell and George (1981) found that preschool age deaf and hearing peers shared dialog and that deaf children interacting with hearing peers appeared to develop alternative language skills and interaction strategies appropriate to the sociolinguistic contexts they experienced with hearing peers. To speculate, there are several possible reasons why Zack's and Katy's expressed mixture of patterns of dialog were successful. First and probably the most important was Zack's diversity of patterns.

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He exhibited at least 13 patterns, each of which involved numerous elements in his initiations, exchanges, and terminations with Katy. Each of these patterns presented Katy with a variety of communicative options from which to respond. This rich field of options created a response-acknowledgment loop which, temporally, would have resulted in a sorting out and appropriate application of patterns which "worked" for both Katy and Zack in their dialog initiations and exchanges. Second, in this dyad Katy was the older sibling. Yoshima-Takane et al. (1996) found that the older sibling provides a younger sibling with a linguistic environment that readily facilitated communicative and language development between them. The patterns Katy used with Zack were processes expressed within a learning context for him and were patterns which Katy had (more than likely) developed with Alicia through the years of their dyadic play and dialogs before Zack was born. Third, the patterns which Zack expressed with Katy, which were typically those utilized by visual-auditory processors, were often responded to by Katy. Again, these were patterns which Katy possibly learned in context with Alicia (who was the older sibling in that dyad) and recognized in her dialogs with Zack. Overall, Zack's diverse patterns of communication facilitated and mediated his and Katy's developing communications styles. This diversity of patterns available to both siblings providing open-ended links which both Zack and Katy used to facilitate their dialogs, which Zack used to meet the egocentric communicative needs of a three-year-old child, and which Katy used to mediate positive communicative interactions out of the patterns Zack expressed with her.

With a few exceptions, Alicia, Katy and Zack expressed patterns of communication in dyadic interactions, as reported in this study, which were not reflective of the patterns of communication documented in Hm/hc, Dm/dc, or Hm/dc dyads. Alicia did use a visual pattern with Katy, which mirrored the modality used between deaf mothers and deaf children, but the expression was one-sided. That is, Katy did not reciprocate with the same modality in shared conversations with her hearing sister. The findings from this study suggest that Alicia, Katy and Zack interacted, communicated and expressed patterns of dialog with each other not described in the literature. Therefore, in the following section, I will propose nomenclature reflecting the patterns of expression which I observed and documented occurring between deaf and hearing

siblings as they engaged and shared dialogs within two respective dyads: the older with Alicia and Katy, and the younger dyad with Zack and Katy.

Suggested Terminology Reflecting Deaf and Hearing Siblings' Predominantly Mutually-Expressed Patterns of Communication

Alicia, Zack, and Katy did not mirror hearing mother/hearing child, deaf mother/deaf child, or hearing mother/deaf child patterns of communicative interaction as they conversed during dyadic interactions. This was an important finding in this study for several reasons. First, the lack of mirrored mother/child patterns indicates that each sibling was adapting their own behavioral and communicative interactions to mediate and facilitate not only their communicative processes with a dyad partner, but that each child was also adapting their personal conversational patterns to those used and expressed by a dyad partner. Second, each child appeared to experiment with patterns of communication delivered to a dyad partner based on the context of an ongoing play interaction and the demands of conversations carried out during a dialog. Third, the developmental age of each child seemed to contribute to the use and expression patterns. This was most evident in the diversity of conversational patterns expressed by Zack with Katy where he conversed with her in spoken English with no visual contact to the expression of proper visual patterns for sharing Sign.

In dyadic dialogs shared between siblings there occurred an overlap of patterns as they conversed with each other. Alicia's predominant pattern of communication with Katy was, as noted in an earlier section, a Visual → Visual → Visual pattern. Katy's predominant pattern used with Alicia was a Visual/Auditory → Visual/Auditory → Visual pattern. As these two sisters mutually conversed, one using a visual pattern and the other using a visual/auditory pattern, they laterally (towards each other at the same time but from different [communicative] directions) sought each other's attention, exchanged messages, and terminated dialogs. That is, each sibling expressed a pattern reflective of his or her developmental adaptations to a sibling's need for processes reflecting that sibling's primary communication modality. Alicia, a visual-auditory processor, used a visual pattern with Katy. Katy, a visual processor, expressed with Alicia an auditory pattern containing visual elements. Behaviorally, this opposing use of different forms of

communication can be referred to as a contrasting expression of patterns which both facilitated and mediated these siblings' dialogs. Thus, when a hearing sibling used a visual pattern with a deaf sibling and the deaf sibling used a visual/auditory pattern in return, I am suggesting that this shared laterally expressed yet opposing form of communicative interaction be termed a contra-lateral visual-auditory pattern of communication (ConLat V-A). In this descriptive term the hyphen reflects the separation and individual expression of visual elements by the hearing sibling and the use of both visual and auditory elements by the deaf sibling.

