

MOTHER-CHILD ATTACHMENT DEVELOPMENT IN YOUNG CHILDREN WITH
HEARING LOSS: EFFECTS OF EARLY VERSUS LATE
DIAGNOSIS OF HEARING LOSS

By

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DEDICATION

To my husband Kevin who has supported me unconditionally every step of the way,

and

To my son Evan who provided many wonderful examples of attachment behavior.

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TABLE OF CONTENTS

	Page
DEDICATION	ii
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	X
LIST OF FIGURES	X
Chapter	
I. INTRODUCTION.....	
II. REVIEW OF THE LITERATURE.....	
Attachment Theory.....	
Attachment Classification.....	
Parent Behavior.....	
Tools to Evaluate Attachment.....	
Factors Influencing Attachment.....	
Influences of Newborn Hearing Screenings.....	
Attachment Research in Children with Hearing Loss.....	
III. METHODS.....	
Participants.....	
Measures.....	
Procedures.....	
IV. RESULTS AND DISCUSSION	
Group Equivalency.....	
Group Data Analysis.....	
Early versus Late Analysis.....	
Qualitative Findings.....	
V. SUMMARY AND CONCLUSIONS.....	

Appendix

A. Depiction of sorting method.....

B.

C.

D.

REFERENCES.....

LIST OF TABLES

Table	Page
1. Demographic Details.....	
2. Individual Security Scores Per Subject.....	

LIST OF FIGURES

Figure	Page
1. Correlation of Deaf Composite Sort to Waters' Criterion Sort.....	28
2.	

CHAPTER I

INTRODUCTION

In the recent past, the typical age of identification of children with significant hearing loss was between two to two and a half years of age (Davis, et al., 1997; National Institutes of Health, 1993). However, the age of identification has dramatically decreased since the widespread implementation of newborn hearing screening (NBHS) and usually results in identification occurring between two and six months of age (Dalzell, et al., 2000; Harrison & Roush, 1996; Stuart, Moretz, & Yang, 2000). Now that children are being identified with hearing loss at an early age, interest has focused on the effects of early identification and intervention in areas such as speech-language development (Yoshinaga-Itano, Sedey, Coulter, & Mehl, 1998), general parental life satisfaction (Lederberg & Golbach, 2002), and parental stress (Pipp-Siegel, Sedey, & Yoshinaga-Itano, 2002). Hearing loss in young children not only has the potential to influence speech understanding and communication development but also has the potential to negatively affect social/emotional development such as peer interactions and attachment development (DeLuzio & Girolametto, 2011; Koester, 1994). Attachment, or the affectionate tie between a child and parent, is well studied in children with typical development as well as in those with special needs. However, research in the area of attachment development specifically in children with hearing loss has received little attention.

Attachment, especially when in reference to infants or young children, is defined as the connection or bond that is formed between a child and his or her primary caregiver

that results in the desire of close proximity to and comfort from the primary caregiver, especially at times of fear or stress by the child (Ainsworth, 1973; Bowlby, 1969).

Attachment theory was initially proposed by John Bowlby (1969) and has been supported by various researchers over the years (Ainsworth, 1973; Lamb, 1977; Main & Solomon, 1986). For children with normal hearing, attachment patterns and characteristics (i.e., those expected from children when interacting with the primary caregiver) have been well established (Ainsworth, Blehar, Waters, & Wall, 1978). Based on how these behaviors are manifested, children are classified as either securely attached or insecurely attached.

Because the typical attachment pattern and rate of occurrence for low-risk children is well established, focus has shifted to attachment patterns in high-risk children (such as those in abusive or neglectful environments) and children with developmental disabilities. Interestingly, the attachment patterns of some children with special needs are similar to those of children with normal hearing while other groups of children exhibit a greater degree of insecure attachment. Thus, it appears that attachment classification patterns are dependent upon the specific special population under investigation (Coy, Speltz, & Jones, 2002; Hodapp, Dykens, Evans, & Merighi, 1992; Vaughn, et al., 1994). There is limited research in the area of attachment in children with hearing loss with most, if not all, occurring prior to the introduction of newborn hearing screening and intervention programs (Zand & Pierce, 2011). Therefore, the current study was designed to examine the attachment behaviors of children with hearing loss, with particular interest in the effects of early- and late-diagnosed hearing loss.

CHAPTER II

REVIEW OF THE LITERATURE

Attachment Theory

John Bowlby developed his theory of attachment while detailing pediatric mental health concerns for children experiencing maternal deprivation for extended periods of time. The prevailing belief at that time was that infants developed a bond with their mothers solely because mothers provide nourishment. In contrast, Bowlby speculated that attachment had broader implications and that a child's interaction with his or her mother was reflective of biological necessity (i.e., survival) and drew this conclusion with ethological backing. For example, prehistoric children who demonstrated typical attachment behaviors, such as maintaining a close proximity to the mother or crying when separated, theoretically would be well cared for by the mother, thus avoiding potential life hazards such as predators (Belsky, 1999; Bowlby, 1988). It is this innate behavior by the child to keep a caregiver close by, and the innate actions of the parent to protect the child, that helped to establish the basis of human attachment theory (Goldberg, 2000). Support for Bowlby's intuitive attachment theory came from other studies including work with rhesus macaques monkeys that demonstrated infant monkeys preferred the comfort of a soft artificial "mother" who did not provide food over a hard artificial "mother" that did (Harlow & Zimmerman, 1959).

Bowlby was careful to distinguish between *attachment* and *attachment behavior*. That is, Bowlby saw attachment as an affectionate tie a child has with a figure on whom

the child relies to handle stressful events. Whereas attachment behavior is the actions that a child demonstrates to obtain close proximity to that attachment figure (Bowlby, 1988). More specifically, Bowlby proposed that attachment theory, and the behaviors associated with attachment, represents a behavioral system concept that he labeled as the *attachment control system*. He compared it to the physiological system in which the body tries to maintain homeostasis. Thus, behavioral actions, such as moving closer to an attachment figure or crying, help to adjust the level of “homeostasis” within a given environment. Infants will balance the level of comfort in exploring their environment to the level of comfort expected or received from their attachment figures by adjusting the amount of distance allowed between them and their caregivers. As such, when a child is feeling secure, little to no attachment behaviors might be observed. However, as security level decreases, the amount of attachment behavior will increase. Within this ‘goal-correcting’ system, both initiating and terminating conditions (e.g., mother leaving a room; mother’s response to crying child) contribute to the level of system activation.

Phases of attachment development.

Bowlby theorized that this attachment relationship between the child and the parent can be described in four phases (Bowlby, 1969; LaFreniere, 1998). The first phase is known as the *pre-attachment phase* and occurs from birth to approximately 2 months of age. This phase is characterized by infants providing only general responses to all caregivers with no specific or differentiating response given to the primary caregiver, usually the mother. The second phase is the *developing attachment phase* and occurs at approximately 2 to 7 months of age. During this phase, infants start to recognize their

mother as separate from other adults. Infants also start to anticipate parental responses to their vocalizations or gestures during this phase. However, the child does not display distress upon separation from the primary caregiver. The third phase, occurring between 7 and 24 months is known as the *attachment phase*. The key feature of this stage in attachment development is stranger anxiety. This stranger anxiety is complimented by the child's separation anxiety from the primary caregiver. When initially proposed by Bowlby (1969), attachment theory described the child using the caregiver, usually the mother, as a safe haven and a place of comfort. Over time, this referenced attachment figure has become known as the "secure base". The "secure base" concept, or the use of the primary caregiver as a safe haven during uncertainty or danger, is apparent during this stage as the child is now mobile and capable of exploring away from the caregiver. Children use the parent as a secure base from which they can explore their world and to which they can retreat when fear, anxiety, or stress arises. Children expect that when they return to their secure base, they will be welcomed, accepted, and cared for both physically and emotionally (Bowlby, 1988). The final phase, beginning after 2 years of age, is the *goal-corrected partnership*. During this stage, toddlers start to participate in a reciprocal relationship with their caregiver. That is, the child learns how to be both a passive and active participant during a conversation and/or interaction with his or her mother as well as being able to understand a caregiver's feelings and motivations (Bowlby, 1969; LaFreniere, 1998; Zand & Pierce, 2011).

Internal working model.

As indicated by the description of the *pre-attachment phase* of development, infants start to show preference for a primary caregiver and begin to anticipate their responses. This anticipation becomes more pronounced during the *attachment phase*. Bowlby proposed that the infant/child, based on repeated interactions with the attachment figure, develops a mental concept of behavioral expectations by the attachment figure, a self concept of worthiness, and a concept about their relationship, all of which occur on a primarily unconscious level (Bowlby, 1988; Bretherton, 1985; Bretherton & Munholland, 1999). This mental concept is known as an ‘internal working model’ (Bowlby, 1973; N. L. Collins & Read, 1990; Pietromonaco & Barrett, 2000).

The internal working model that a child uses forms the basis of attachment theory (Pietromonaco & Barrett, 2000). Each child will use his or her model to anticipate responses from an attachment figure, to adjust behavior to maintain proximity to an attachment figure, and to determine future actions. As a child ages, new events and interactions are incorporated into these working models. By the *goal-corrected partnership phase*, the internal working models that the child has will not only be reflective of actions and emotions experienced by the child but also by communications regarding expectations, desires, and actions between the child and attachment figure (Bowlby, 1969; Bretherton & Munholland, 1999).

Attachment Classifications

Mary Ainsworth, a colleague of Bowlby, expanded the concept of attachment development by classifying types of attachment patterns. Her understanding of child-

parent interactions was greatly influenced by her work in Uganda and Baltimore, Maryland (Ainsworth, 1967; Ainsworth, et al., 1978). It was her understanding of these interactions and her extensive work with the Strange Situation Task (see description under *Tools to Evaluate Attachment* below) that led to these classifications. Through her observations of infants and young children in both home and clinical settings, she concluded that the quality of interactions between the primary caregiver and the child during the developmental period affects the type of attachment that is formed between them (Ainsworth, et al., 1978; Belsky, 1999). She identified three attachment patterns: *secure*, *insecure avoidant* and *insecure resistant* (Ainsworth, 1967; Ainsworth, et al., 1978).

Similar to Bowlby's third phase of attachment, Ainsworth noted that secure attachment, or type B, reflects the child using the parent, or primary caregiver, as a secure base. That is, the child feels comfortable enough in the relationship that new surroundings are explored with the confidence that the child can retreat to the parent when feeling threatened, knowing that comfort and affection will be provided. Furthermore, the child will demonstrate some resistance to having the mother leave but will be easily and quickly comforted upon the return of the mother to the room (Ainsworth, et al., 1978). Secure attachment behavior demonstrated by the child includes using the caregiver as a secure base from which to explore, seeking comfort from the caregiver upon reunions or when distraught, lack of resistance to contact or interaction by the parent and affective sharing with the parent (V. Collins, 1996). Secure attachment occurs in about 60-65 % of the North American population (Ainsworth, et al., 1978; V. Collins, 1996).

The *insecure avoidant* (type A) pattern is characterized by minimal use of the primary caregiver as a secure base, minimal concern or anxiety upon separation from the primary caregiver, and avoidant behavior when the primary caregiver returns (Ainsworth, et al., 1978; Belsky, 1999). Behavioral characteristics that are anticipated during an observation include the child habitually displaying minimal distress during separation from the caregiver, indifferently responding to the caregiver upon her return and interacting easily with strangers. The rate of occurrence of type A is 20-25% of the North American population (V. Collins, 1996).

Alternatively, the *insecure resistant* (type C) pattern, also known as *insecure ambivalent*, is characterized by the child clinging to the secure base figure (i.e., failure to explore his surroundings), severe anxiety upon departure of the primary caregiver, and failure to be comforted by the primary caregiver upon return (Ainsworth, et al., 1978; Belsky, 1999). Children with an insecure ambivalent/resistant (type C) classification will appear ambivalent about the caregiver but will seek close proximity to the caregiver while resisting contact or interaction. Additionally, these children will appear extremely distressed during separation from the caregiver but will be difficult to soothe upon reunion. The rate of occurrence is relatively low at 7-15% (V. Collins, 1996).

Since the initial classification by Ainsworth, a fourth pattern has been identified. The *Disorganized/Disoriented* (type D) classification is characterized by unexpected behaviors of the child that are not typical for any of the three original attachment classifications (Main & Solomon, 1990). Specifically, these children appear disorganized, disoriented, depressed, and even dazed. They demonstrate contradictory behaviors, use repetitive gestures or motions, often freeze for no understood reason, and briefly

demonstrate fear of the caregiver (V. Collins, 1996). Although type D behaviors can be seen in typical populations in low occurrences (up to 15%), they often are seen in high percentages (up to 82%) for high-risk populations, such as children who have been abused or neglected (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Crittenden, 1988).

Parent Behavior

Parents of children classified as secure (i.e., type B) are most sensitive and emotionally available when needed. Parents of children with insecure resistant classifications tend to display maternal sensitivity towards the child but are inconsistent in their responses. In contrast, parents of children with insecure avoidant classifications display insensitivity to the child's signals as well as verbal and physical indications that they do not want physical contact with the child (Ainsworth, et al., 1978; Main & Weston, 1982). Additionally, Ainsworth noted that as these children mature, they attempt to achieve a set proximity to the mother even in the absence of fear or stress, causing Ainsworth to conclude that the child's actions affect the attachment figure's responses which, in turn, influence the type of attachment formed between the child and caregiver (Ainsworth, 1973). It appears that maternal sensitivity to a child's needs is influential in the development of the child's internal working model and subsequent attachment development.

Tools to Evaluate Attachment

As noted previously, Ainsworth extended present understanding of attachment theory through her use of a short laboratory procedure she designed commonly known as

the Strange Situation Task (SST; Ainsworth et al., 1978; LaFreniere, 1998). The SST was designed to evaluate a young (e.g., 12-18 months) child's attachment behavior elicited by both the removal of, and the reunion with, the mother in an unfamiliar setting. The overall design of the tool consists of brief, but increasingly stressful, events that last a total of approximately 21 minutes. Within these episodes, opportunities for reconnecting with the mother are inserted. Concisely, staged "situations" are presented at set intervals in which the infant is left alone, is left with a stranger, is alone with the parent, or is with both the parent and a stranger. During each of these situations, the child's reaction is observed, especially during the reunion of the parent and child. Based on observation of the child's behavior, a classification of Secure, Insecure Avoidant, Insecure Resistant, or Disorganized is made (Ainsworth, et al., 1978; Main & Solomon, 1986).

As an alternate method to the SST, Waters and Dean (1985) developed the Attachment Q-sort (AQS). Concerns arose regarding administration of the SST, such as use of laboratory versus home settings, limited age range usage, taxonomic versus quantitative measurements, and lack of assessment of developmental changes, that prompted the development of the AQS. Briefly, the AQS was designed to facilitate categorization of secure base behavior with observations occurring in settings familiar to the child, such as the child's home (Waters & Deane, 1985). An indication of how strongly a child displays secure attachment behavior is obtained through correlations to a 'hypothetical' secure child (Waters & Deane, 1985). Overall, the AQS has been determined to be a valid tool that offers many advantages over the SST, such as administration over a broader age range, ecological validity, and less intrusiveness (Rutgers, van IJzendoorn, Bakermans-Kranenburg, & Swinkels, 2007). The AQS has

also has been used to evaluate the stability of attachment behavior over time (Symons, Clark, Isaksen, & Marshall, 1998).

Factors Influencing Attachment

Culture.

As the foundation for Bowlby's theory is built upon primitive human interactions, it is generally accepted that attachment theory is universal (Posada, et al., 1995; van IJzendoorn & Kroonenberg, 1988). To be precise, *all* infants will develop attachment to at least their primary caregiver. Therefore, regardless of cultural influences, *all* children will develop and display attachment behaviors (Posada, et al., 1995). However, they will demonstrate attachment behavior within each culture differently (Bretherton, 1985). That is, within a culture, certain attachment behaviors (e.g., type A behaviors) might be more prominent than in other cultures. It appears that the secure classification occurs most often in North American populations. Insecure avoidant classifications are prominent in Northern Germany while insecure resistant classifications are prominent in Japan and Israel (van IJzendoorn & Kroonenberg, 1988). Many times, these cultural variations are explained through maternal or social expectations of the child, thus resulting in interactions that reflect these expectations (Posada, et al., 1995).