The most frequently used pattern of communication expressed between Zack and Katy was a Visual/Auditory → Visual/Auditory → Visual pattern. Within this shared pattern the expression of embedded visual and auditory elements was different for each sibling, rarely overlapping in expression. That is, there was little overlap in the simultaneous expression of behavioral or communicative traits, but there was extensive use of elements expressed differently at the same time: a lateral expression of elements. Unlike the shared ConLat V-A pattern expressed between Alicia and Katy, Zack and Katy's predominant sharing of patterns occurred laterally and co-jointly. The term which I am proposing for this shared, yet differing, pattern of communication between deaf and hearing siblings is: a Co-lateral visual/auditory pattern of communication (CoLat V/A). In this descriptive term the back-slash reflects the simultaneous use of both visual and auditory embedded elements of processes of dialog.

A Variation on Expression of Patterns of Communication - Mode Switching

One interesting departure from the patterns of communication which were found during data analyses was that each child mode-switched. Mode-switching for Alicia, Katy, and Zack was the deliberate change in or a modification of the communication modality each used and expressed with a sibling during dialogs. Mode-switching for Alicia appeared to be linked to the kind of play she was engaged in with Katy, her emotional disposition (angry, frustrated) at the time of conversations, and her attention to her and Katy's conversation (attending to the dialog or ignoring Katy while conversing). Mode-switching for Katy appeared to be based on her cumulative awareness and accommodation of her siblings' ability to use Signs, gestures, or spoken English in

communication with her. Katy's mode-switching seemed to be linked to either the ongoing speech event or to an ongoing behavioral situation which Katy might have recognized as requiring a change in her mode of expression, use of dialogic processes, and expression of communicative patterns with Alicia or Zack. Zack's mode-switching seemed to be linked to his personal needs to converse with Katy and were probably associated to his developmental age. He used Signs when dialogs were important to him, he used spoken English when he was self-involved in an activity while playing with Katy, and he used spoken English, gestures, and non-linguistic sounds when general conversation took place between him and Katy.

Alicia, Katy, and Zack appeared to accommodate and coordinate communication with a sibling based on each child's knowledge of another's skills and their ability to communicate together. This ability to accommodate and coordinate communication was most obvious though in Katy's conversations with Alicia and Zack. Katy's awareness of her siblings' abilities to communicate with her seemed to provide the cues she used to facilitate a choice of mediating the language tools she expressed in conversation with each sibling.

The research implications, as well as the practical application, associated with understanding mode-switching are very important. Recognizing that a hearing and deaf children raised in a dual-language environment (spoken English and Signs) have the insight and ability to assess and accommodate another's language abilities and to adjust or mediate the mode, processes and patterns of communication each uses to match another's skill level, has the potential to advance our understanding and knowledge of children's language development. The behavioral mediation and language facilitation which each child expressed through mode-switching with a sibling, each possessing differing skills and abilities to communicate , provides unique evidence supporting the theoretical concepts of situated learning (Anderson, Reder, & Simon, 1996), mediated action (Vygotsky, 1987, Wertsch, 1991) and the link between mediated action and sociocultural settings (Bakhtin, 1986; Charlie, 1996). Research on mode-switching, a behavior which is noted in the literature on deaf children's communicative interactions in only a single study (Moreno, 1995), and its relationship to language and cognitive development, is a vastly open arena for study, and one

which holds unique promise of advancing insight about the development of language skills of deaf and hearing siblings and deaf children of hearing parents.

Significance of the Study

This case study investigation has described the unique and shared processes and patterns of communication which deaf and hearing siblings used as they initiated, maintained and terminated dialogs with each other. The results reported have yielded rich and positive descriptive findings about siblings' communicative behaviors and interactions, findings which have applied, theoretical and methodological merit. From an applied perspective, insight has been gained into the specific and fundamental processes of positive sociolinguistic interactions taking place between deaf and hearing siblings and the patterns each child used to facilitate a positive communication approach and outcome as they initiated and exchanged information in dialogs. In this study, I found that preschool deaf and hearing siblings showed considerable ability in assessing the communication needs of their dialog partner and in adapting their communication styles to meet those needs. In addition, I have described the behavioral mechanisms each child expressed which influenced not only communicative interactions but also the overall interactive social behavior shared between them. Moreover, the insight and understanding about siblings' dialogs which has been generated from this study has facilitated comparative examination of the processes and patterns of dialogs which occur in other deaf/hearing dyads from mother and child to peer and family interactions.