Physical impairments and developmental delays.

Children with physical impairments and/or developmental delays also demonstrate variances in attachment patterns. One could suspect that a child with a

developmental delay might be at risk for developing insecure attachment as the child's condition could influence his ability to use his primary caregiver as a secure base, how he interacts with his caregiver, or even how his caregiver responds to him. For children with Down syndrome, an increased rate of insecure attachment relative to typically-developing children has been documented (van IJzendoorn, Goldberg, Kroonenberg, & Frenkel, 1992; Vaughn, et al., 1994). Similarly, Marvin and Pianta (1996) found that children with cerebral palsy have an increased rate of insecure attachments, especially if the parents are not able to accept their child's condition. Clement and Barnett (2002) also found that children with congenital neurological disabilities, such as cerebral palsy, had greater than normal rates of insecure attachments.

In contrast, for children with non-neurological conditions, such as cleft palates, there appears to be an increase in parental care, attention, and attachment as the severity of the deformity increases (Clements & Barnett, 2002; Hodapp, et al., 1992). Additionally, Coy and colleagues (2002) found that children who were considered "less attractive" when examining a variety of facial classifications (i.e., cleft palate and lip, cleft lip, or no facial abnormalities) were more likely to have secure attachment. The proposed theory for this occurrence is that parents of unattractive children feel the need to be more nurturing. As a result, this increased attention positively affects attachment development. Furthermore, a meta-analysis examining child problems (e.g., developmental delays) and maternal problems (e.g., alcohol abuse or mental health issues) revealed that "maternal problems" were more likely to result in insecure attachment than "child problems" (van IJzendoorn, et al., 1992). The authors theorized

that childhood issues play a minimal part in influencing attachment behavior because most mothers are able to compensate for the impairment during parent-child interactions.

Language/communication.

According to Bowlby, internal working models are created and modified based on non-verbal and verbal communications between the child and the attachment figure, regardless of security classification (Bowlby, 1973). Bowlby acknowledged that open, honest communication between the child and attachment figure regarding these working models is needed so that a child can revise the model. This type of effective communication usually occurs only between children and attachment figures who have secure attachments (Bowlby, 1973). Support for this conclusion was provided by Van IJzendoorn, Dijkstra and Bus (1995) when they found that children with secure attachments had better language performance than children with insecure attachments. Bowlby's concern regarding communication and internal working model development was noted when considering insecure attachments. That is, a child might develop an initial internal working model reflecting a negative concept of self resulting from poor maternal sensitivity that is continued as the child ages due to miscommunications (Bretherton & Munholland, 1999).

Communication deficits in children who have hearing loss could lead to the parent not recognizing certain communication cues from the child. This lack of mutual understanding might be significant in the context of attachment theory. That is, children start to develop an expectation of how their caregivers will respond to them. In infancy, these working models help the child to anticipate caregiver responses, determine their

need for proximity to the caregiver, and determine appropriate actions for interacting with the caregiver. By approximately 2 years of age, or more specifically during the goal-corrected partnership phase of attachment development, the child's working models will reflect communication experiences regarding expectations and desires between the two parties (Bowlby, 1969; Bretherton & Munholland, 1999). Therefore, any interruptions in communication between mother and child (such as those imposed by significant hearing loss) prior to two years of age could ultimately influence child-parent attachment.

Influences of Newborn Hearing Screening

With recent implementation of universal NBHS programs, concerns about parent-infant bonding have been raised (Bess & Paradise, 1994; Tharpe & Clayton, 1997). As with other conditions such as cystic fibrosis and phenylketonuria that are included in newborn screening programs, experts recognize that failed screenings and the associated assessments and diagnoses might influence the bond between mother and child (Baroni, Anderson, & Mischler; Lord, Ungerer, & Wastell, 2008; Tharpe & Clayton, 1997). In fact, parents of children with cystic fibrosis indicated that delays in diagnosis were anxiety provoking and that they felt a positive diagnosis interfered with the bonding process (Clemens, Davis, & Bailey, 2000; Helton, Harmon, Robinson, & Accurso, 1991; Watkin, Baldwin, Dixon, & Beckman, 1998).

Therefore, if the bonding process for a mother is affected by early identification of hearing loss, it could be argued that early knowledge of a child's disability (i.e., at birth) influences mother-child interactions. In fact, a mourning process has been documented indicating that mothers grieve when their child is newly diagnosed with a

disability (Hodapp, 1988). This grief process, which is associated with parents losing the child they expected, has similar stages as the grief process that parents go through upon the loss of a child (Emde & Brown, 1978; Marvin & Pianta, 1996). Furthermore, it is common for parents with a newly diagnosed child with a disability to feel anger, grief, guilt, and/or helplessness (Dyer, 2005; Luterman, 1979; Luterman & Ross, 1991).

Despite these possible adverse effects upon learning of a child's disability, most parents of children with hearing loss indicated that they believe early identification is important, primarily so that language or educational issues can be addressed as early as possible (Fitzpatrick, Graham, Durieux-Smith, Angus, & Coyle, 2007; Luterman & Kurtzer-White, 1999). Additionally, it appears that parents of children who have been identified with hearing loss after the newborn period would prefer to have known earlier to limit the amount of guilt that is felt because they failed to notice the hearing loss sooner (Young & Andrews, 2001). Nonetheless, mothers report concerns of early identification of hearing loss affecting their bonding with the child (Fitzpatrick, et al., 2007; Luterman, Kurtzer-White, & Seewald, 1999).

Alternatively, one of the suggested benefits of identifying hearing loss in children after infancy is that parents are able to bond with their child prior to the diagnosis. Obviously, if a parent has no reason to suspect hearing loss when the child is born, a parent will interact and bond with the child normally (Marschark, 2007). Over time, the parent might notice that the child does not respond normally to sounds or voices. Therefore, for children identified around two years of age, the parents typically are the ones initiating the hearing test. Thus, they are able to 'prepare' themselves for the

diagnosis, at least, to a greater extent than a newborn's parent who had no considerations of hearing loss prior to diagnosis.

For children who receive early identification and intervention of hearing loss and whose developmental abilities are near normal, it is conceivable that parents who initially interacted differently with their child because of the (knowledge of) hearing loss could start to feel more comfortable interacting with their child. Therefore, as the child starts to respond to intervention services, and is developing normally, the parents might not view the hearing loss as the detriment to the child and family as they had initially. Thus, the likelihood of developing secure attachment becomes favorable.

Attachment Research in Children with Hearing Loss

The limited amount of research that is available on attachment in children with hearing loss indicates that these children have similar rates of *secure* attachment as those of typically-developing children (Beckwith, Rozga, Sigman, & Robert, 2003). However, there appears to be a greater number of children with hearing loss who have *insecure ambivalent* attachments than in the general population (Lederberg & Mobley, 1990). It is likely that a child who has hearing loss, particularly when severe or profound in degree, will have difficulty monitoring the mother's location via auditory cues only. Therefore, a deaf child might be more inclined than a hearing child with *secure* attachment to visually search or monitor the mother's whereabouts to ensure that she is within a desired range. Additionally, the child with hearing loss might cling to mother, cry when she departs, or even follow her to a greater extent than would a child with normal hearing because of an inability to understand verbal explanations from the mother as to where she is going and

when she plans to return. This increase in the amount of attention paid to the mother might then result in decreased exploration by the child. Furthermore, the child might be cautious regarding exploration because of a lack of verbal encouragement or explanations that a child with normal hearing would typically receive from the mother. Therefore, as a result of their auditory and/or language deficits, children with hearing loss might display behavioral characteristics that are consistent with those who are *insecure ambivalent*.

Furthermore, experts in the area of childhood hearing loss also have indicated that children with hearing loss are likely to display attachment behavior differently from children with normal hearing (Ryan, 2009). Briefly, experts completed the AQS based on their idea of the “secure deaf child” to determine if there was a difference in attachment behavior for children with hearing loss when compared to the established criterion sort by Waters (1995). Indeed, differences were noted and seen mostly with items in the categories of “compliance” or “smooth interaction with mother”. For example, experts in Ryan’s study indicated that it would be characteristic of a child with hearing loss to “act like he expects mother to interfere with his activities when she is simply trying to help him with something”, where as this would be considered an uncharacteristic behavior of the ‘hypothetical’ secure child.

In contrast to mother-child dyads where the mother’s hearing is normal and the child has hearing loss, Meadow and her colleagues (Meadow, Greenberg, & Erting, 1983) found that deaf preschoolers of deaf parents have similar patterns of attachment as do their hearing peers with hearing parents. Thus, for deaf-deaf dyads, hearing loss does not appear to be an influential factor in attachment development. It is reasonable to assume

that this similarity in attachment pattern is the result of having a shared communication system (i.e., sign language).

It is of interest to examine attachment patterns of deaf children of hearing parents given that approximately 95% of deaf children are born to parents who have normal hearing (Mitchell & Karchmer, 2004; Rawlings & Jensema, 1977). Greenberg and Marvin (1979) found that deaf preschoolers with hearing parents could develop secure attachments. However, there was a strong link between communication skills and classification. Specifically, those preschoolers with good communication skills (determined by the Alpher-Boll Developmental Profile and coded observations) were securely attached while those with poor communication skills were insecurely attached. As noted previously, Lederberg and Mobley (1990) found that young children with hearing loss who had hearing parents were as likely to have secure attachment as their hearing counterparts. But, for the insecure groups, there was a greater percentage of ambivalent classification for children with hearing loss than for those with normal hearing. However, they concluded that children with hearing loss do not have to have normal language development for secure attachment to occur. Still, it might be possible that the parents of the children with secure attachment were more effective at picking up on communicative cues by the child whereas parents of children with insecure attachments are not as perceptive.

In addition to communication skills, parental attitude toward deafness has been found to influence attachment development in children with hearing loss. A study conducted in the mid-1990s examined the relationship of secure attachment and attitudes toward deafness by mothers and fathers of children whose deafness was identified prior

to 18 months of age (Hadadian, 1995). As a whole, deaf children were as likely to develop secure attachment to the mother as to the father. However, individual dyad differences were found, indicating that within a family, a child is just as likely to establish a secure relationship with one parent and an insecure attachment with the other as they are to establish the same attachment pattern to both parents. This finding was mediated by parental attitude toward deafness. Specifically, if a parent indicated a negative attitude toward deafness, there was an increased likelihood that the child would develop an insecure attachment with that parent (Hadadian, 1995).

Collectively, these findings suggest that deafness, in and of itself, is not a contributing factor to an increased rate of insecure attachment classification. However, there remains concern that poor communication in parent-child dyads and/or parental attitudes toward the deafness contribute to insecure attachment. It is known that, on average, children with insecure attachment have poorer language skills than their counterparts with secure attachment (van IJzendoorn, et al., 1995). Additionally, children with parents who were more sensitive to their needs and interactions were more likely to be classified as secure (van IJzendoorn, et al., 2007). Therefore, it seems reasonable that if parents of deaf children are sensitive to the children's communicative attempts then secure attachment can be developed. Thus, it might be that the effectiveness of communication, by *both* the parents and the children with hearing loss, plays an important role in attachment development.

In conclusion, attachment development in children with hearing loss has received limited attention. However, as the age of identification of hearing loss in children decreases, an early diagnosis might impact attachment development. Although the

existing literature suggests that children with hearing loss, as a group, are just as likely to have secure attachments as their normal-hearing peers, experts in the field of hearing loss indicate that the current Criterion Sort (Waters, 1995) of the AQS might not provide an accurate assessment of attachment behavior of children with hearing loss. Therefore, the current study proposes to address the following questions:

1. Are children with hearing loss who use spoken language in this study as securely attached as children without hearing loss of similar ages as based on extant literature?
2. Is attachment classification of deaf children affected by an early versus later diagnosis of hearing loss?

CHAPTER III

METHODS

Participants

Twenty-one young children, ranging in age from 2 to 6 years, with moderate-to-profound permanent, bilateral hearing loss and their mothers enrolled in this study. Children were recruited from six metropolitan areas in the southeast U.S. in accordance to Vanderbilt University Institutional Review Board (IRB) approved procedures. These mother-child dyads were subcategorized into one of two groups distinguished by the age of the child at confirmation/diagnosis of the hearing loss (i.e., early-diagnosed, late-diagnosed). Diagnosis of the hearing loss had to occur by seven months of age for a child to be placed in the early- diagnosed group. Children with hearing loss diagnosed after age seven months were placed into the late-diagnosed group. Nine children were classified as early-diagnosed and twelve children were classified as late-diagnosed. All children had at least a moderate-to-profound bilateral hearing loss at the time of diagnosis¹.

With the exception of language delay, none of the children had any other significant disability per parental reports. No parents reported having childhood hearing loss and all parents primarily used spoken language with their child. Demographic data obtained on all participants can be seen in Table 1.

¹ One child, S11, had hearing thresholds in the mild-to-moderate hearing loss range with a diagnosis of auditory neuropathy/auditory dyssynchrony. This child ultimately received a cochlear implant.

Table 1

Demographic Details

<u>Characteristics</u>	<u>Diagnosis</u>	
	<u>Early (n = 9)</u>	<u>Late (n = 12)</u>
<i>Sex</i>		
Male	4	2
Female	5	10
<i>Age of Observation</i>		
Mean (in months)	49.0	57.4
Range (in months)	27 - 79	30 – 83
<i>Age of Diagnosis</i>		
Mean (in months)	2.5	19.01
Range (in months)	.25 - 6	8 – 30
<i>Amplification</i>		
Cochlear Implant	5	6
Hearing Aid	4	4
CI/HA combo	0	2
<i>Newborn Hearing Screen</i>		
Completed	8	12
Passed	0	9
Failed	8	3
<i>Mother's Education</i>		
HS diploma/GED	2	3
Some college/AA	5	3
4-yr college degree	1	6
Advanced degree	1	0
<i>Mother's Age</i>		
Mean (years)	34	33
Range (years)	24-44	22-42

Note: CI/HA combo = cochlear implant/hearing aid combo; GED = General Educational Development; AA = Associate of Arts degree

Measures

The primary tool used for this study was the third edition of the Attachment Q-Sort (AQS; Waters, 1987). The AQS is comprised of 90 behavioral descriptions that were listed on individual cards for sorting purposes and reflect different types of child behavior. These behaviors represent such concepts as security, anger, self-efficacy, communication skills and response to physical contact. The use of the AQS in both infants (Bakermans-Kranenburg, van IJzendoorn, Bokhorst, & Schuengel, 2004; van Bakel & Riksen-Walraven, 2004) and older children (i.e., preschoolers - 6 year olds) is well established (Park, 1992; Symons, et al., 1998).

Secondary measurements included the Amplification in Daily Life Questionnaire, a non-validated, experimenter-administered tool that has both open-ended questions and 15 items that are scored via a five-point Likert scale (Moeller, Hoover, Peterson, & Stelmachowicz, 2009). Amplification usage could be considered a possible contributing factor to attachment development; that is, the amount of amplification usage could have direct and indirect relationships to language performance or to the child's responsiveness towards the parent's attempt at communication and/or interactions. Thus, total daily amplification usage information for all children was collected. Additionally, mothers were asked to complete a study-created demographic survey to collect general information about the family and the child (e.g., parent education level, cause of hearing loss, number of siblings, etc.).

The Communication and Symbolic Behavior Scales Developmental Profile (CSBS DP; Wetherby & Prizant, 2002) was used to assess communication ability of the participants. The CSBS DP is a norm-referenced tool that evaluates communicative

competence in children 2-6 years of (chronological) age but who might have a low functional communication age (i.e., 6-24 months). The CSBS DP was used in addition to collecting language performance scores. The language performance scores (i.e., standard scores) came from recent standardized test(s) completed by the children's therapists. Parents were asked to provide their child's language scores and return to the primary investigator via a self-addressed, pre-paid envelope along with a copy of a recent audiogram, unless records could be obtained through Vanderbilt's medical records.