Vygotsky (1993) framed a sociocultural theory which posited that a child's development and understanding of human interactions and communication are steeped within the social interactions experienced as he or she matures. As a child matures within this social framework, language is one of the primary tools which mediates the child's development. Vygotsky claimed that a child's language acquisition and development is a learning process emerged in the sequential progression of experience where communicative understanding occurs through mutually negotiated, mediated and facilitated processes of dialog between individuals. Alicia, Katy and Zack used mutually accessible and interactive communication tools and shared common

communicative modalities throughout most dialogs they initiated, maintained, and terminated with each other in dyad play. The findings of this study readily lend support to Vygotsky's notion that children's actions and experiences are mediated by the tools and signs of communication they use with each other and to sociocultural theory which notes that the pattern of a child's development depends, above, all on the nature of child's sociocultural environment.

Methodologically, qualitative paradigms and case study research have often been challenged in the social sciences as unreliable and untrustworthy (Yin, 1989). I designed this study of siblings' behavioral and communicative interactions within a case study approach based on Yin's (1989, 1997) qualitative-naturalistic research model and Jamieson's (1994a, 1994b) examination of dialogic behaviors. I then took the investigation into the children's naturally occurring play environment where control of variables was limited and observation/videotaping were the key instruments of data collection. Through systematically conducted, multi-level fine-grained inductive analyses, I was able to reveal and describe the contextual processes and patterns of communication embedded within siblings' dyadic play as the siblings sought to gain each other's attention, exchange information, and terminate dialogs with each other. The wealth of data which was uncovered in this study is substantial. The findings indicate that deaf and hearing siblings share and use intricate communicative behaviors which facilitate and mediate positive sociolinguistic interactions which, prior to this investigation, were unknown. Overall, the research design of this study and results reported therein illustrate the strength, importance, and value of qualitative, descriptive case study research.

Research Validity and Study Limitations

The trustworthiness of a descriptive research investigation, such as this one, is based on the soundness of its findings and the methods used to obtain them. When a study involves qualitative description, the design is often challenged with regards to internal validity (Yin, 1997). Thus, a number of potential limitations as well as facets establishing this study's trustworthiness require discussion.

This descriptive investigation was classified as an embedded short-term case study examining the behavioral and communicative interactions expressed during the naturally occurring play of three siblings. Children's naturally occurring play has often been considered uncontrolled, variable, rich, and non-replicable (Eibl-Eibesfeldt; 1989; Fagen, 1981), and, therefore, precludes causal analyses (Kidder, 1981) or extrapolation to other research (Kennedy, 1976). When play is examined descriptively, the actions and behaviors which children express reflect a holistic picture of their interactions (Nicolopoulou, 1993; Vygotsky, 1967). The behavioral and communicative interactions examined in this study were limited not to a causal or reflective role but to a descriptive one. Analyses which sequentially examined finer-grained layers of siblings' interactions - not as fragments of interaction, but as interactive elements - contributed to an understanding of the holistic processes and patterns of communication which took place between siblings. This approach could be interpreted as limiting if the study's framework was causal, but because the study has a descriptive foundation, this approach becomes part of its strength.

The parameters for selection of participants and the resulting dyads were both a strength and weakness in this study. Because the study was the initial investigation into the communicative interactions of deaf and hearing siblings, three children with differing modalities of communication represented the simplest combination of play dyads that could respond to the research questions.

Short-term studies are often considered data-poor (Rees, 1998) and, therefore, the limited duration for data collection is often considered a limitation to internal validity. In addition, data from short-term studies are often presented as generalized analyses without detailed scrutiny (Eibl-Eibesfeldt, 1989), an aspect of reporting findings which has the potential to limit and impact a study's trustworthiness. In the five months of data collection, over 250 playbouts, 800 dialogs, and 5,800 individually expressed behavioral and communicative elements were recorded. Although the total data recorded are substantial, only those playbouts (N = 54), dialogs (N = 218), and embedded elements (N > 1,500) meeting stringent operational definitions were analyzed, thereby mediating the potential existence of spurious influences in siblings' behavior and interactions. The total data recorded appears to have further served to strengthen the study's validity. However, there is the possibility that the data which were not analyzed (i.e., those

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playbouts which met playbout definition, yet were excluded because of poor viewing quality) may have contributed to an interpretation of data presented and described in the text of the study which is skewed from the norm of the behavior under investigation. That possibility exists; however, as Yin (1997) noted, preliminary descriptive case-studies which examine *how* questions are inherently skewed but not biased with respect to the data presented because the descriptions presented reveal initial discovery, which, with replication, result in a regression of the explicated data towards the mean - that which will be observed repeatedly over time. The total data reported in this study when compared to that reported on play and dialogic interactions in comparable studies (as cited in this thesis) of deaf and hearing children are noteworthy.