Procedures

Home observation.

An observer AQS procedure which has been shown to be a valid method to assess attachment, as opposed to a maternal AQS procedure, was used (van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004). Home observations were scheduled to be completed by the primary investigator alone or with a second observer. An additional observer was present, when possible, to assess the reliability of the AQS sort description. Three female graduate students were trained to complete the observations as secondary observers. Prior to experimental observations, the primary (H.R.) and secondary observers familiarized themselves with the Q-set items and read educational and instructional materials (Prior & Glaser, 2006; Waters, 1987, n.d.). Each graduate student observer completed observations and Q-sorts on three normal hearing children, in the target age range, for training and validation of inter-rater consistency. The principal investigator, Observer 1, accompanied each of the secondary observers on

their home visits and completed a sort for the same observation. Following training, all observers had a correlation coefficient of at least a .70 inter-rater reliability with Observer 1.

One home visit was made to each mother-child dyad. The average home visit lasted 3.0 hours (range 2.5 - 4.0 hours). Per van IJzendoorn and colleagues (2004), studies with at least 3-hour observations had AQS results that were more valid than those with less observation time. Despite efforts to have two observers for all home visits, 13 observations were completed by two observers with the remaining eight observations being completed by only Observer 1, the primary investigator.

When scheduling the observation, mothers were informed that optimal observation conditions would be with the mother and child alone in the home. However, no families were excluded if additional family members were present for the observation. In most circumstances, when other families members where present in the home, they remained in areas separate from where the observation was being conducted. The few exceptions usually occurred when (younger) siblings were kept close by the mother for monitoring.

Upon arriving at the home, parents were encouraged to “go about their daily routine”. Mothers were informed that activities might be suggested during the observation to facilitate or ensure a variety of behaviors occurred. Such activities included baking together, reading a book, or playing a game. Additionally, some small toys designed to initiate activities were brought by the observers (e.g., bubbles, puzzles, books, stuffed toys) to introduce to the dyad during periods of slow or ‘unproductive’ interactions when, and if, necessary. When determined appropriate by the investigator, or

when interest in the ‘toy bag’ was initiated by the child, these toys were introduced one at a time. Presentation of these toys to the child not only initiated another activity for the child, but also allowed for different ‘behavioral items’ listed in the AQS to be evaluated by the introduction of new toys. This primarily unstructured observation is consistent with Waters and Deane’s (1985) procedure.

The observers attempted to minimize their presence, but interacted appropriately (as would a social visitor to the family home) if the child initiated conversation or play with the observer(s). Additionally, the observers attempted to have a relaxed interaction with the mother. That is, they become acquainted and accepted offerings (e.g., snacks or drinks) but encouraged the mother to ‘go about her daily activities’. During the observations, if and when appropriate, the observers initiated certain interactions with the child that helped in observing certain attachment behaviors. For example, an observer might have asked the child to show her a toy with which the child was playing or to give her a good-bye hug. Such a request allowed the observers to determine how the child responded to requests by visitors, their willingness to show or share toys or personal belongings with a visitor, or if they willingly allowed physical contact from a visitor. Brief and direct questions were asked of the mother for clarification or for assistance in classifying behaviors that were inconsistent or unobserved. For example, the observers might have asked if a certain behavior was “typical” or just there because a visitor was present. Mothers also were asked to describe a typical routine, such as bed-time, or a child’s reaction to certain potentially stressful situations such as the child being left by the mother with another family member or babysitter.

Q-sort.

Observer 1 completed all 21 home observations and was accompanied by secondary observers on 13 home visits. After each of the observations, the observers sorted the AQS cards based on their observations and detailed notes taken during the visits. For each observation, the 90 AQS cards were initially divided into three piles, reflecting “most characteristic of the child”, “least characteristic of child”, and “neither characteristic or uncharacteristic of the child”. This sorting is based on the observation of the child during the three-hour visit in relation to how the child interacted with his/her mother, with the observers, and how he/she played independently. During this initial sort, an exact breakdown (i.e., 30 cards in each pile) is not necessary and is done in a quick manner. After the initial sort into three piles, the observer further sorts the three piles into nine piles, with the “least characteristic” pile (pile #1) at the far left, the “neither characteristic or uncharacteristic” pile in the middle (pile #5), and the “most characteristic” pile (pile # 9) at the far right (see Appendix A for a visual depiction of the sorted piles). The number of cards in each pile was in quasi-normal order with fewer cards in the extreme piles and the most in the middle pile. That is, the respective piles have the following number of cards in them: 4, 6, 10, 15, 20, 15, 10, 6, and 4. The average time taken to complete the first sort was 48 minutes.

Careful thought during the final phase of sorting is encouraged to ensure that each characteristic is properly placed (Waters, n.d.). That is, when sorting, the observer placed items to the extremes that most (or least) represented the child to provide a description of the child’s behavior. How one sorts the items should reflect the sorter’s response to

specific questions about the child's behavior, such as, "Is this the behavior that would let me pick this child out of a crowd?" (Waters, n.d.). If a behavioral item was not observed, or not age appropriate, then that item was placed in the middle pile. All sorts were completed within six hours of the observation with the exception of one sort that was completed within 12 hours because of travel requirements.

Once the sort was completed, each AQS item was assigned a value based on the pile into which it was sorted. The pile to the far left (i.e., pile #1) was assigned a value of one. Likewise, the second pile from the left (i.e., pile #2) was assigned a two, and so on. Thus, the far right pile, or the "most characteristic" pile (i.e., pile #9) was assigned a value of 9. All items within a given pile receive the assigned value. As such, four items have a value of "1", six items have the value of "2", 10 items have the value of "3", and so on.

After completion of the first sort by both observers, a review of item scores was conducted. Any item resulting in a difference in value equal to or greater than three was considered to be in 'discrepancy' between the two observers and was discussed. Using a difference of three or greater is consistent with other AQS studies (Posada, 2006). The average number of item discrepancies across all observer pairs during a single sort was 15 out of 90.

Following the first sort and a discussion between the two observers, a second sort was completed by each observer. Observers were encouraged to take into consideration comments made during the discussion session. However, observers were not to change an item placement unless they felt confident in the change. That is, the primary investigator did not want the student observers to be influenced or to feel obligated to

change their rating of an item simply to agree with Observer 1. Inter-rater reliability was calculated by correlating the q-sort produced by Observer 1 with the q-sort produced by a second observer. Overall inter-rater reliability after the second sort was .74 (range: .63 - .84) and was consistent with other studies (Bost, Vaughn, Washington, Cielinski, & Bradbard, 1998; Posada, 2006; Szewczyk-Sokolowski, Bost, & Wainwright, 2005).

Using the second sort completed by each observer, an overall composite q-sort was calculated for each subject. To obtain a composite q-sort description, the values assigned per item by each observer were averaged together. The composite q-sort description was then compared to an established criterion sort to obtain a correlation coefficient, or security score, for each participant. The primary observer's first, and only, sort was used as the q-sort description when there was no second observer.

Questionnaires.

During the observations, the mothers completed the demographic survey, the Amplification in Daily Life Questionnaire, and the CSBS-DP. This allowed the observers a chance to view behavior of the child when the mother's attention was diverted from the child.

CHAPTER IV

RESULTS AND DISCUSSION

Group Equivalency

As indicated in the Methods section, demographic information was collected to determine group equivalency (early-, late-diagnosed) and included gender, age of diagnosis, type of amplification, mother's education level, and newborn hearing screening status. No between-group differences were observed for any of the items. Additionally, no significant differences were present between the two groups on the results of the CSBS-DP, ADLQ, or language performance measures.

Group Data Analysis

AQS security scores.

For an initial examination of the data, an overall deaf composite sort was calculated by averaging the participants' scores for each of the 90 behavioral items. This composite sort was compared to the criterion sort established by Waters (1987; 1995) and the correlation is presented in Figure 1. A strong relationship ($r = .64$) was observed between the deaf composite sort and Waters' criterion sort. For comparison, scatter-plots of the correlation between Waters' criterion sort and two individual participants are provided. Figure 2 displays a child with a strong correlation to the criterion sort and

Figure 3 displays a child with a weak correlation to the criterion sort. Fourteen of the 21 children demonstrated moderate or strong correlations to the criterion sort.

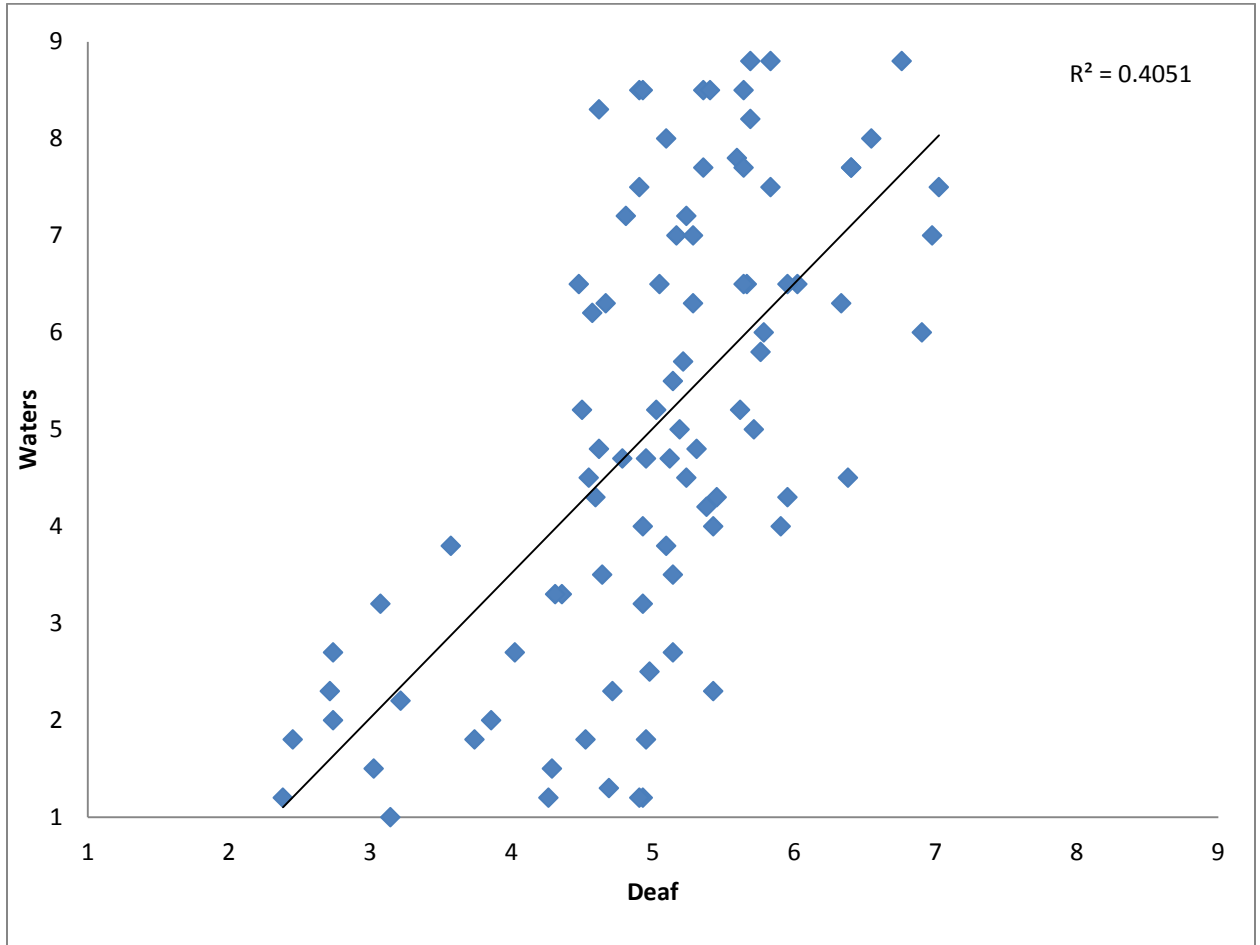


Figure 1: Correlation of Deaf Composite Sort to Waters' Criterion Sort ($r = .64$).

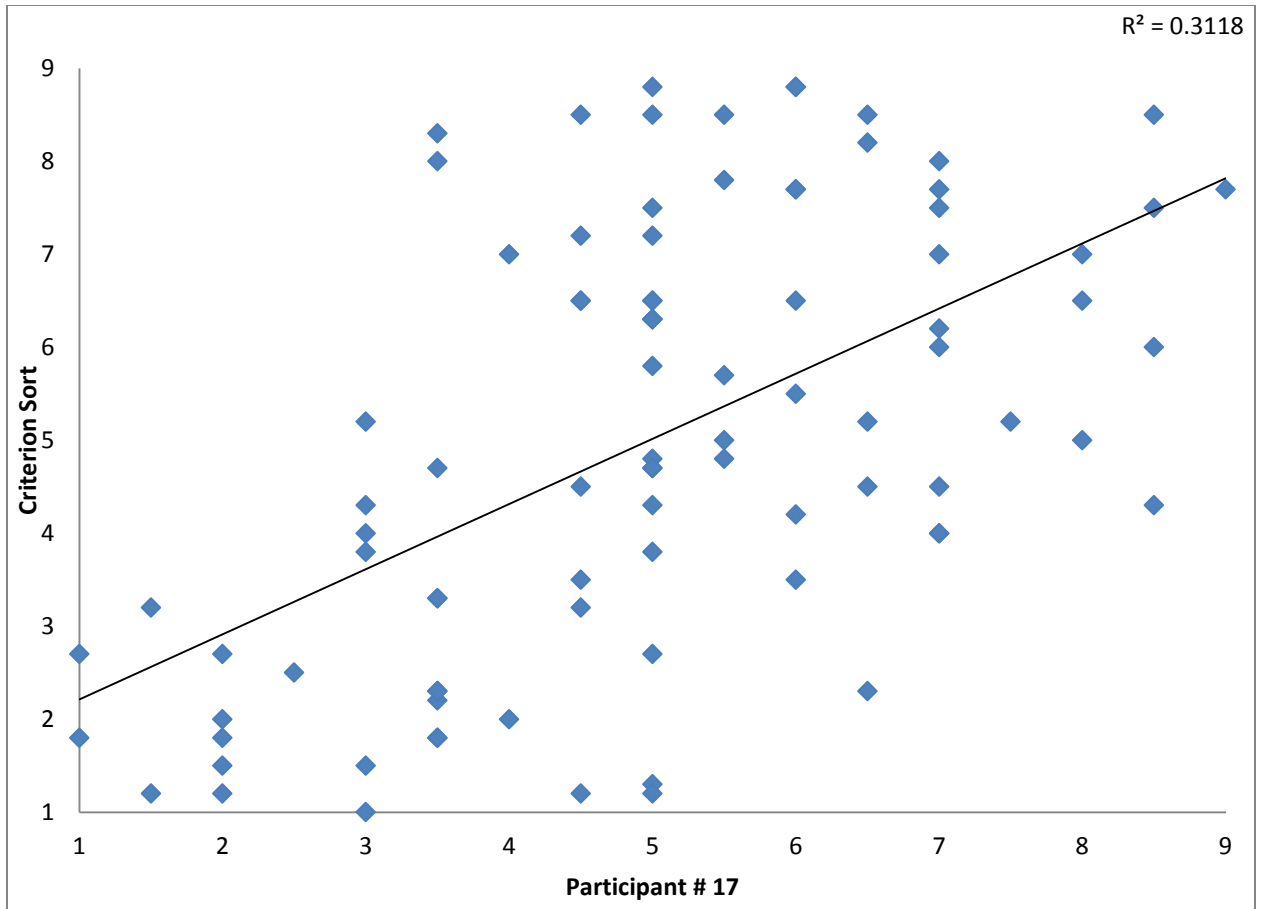


Figure 2: Correlation of Participant # 17 and Waters' Criterion Sort (security score = .56).