The level of analysis undertaken and depth of information obtained from the embedded elements (coded categories) of the playbouts and dialogs analyzed approached the limits that could be effectively handled though comparative analyses for a descriptive study. Validity, though, was enhanced at this upper limit by incorporating a systematic, hierarchical examination of each embedded behavioral and communicative trait and characteristic expressed by siblings in dialogs. Analysis began with the gross identification of playbouts and ended with fine-grained analyses of subelements of embedded behaviors of each dialog process and every pattern expressed in siblings' dialogs. This procedure provided an in-depth continuum of data. In addition, as I analyzed elements and subelements of dialogs through repeated pattern matching, a chain of evidence was established validating analysis replicability, a strategy that acknowledges Yin's (1997) requirement for internal research validity in descriptive case studies.

There are several other issues within this study which must be addressed as potential limiting factors affecting data analyses and interpretation of analyzed data from the field study. These are the non-transcription of dialogs occurring between siblings in dyad during play, the potential influence of gender differences in language acquisition and the communicative expression of processes and patterns of dialogs taking place between brothers (boys) and sisters (girls), and the age differences in siblings across dyads.

The decision was made in this study not to transcribe conversations occurring between siblings. This decision was made because it was believed that the topics shared between

interlocutors would not contribute to a detailed understanding about the embedded elements and subelements behaviorally and communicatively expressed between siblings as they conversed. However in retrospect, topics of dialog do appear to reflect conversational parameters occurring between siblings and may have contributed to the behavioral expression of embedded elements as each child interacted with a dialog partner. For example, a gesture such as pointing may have been expressed as either a linguistic expression or directive purpose within an exchange of information (message delivery) between siblings. Furthermore, transcriptions would have provided coders with tools to compare and substantiate individual observations.

Was there a difference in how Zack and Katy conversed with each other as compared to how Alicia and Katy conversed? If so, were these differences specifically related to each sibling's gender? Cook (1985) and Doyle (1987) suggested that there are differences in the expression and functional use of language in conversations within and across dialogs between genders. Gender differences in language expression between siblings were not a facet examined within the analytical framework developed for this study. Thus, there is a concern that gender differences in dialogic expression occurring within or across siblings' dyads may have influenced the use and expression of behavioral and communicative interactions. As a consequence, the descriptive analyses presented herein may not represent a holistic picture of the entire spectrum of dialogic processes and patterns of communication taking place between Alicia and Katy (the older dyad) as compared to Zack and Katy (the younger dyad). For example, DeHart (1996) found that gender distinctive patterns of language use between siblings were specifically related (i.e., sensitive) to symbolic play with a dialog partner and the relationship of each interlocutor's ability to mitigate the context of information shared during any exchange of information. However, as Craig and Evans (1991) noted, findings from their study on gender differences between interlocutors primarily impacted affective traits of conversational flow indicating that base-level behavioral and communicative interactions (i.e., the expression of behavioral traits and elements) may not have been affected. The fact that potential gender differences may have existed or been expressed between Katy and Zack potentially affected each child's behavioral expression of dialogic elements as they engaged

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each other in dialogs certainly is a limiting factor requiring recognition within the holistic scope of this study.

Zack was three years old at the time of the study, Katy was five years old and Alicia was seven years old. Child development research finds that perspective-taking (Dixon & Moore, 1990), social play interactions (Rubin, 1977), and language development (Bloom, 1991; Clark, 1971) are related to children's age and developmental status. Thus, it is not known whether Zack's, Katy's or Alicia's processes and patterns of dialog expression were affected by any of these developmental facets because each of these aspects represents an uncontrolled variable within this study. The differences in Alicia's and Zack's ages may even have been a limiting factor for interpreting expressed communicative behaviors across dyads, and even a factor affecting behavioral expression within dyads.

Future Research Directions

The findings of this study have the potential to further advance an understanding of the sociolinguistic interactions occurring between deaf and hearing siblings. The findings from this research could be extended along several specific pathways. The first would be an extension to investigate how siblings' direction of gaze occurs in dialogs. Patterns of element expression were reported in this study but due to the technical limitations of video equipment, siblings' propensity to move about, and often the distance between children and the camcorder these data were not analyzed. However, a thorough understanding of the communication patterns which siblings utilize and their potential expression of simultaneous visual auditory and/or sequential visual communication patterns requires further investigation and explication of the micro-behaviors of this component of siblings' dialogs.

I found differences in the nature and quality of visual/visual patterns of communication occurring between Zack and Katy and between Alicia and Katy. That is, the attention-getting processes and subsequent exchanges of information through Sign were expressed differently in the older dyad than they were in the younger dyad. The very nature of the differences found in this

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study suggest that Alicia has learned to use a Seq V modality differently than that which Zack shared with Katy. This difference may have roots in the experiences which each hearing sibling has experienced and shared with Katy as they developed their mutual forms and styles of communicating with each other. If this is so, then an investigation into the relationships which hearing siblings experience with a deaf sibling, with an emphasis on examining dialogic interactions for the establishment of ZPDs (zones of proximal development [Vygotsky, 1978]), and the developmental role the process may create in language acquisition amongst and between deaf and hearing siblings is important in the potential application to early language intervention in hearing families with deaf children.

During the field study I learned (and observed at times) that Alicia (the older hearing child) resisted Signing with Katy and that her level of enjoyment in Signing with her deaf sister was somewhat neutral.[18] On the other hand, Zack's Signing with Katy always appeared expressive and was physically interactive. One facet of a hearing mothers communication with her deaf child which has been demonstrated in numerous studies is that mothers expressed communicative patterns which were controlling, directive, and commanding. Joyfulness in communication within mother/child interactions, as characterized those studies appeared to be very limited. The enjoyment of communicative interactions facilitates and mediates not only the establishment of intersubjectivity (Göncü, 1993a), but also contributes to the effectiveness of dialogic interactions between conversing partners (Göncü, 1993b), mediates the learning processes which may occur in dialogic processes in bi-lingual environments (Van Horn, 1995), and contributes to the initiation and maintenance of play, for in play language use and expression is manifested amongst children (Vygotsky, 1993). Thus I would like to suggest, as an extension of this study, an investigation into the communicative enjoyment - the joy of interaction - which occurs between deaf and hearing siblings as they engage in dialogs during naturally occurring play.

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[18] I learned this in conversations with parents during the first week of the field study when I was inquiring about the developmental history of each of child and each child's relationship with siblings as they were born into the family.

Mode-switching, the ability to change or modify the communication modality used in communication with another based on the locutor's knowledge of the interlocutor's conversing skills, is an arena of investigation which should also be advanced. The knowledge which may be gleaned from studies investigating deaf children's ability to mode-switch offers potentially significant insight about the development of language skills deaf children.

A Conclusion and a Beginning

This single case study investigating the processes and patterns of deaf and hearing siblings' dialogs has resulted in several important and significant findings. In this thesis I have described the behavioral and communicative interactions which three siblings used and expressed with each other in dyadic interactions. These behaviors contributed to effective, although not always efficient, dialogs between an older hearing child and her younger deaf sibling and a deaf child with her younger hearing sibling. I found that these three siblings exhibited considerable ability in assessing the communication needs of a dialog partner and adapted individually expressed communication styles to meet those needs. Alicia, Zack, and Katy each used and expressed processes and patterns of dialog in manners which facilitated and mediated the initiation and maintenance of dialogs mutually shared between each other.

The behavioral and communicative interactions which took place between siblings in this study lends credence to Vygotsky's theory of a sociocultural, historical foundation for children's language development. Alicia, Katy, and Zack used dialogic tools which facilitated and mediated shared communication, tools which each sibling appeared to have learned through both mutually shared learning processes (possibly related to ZPD experiences) and sibling-based language needs expressed by each child as each conversed with a sibling. The results reported in this thesis support Vygotsky's posit that children's dialogic actions and experiences are mediated by communicative tools reflective of children's sociocultural environment. However, I also found that one cannot attribute all facets of children's communicative development to Vygotsky's theory

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of a sociocultural origin of language. As Piaget noted (1959) a child's age and maturation level are important determinants of expressed behavior and communicative interaction.

From this study, I found that when qualitative, descriptive questions are framed within a multi-level fine-grained research paradigm, insight into the contextual and descriptive facets of a research problem embedded within a well defined unit of analysis is readily accessible. This investigation of siblings' naturally occurring play and the dialogs which occurred between siblings during playbouts revealed the detailed level of the contextual processes and patterns of communication which were embedded in siblings' dialogs. I found that siblings utilized and expressed intricate communicative behaviors with each other, behaviors which facilitated and mediated positive sociolinguistic interactions.

This study was the first of its kind. It is a study which has shown the strength, importance and value of a qualitative, descriptive, case study approach to research. But most importantly, it is a study which has shown that deaf and hearing siblings raised in a multi-language environment can become dexterous and proficient in communicating with each other.

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THE UNIVERSITY OF BRITISH COLUMBIA

Letter of Request for Volunteers for Field Study of Deaf and Hearing Siblings' Play
to Deaf Children's Society of B.C.