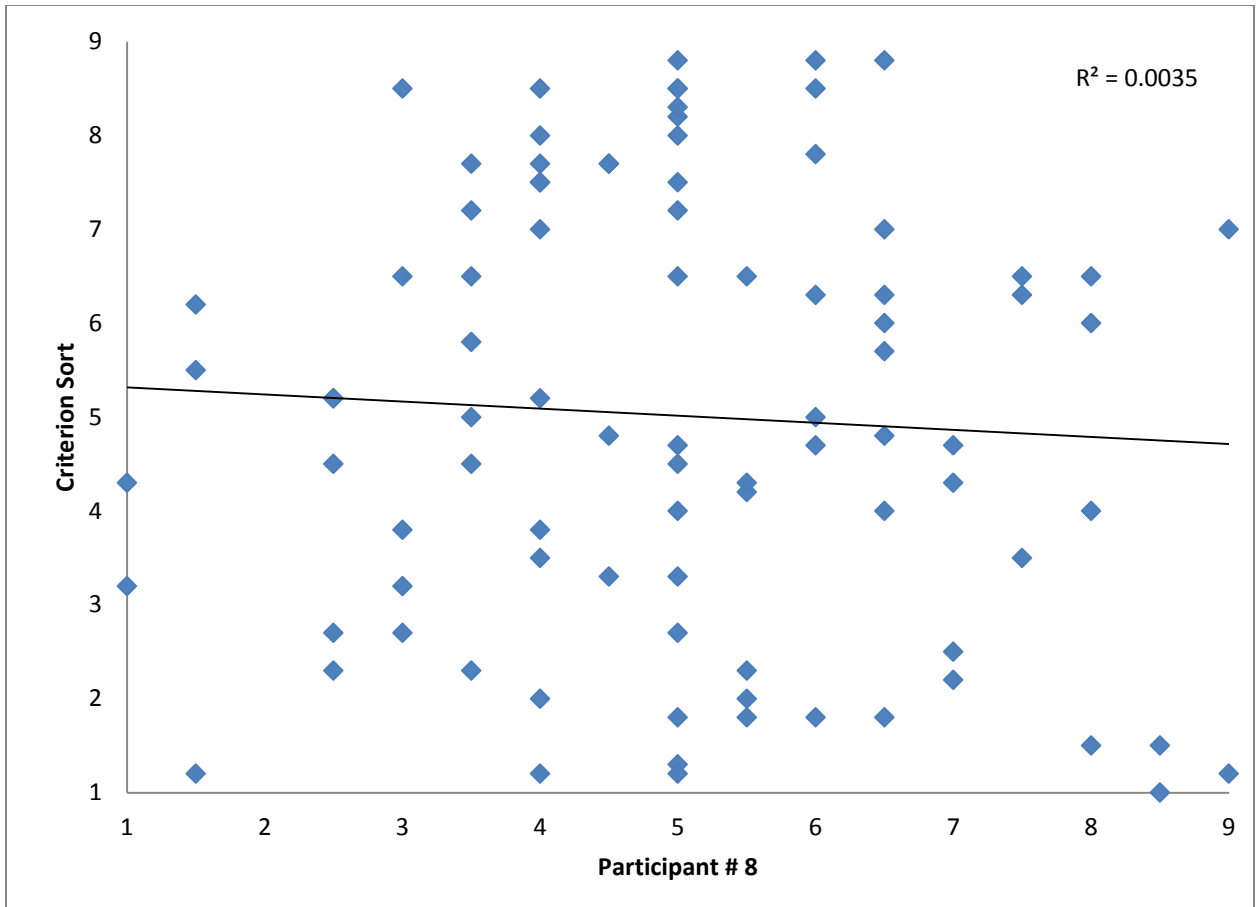


Figure 3: Correlation of Participant # 8 and Waters' Criterion Sort (security score = -.06).

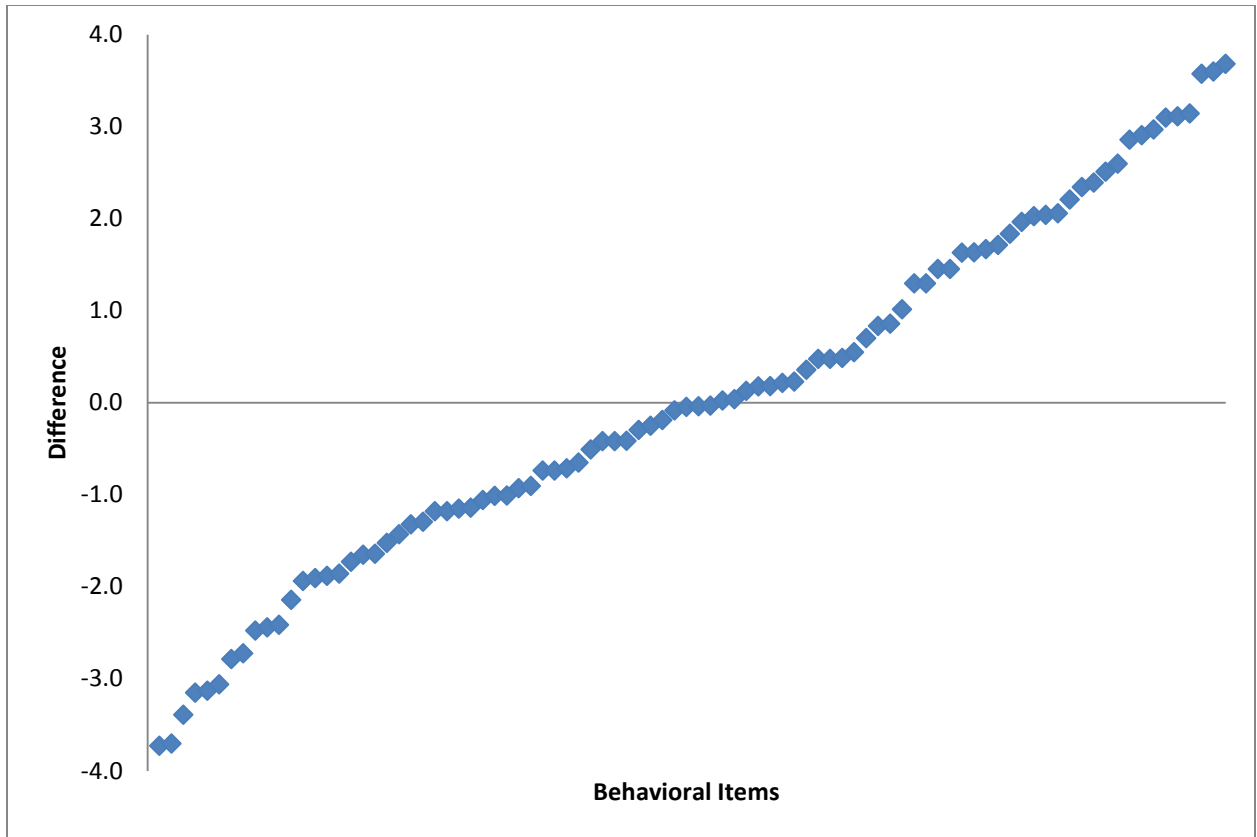


Figure 4: Score differences between Waters' criterion sort and deaf composite sort.

Next, a security score was calculated for each subject as described in the procedures section. The mean security score was .33 (SD = .20, range = -0.06 - .57). Individual security scores can be seen Table 2. A mean security score of .33 is consistent

with previous studies of typically developing children (Bost, et al., 1998; DeMulder, Denham, Schmidt, & Mitchell, 2000; Pool, Bujleveld, & Tavecchio, 2000). Furthermore, this mean security score is similar to the average security score of .32 ($SD = .16$) from a meta-analysis with over 2500 typical children (van IJzendoorn, et al., 2004) when the observer AQS procedure was used. A one sample t -test showed no significant difference between this study's mean security score and the mean security score from van IJzendoorn and colleagues' meta-analysis, suggesting that deaf children develop attachment security similarly to their typical peers.