**Department of Educational and Counselling Psychology,
and Special Education**
Faculty of Education
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Deaf Children's Society of B.C.
Date

Dear Ms. _____ ,

A Field Study examining deaf and hearing siblings' play is in the final planning stages as part of my Doctoral studies at The University of British Columbia. I am hoping that Deaf Children's Society of B.C. will be able to assist me in locating a hearing family with hearing and deaf siblings who would be willing to participate in a short-term study. The specific criteria which have been developed for family participation in this study are:

1. There are three children in the family;
2. The first-born child is no more than eight years old and the last-born child is no younger than three years old at the beginning of the field study and data collection;
3. The first-born child is hearing, uses spoken English and has been exposed to Signs to communicate with the second-born deaf child;
4. The second-born child is deaf, has an aided hearing level of no better than 70 dB in the better ear, has no additional educationally significant disabling conditions, and uses Signs to communicate within the family;
5. The third-born child is hearing and uses spoken English to communicate within the family and has been introduced to Signs to communicate with the second-born deaf child;
6. The family has been involved in an early intervention program.

The field study will focus on deaf and hearing sibling's naturally occurring play interactions. The study will be conducted over a four to five month period with data collection scheduled to commence in April, 1996. I would be most appreciative if you would bring the enclosed request for volunteers to the attention of parents of deaf and hearing children who would be eligible and may be interested in taking part in this study. Any family who volunteers to participate would be able to withdraw at any time from the study with no ensuing problems. Participants confidentiality will be ensured.

If you have any questions about this study and my request for volunteers, please feel free to contact me [phone] or Dr. Janet R. Jamieson (phone [voice or TDD]).

Sincerely,

Denny AFMJ Van Horn
Department of Educational and Counselling Psychology, and Special Education
Faculty of Education
2125 Main Mall
The University of British Columbia
Vancouver, B.C.
Canada V6T 1Z4

Volunteer Request for Field Study

VOLUNTEERS WANTED

FOR A STUDY INVESTIGATING
DEAF & HEARING SIBLINGS' PLAY INTERACTIONS

I am seeking a hearing family with hearing and deaf children, meeting the criteria noted below, who would be willing to participate in a field study investigating deaf and hearing siblings' play. The field study is scheduled to commence by mid-April, 1996 with an anticipated end to data collection in late August, 1996. The field study will entail videotaping siblings naturally occurring play interactions in their home environment. The specific criteria for participation by the volunteering family are:

1. Three children in the family;

2. The first-born child is no more than eight years old and the last-born child is no younger than three years old at the beginning of the field study;

3. The first-born child is hearing, uses spoken English, and has been exposed to Signs to communicate with the second-born deaf child;

4. The second-born child is deaf, has an aided hearing level of no better than 70 dB in the better ear, has no additional educationally significant disabling conditions, and uses Signs to communicate within the family;

5. The third-born child is hearing and uses spoken English to communicate within the family and has been introduced to Signs to communicate with the second-born deaf child; and

6. The family has been involved in an early intervention program where Signing has been the focal language.

You and your children's names will be kept strictly confidential. The only individuals who will view the video tapes made during the field study will be myself, members of my Doctoral committee, and several research associates. Even if you agree to participate in the study, you are free to terminate participation at any time. If you are interested in allowing your children to participate in this study of deaf and hearing siblings' play interactions, please contact me or Dr. Janet R. Jamieson at the address and/or phone numbers noted below.

Dr. Janet R. Jamieson (phone [voice or TDD])
or
Denny AFMJ Van Horn
(phone)
2125 Main Mall
Department of Educational Psychology and Special Education
Faculty of Education
The University of British Columbia
Vancouver, B.C.
Canada V6T 1Z4

APPENDIX C

INFORMED CONSENT FORM
RECORD of SIGNATURE
PARENT'S COPY

Participant's Names
Home Address
Province
Canada

We have spoken with Mr. Van Horn about his proposed field study on deaf and hearing siblings' play. Our children have been told about this research and the reasons for Mr. Van Horn's presence in our home and why video tapes will be made. The children have been asked (in spoken English and in Signs) if they wish to participate in this study. (Yes / No) We consent/do not consent (please circle one) to our children taking part in this study.

The children's names are

1. _____

2. _____

3. _____

We understand that our children and ourselves may leave the research study at any time if we want, with no problems resulting.

Signed

_____   _____
Parent   Date

_____   _____
Parent   Date

PLEASE KEEP THIS SIGNED FORM FOR YOUR RECORDS
THANK YOU

INFORMED CONSENT FORM
RECORD of SIGNATURE
RESEARCHER COPY

Participant's Names
Home Address
Province
Canada

       We have spoken with Mr. Van Horn about his proposed field study on deaf and hearing siblings' play. Our children have been told about this research and the reasons for Mr. Van Horn's presence in our home and why video tapes will be made. The children have been asked (in spoken English and in Signs) if they wish to participate in this study. (Yes / No) We consent/do not consent (please circle one) to our children taking part in this study.

The children's names are

    1. _____

    2. _____

    3. _____

We understand that our children and ourselves may leave the research study at any time if we want, with no problems resulting.

Signed

_____   _____
Parent   Date

_____   _____
Parent   Date

PLEASE RETURN THIS SIGNED FORM TO
Mr. Denny AFMJ Van Horn
2125 Main Mall
Department of Educational Psychology and Special Education
Faculty of Education
The University of British Columbia
Vancouver, B.C.
Canada V6T 1Z4

APPENDIX D

Example of a Flow Map of
Sequentially Coded Embedded Elements and Subelements of Siblings' Dialogs

An example of a flow map of sequentially coded embedded elements and subelements of processes of dialogs is presented on the following two pages. The form is a facsimile of forms I used during all coding processes of siblings' behavioral and communicative interactions. The flow map shown here is a duplication of the flow chart which was coded for dialog 122 taking place in playbout 26 between Alicia (first-born, hearing, seven years old) and Katy (second-born, deaf, five years old) in the older dyad. The following notes define terms on the form.

PB	Playbout number - an accounting record.
Kids' Talk	Dialog number - an accounting record.
Exchange	At times, dialogs were examined at a micro-behavioral level. When this level of coding was undertaken, *Exchange* was a tracking number.
PLAY	The kinds of play observed throughout a playbout or dialog.
Katy	Notes on siblings' interactions.
Alicia	Notes on siblings' interactions.
Time	Time from beginning to end of dialog.
Footage	Video tape footage from initiation through termination.
Katy / Alicia	Siblings in the playbout engaged in dialog.
"Hey!"	Coded embedded elements and subelements expressed and used by siblings during *Attention-Getting* processes of dialog.
Looking?	Coded embedded elements and subelements expressed and used by siblings during *Direction of Gaze* in dialog maintenance.[19]
Say what?	Coded embedded elements and subelements expressed and used by siblings during *Exchange of Information* processes of dialog.
End	Coded embedded elements and subelements expressed and used by siblings during *Termination* processes of dialog.
__ of __	Sequential tabulation of number of pages required to code dialog.

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[19] See footnote 11, page 48.

Kids' Talk

PB 26 | Kids' Talk 122 | Exchange None

PLAY / Game	Katy	Alicia	Time	Footage	"Hey . . . !" Katy	"Hey . . . !" Alicia	Looking? Katy	Looking? Alicia	Say what? Katy	Say what? Alicia	End Katy	End Alicia
Game	Alicia & Katy - both looking at game board (7)		12:12:12	14/665								
	Katy reaches out for her game piece (6)	Continues looking at game board	:13	675			Lo7	Lo7				
	Pauses hand over game piece	Turns, looks at Katy's game piece	:14	685			Ro6	Lo7				
	Picks up game piece	Looks at Katy's hand	:15	693			Lo6	Tu/Lo6				
		Reaches out towards Katy's hand & game piece	:16	704			Pu6	Lo6				
	Turns, looks at Alicia	Turns, looks up at Katy	:17	713			Lo6	Ro6				
	Still looking at Alicia	Reaches out, taps Katy's hand	:18	724		Ro, BC	Tu/La-A	TuLu				
	Looks down at her hand and game piece	Looks down at Katy's hand	:19	735			La-A	La-K				
	Watches Alicia take game piece	Takes game piece fm Katy's hand	:20	744			Ld/Lo6	Ld/Lo6				
	Looks back at Alicia	Looks up at Katy	:22	765			Lo6	Pu6				
	Continues looking at Alicia	Looks at Katy, Points to self	:23	774			Lu/La-A	Lu/La-K				
	Looks down to game board	Looks down to game board, Points to game board	:24	781			LA-A	LA-K		PT-S		
	Looks up fm game board	Looks back up fm game board	:26	803			Ld7	Ld7				
	Looks at Alicia	Looks at Katy	:27	814			Lu/La-A	Lu/La-K		PT7		
	Continues looking at Alicia	Looks back down to game board	:30	841			La-A	La-K				
	Continues looking at Alicia	Looks up fm game board	:31	853			La-A	Lo7				

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26 PLAY	122 Katy	none Alicia	Time	Footage	"Hey...!" Katy	"Hey...!" Alicia	Looking? Katy	Looking? Alicia	Say what? Katy	Say what? Alicia	End Katy	End Alicia
Game	Continues looking at Alicia	Looks at Katy	12:12:32	861			La-A	La-K				
	Signs w/ sound	Watching Katy	:34	880			La-A	La-K	S w/ s			
	"My turn"		:35				La-A	La-K				
		Watching Katy	:36	903			La-A	La-K				
	Watching Alicia	Turns, looks down at dice (8)	:38	926			La-A	Lo8				
	Continues looking at Alicia	Shifts gaze across game board	:39	934			La-A	Lo7				
	Watches Alicia, does not look down	Reaches out (rh), Points	:40	941			La-A	Lo7		Pt		
	Watching Alicia	Repeats Point	:40	945			La-A	Lo7		Pt		
	Watching Alicia	Repeats Point	:41	950			La-A	Lo7		Pt		
		Looks up fm game board to Katy	:42	962			La-A	Lu/La-K				
		Looks at Katy	:43	970			La-A	La-K				
	Looking at Alicia, Signs	Continues to look at Katy	:44	982			La-A	La-K	S			
	"Many, many, many"		:45	994			La-A	La-K	G			
	Makes an ugly face at Alicia		:46	1006			La-A	La-K	S			
	Signs		:48	1027			La-A	La-K				
	"Why, Many, My turn"		:49	1035			La-A	La-K				
		Shrugs shoulders	:50	1043			La-A	La-K		G		
		Looks down to game board	:52	1051							Law	
	Looks away fm Alicia		12:12:52	1055								Lo7

40 sec

GAME continues / Dialog 122 ENDS

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APPENDIX E

Reliability of the Research Design

Reliability was enhanced in this study through numerous steps. Reliability was increased through the video recording of all siblings' interactions, the coding of all behavioral traits and characteristics expressed by siblings during each playbout, the hierarchical examination and narration of these behavioral elements, and analysis of the expression of all elements through pattern-matching analyses. Although field notes were not used as a specific tool in data analyses, the consultation of notes on siblings' activities during the coding of tapes and the evolving interpretation of data were a further effort to enhance this study's reliability. Objectivity and subjectivity are often significant factors affecting reliability of analyses and the dependability of results reported in any qualitative study. The trustworthiness of the data was enhanced by operationally defining all categories of analysis, thereby providing a strong measure of conformability through repetitive use of the same tools during all analysis steps.

Reliability was further enhanced through cross examination of a randomly selected set of playbouts by two co-raters.[20] Each co-rater randomly selected 14 playbouts for analyses and coding of play and dialogs occurring within those playbouts. A total of 25 separate playbouts (46% of total playbouts (n=54) analyzed in this study) was cross examined by co-raters. Eleven playbouts each were examined by each co-rater and an addition three were examined by both co-raters, as random selection resulted in three overlaps. Raw data agreement (Hartmann, 1982) was used to calculate reliability agreement between each co-rater and myself and was set at >80% agreement for all embedded categories coded for play and dialogs. That is, each co-rater's individual coding each category (e.g., exchange of information elements) had to meet or exceed agreement (80%) of their coded elements as compared to my coding of elements for the same category. Each co-rater was provided a coding handbook listing kinds of play and embedded behavioral and communicative elements along with operationalized definitions. Co-raters each participated in a minimum of four instructional coding training sessions. A fifth session was conducted as a test of competence for each co-rater. I set a raw data agreement of >70% competence on the first playbout coded noting that if either co-rater scored below this percentile, further training would have been initiated. Both scored above 85% agreement on that test. To further enhance reliability during co-rater coding two parameters were established. First, if any trait or characteristic was in doubt as to its specific coded category, the element was flagged and discussed between the two co-raters and myself until resolution was reached. Second, when cross-comparing each co-rater's coding scheme with the coding charts produced during my

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[20] Co-raters were two graduate students; each was a certified Sign interpreter.

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analyses, the co-raters and I would discuss concerns, discrepancies, or disagreements of elements coded and reach resolution as to the specific element to be coded for, for that particular behavior or communicative interaction.

The mean percent agreement scores calculated for the two co-raters cross-examination of my coding-charts on initial examination without discussion or resolution of differences were

    (a) 93% for playbout identification, and

    (b) 88% for kinds of siblings' play identified in playbouts.

Mean raw data agreement calculations for dialogs and embedded elements of initiation, maintenance and termination were

    (c) 89% for dialog identification,

    (d) 89% for attention-getting embedded elements,

    (e) 86% for exchange of Information embedded elements, and

    (f) 94% for termination embedded elements.

Initial individual co-rater reliability raw data agreement calculations are tabulated in Table 8. These data indicate that each co-rater's cross-examination of my coding exceeded the >80% reliability agreement established for the present study for all siblings' play and dialog categories.

Table 8.

Co-rater Percent Agreement for Play, Dialogs and Embedded Elements of Dialogs.

Categories of Analysis	Rater 1 % Agreement	Rater 2 % Agreement	Mean % Agreement
Play			
Playbouts	89	96	93
Kinds of play	83	92	88
Processes of Dialogs			
Dialogs	86	91	88
Embedded Elements of Dialogs			
Attention Getting	85	93	89
Exchange of Information	82	90	86
Termination	92	96	94

Note 1. The rater percentiles reported in this table are the percent agreement between the rater's coding of each category as compared to my original coding of each category.