Table 2

Individual Security Scores Per Subject

Early-Diagnosed	S 2	S 4	S 7	S 8	S 10	S 11	S 12	S 15	S 17			
security score	0.46	0.17	0.32	-0.06	0.51	0.57	0.33	0.45	0.56			
Late-Diagnosed	S 1	S 3	S 5	S 6	S 9	S 13	S 14	S 16	S 18	S 19	S 20	S 21
security score	0.19	0.13	0.56	0.56	-0.06	0.42	0.42	0.33	0.04	0.43	0.4	0.28

Although the AQS is not considered a categorical measurement, a recent convention has been to classify children as secure if their security score is .33 and greater or as insecure if the security score is .32 or lower (Ahnert, Pinquart, & Lamb, 2006; Howes & Oldman, 2001; Howes, Rodning, Galluzzo, & Myers, 1988; Howes, Vu, & Hamilton, 2011). Classified this way, 13 children (62%) in this study were secure and

eight (38%) were insecure. However, it should be noted that some researchers caution against this convention indicating that there is no ‘natural cutoff’ score to define security (van IJzendoorn, et al., 2004).

A less controversial convention to classify AQS security scores is to categorize the top two-thirds of a distribution as secure with the remaining one third as insecure (Park & Waters, 1989). Using this method, 14 participants would be classified as secure ($range = .32 - .56$), seven insecure ($range = -.06 - .28$). Using either convention (i.e., a .33 cut-off or a ‘2/3 rule’) to categorize the study participants as secure/insecure, results in a similar breakdown of secure and insecure participants. These findings once again suggest that deaf children, as a group, have approximately the same percentages of secure and insecure attachment classifications as their typical peers. Furthermore, it appears that current study results lend credibility to the use of a cut-off score of .33 for security.

Early versus Late Analysis

AQS security scores.

Following group data analysis, participants were subdivided into groups based on early and late diagnosis of hearing loss. The early-diagnosed group had a mean security score of .37 ($SD = .21$, $range = -.06 - .57$) and the late-diagnosed group had a mean security score of .31 ($SD = .20$, $range = -.06 - .56$). An independent sample *t*-test revealed no difference between groups ($d = .30$). Using a security score cut-off of .33, the early-diagnosed group had six secure and three insecure children and the late-diagnosed group had seven secure and five insecure children. Once again, this is consistent with the two-thirds convention, suggesting that deaf children, regardless of

timing of diagnosis (i.e., early or late), demonstrate equivalent levels of attachment as those of their typical peers.

Clusters.

Clusters are groupings of behavioral items that have a similar theme. As an example, Posada and colleagues (1995) established four clusters, *smooth interaction with mother* (SIM; seven items), *interaction with other adults* (IOA; 13 items), *proximity to mother* (PM; 10 items) *physical contact with mother*² (PCM; seven items). Briefly, these clusters focus on items that reflect security behaviors. As indicated earlier, the AQS is composed of 90 behavioral items that reflect such things as security, temperament and dependency. It was of interest to determine if there were any differences between Waters' criterion sort and the deaf composite sort for these cluster items. Differences would indicate areas in which deaf children differ in their attachment patterns to mother compared to the 'hypothetical' secure child. A cluster composite sort is a smaller sort consisting of only the items within that cluster. A Pearson correlation was computed for each cluster between the criterion and deaf sorts. A strong correlation was found between the criterion sorts and the deaf sorts for SIM ($r = .81$), PCM ($r = .78$) and PM ($r = .78$) clusters. A moderate correlation was found between the criterion sort and deaf sort for the IOA cluster ($r = .53$). When these cluster sorts were compared between early- and late-diagnosed groups, no differences in behaviors were found for any of the four clusters, indicating that children from both groups display similar attachment behaviors.

Qualitative Findings

² SIM items: 1, 2, 6, 9, 18, 19, 24, 32, 38, 41, 54, 62, 65, 70, 74, 79, 81; IOA items: 7, 12, 15, 17, 48, 50, 51, 58, 60, 66, 67, 76, 78; PM items: 11, 14, 21, 25, 34, 35, 36, 43, 59, 69; PCM items: 3, 28, 33, 44, 53, 64, 71

Although no between-group differences, or differences between our participants and the criterion sort, were present for cluster items, it is possible that within these clusters, or the AQS itself, children with hearing loss displayed different attachment behaviors for certain items. Therefore, an additional way to analyze the results of this study was to consider differences between the deaf group and the “hypothetical” secure child on an individual item level. To accomplish this, a difference score was calculated for each item between the study’s deaf composite sort and Waters criterion sort (see Figure 4). The greater the difference between the two scores for each item, the more the specific behavior varied between the ‘hypothetical’ secure child and the average deaf child in this study. For example, the Q-sort description score for item # 18 in Waters’ criterion sort was 8.5. The same behavioral item had an average score of 5.4 in the deaf composite, a difference of 3.1. As a way to understand the implied difference, the criterion sort had this item placed high (i.e., approximately pile 8 the sorting process) as a behavior that is “most like [hypothetical] child”, but the deaf sort had this item placed about three piles lower, towards the middle, thus, indicating that this behavior is strongly characteristic of a secure child but is neither characteristic nor uncharacteristic of a deaf child.

To narrow the selection of individual items for analysis, and to reduce the rate of type I error, items with an absolute difference of 2.5 and greater were selected. This resulted in 20 behavioral items being reviewed. See *Appendix B* for a list of the selected items with their difference values and effect sizes. Eight of these items (i.e., 21, 33, 34, 42, 53, 60, 71, 88) were not included in this analysis because they were not considered to be age appropriate or the setting was not conducive to those behaviors being present.

One sample *t*-tests, comparing the deaf sort Q-description score to Waters' criterion Q-description score per item, revealed a significant difference in scores between all 12 items at a $p < .01$ level.

Upon review of these 12 remaining items, it was determined that there were two general themes. Nine of the items loosely involved the child 'seeking the mother's attention and/or physical response', a characteristic considered to be indicative of secure behavior. For all of these instances, however, the deaf composite score for these items was less demonstrative of secure attachment behavior than the "hypothetical" secure child. As an example, children with hearing loss generally behaved in a way that demanded more attention or responses from mother than did the 'hypothetical' secure child. This increase need for attention was sometimes accompanied by fussiness because they anticipated their mothers were not going to comply. One possible reason for deaf children, as a whole, to seek out mother's attention more than that of typical secure (hearing) children is that hearing loss limits their ability to monitor their mother through auditory cues only, thus they might have a greater need or desire to demand more overt indicators of mother's attention. Another possible reason for children with hearing loss to demand more attention is that mothers of deaf children might not be as adept at picking up on their child's subtle attention-seeking cues resulting in the child's need to make stronger demands than a typical (hearing) child.

The remaining three items involved the child following mother's requests or suggestions. Once again, the deaf sort's scores for these items indicated less security than the scores for the 'hypothetical' secure child. That is, the children with hearing loss were less likely than the 'hypothetical' secure child to respond positively to mothers' request.

Although observers made an effort to ensure that a child was being judged on true response/behavior and not the child's inability to hear, it was still difficult to determine if a child fully understood his or her mother's request or if the child willingly disobeyed. Alternately, but less likely, it could be that children with hearing loss, as a whole, are less inclined to follow directions or suggestions made by the mother than are typical (hearing) children. Mothers of deaf children have been shown to be more intrusive and demanding in their interactions with their children (Meadow-Orlans & Steinberg, 1993). This type of mother-child interaction could possibly result in a child with hearing loss being more defiant and less willing than a peer to follow mother's instructions or suggestions.

Of these 12 behavioral items, two are of particular interest. The first item, # 80, "Child uses mother's facial expressions as a good source of information when something looks risky or threatening", had a lower score, meaning that this behavior was not a strong characteristic of children with hearing loss, on the deaf sort (4.9) compared to the criterion sort (8.5). One would certainly expect children with hearing loss to rely heavily on facial expressions and other non-verbal means of communication. One possible reason for this unexpected finding is that the opportunities to experience risky or threatening events during a home visit were limited. Another possible explanation for this finding is that it might reflect a delay in emotion recognition by children with hearing loss (Ludlow, Heaton, Rosset, Hills, & Deruelle, 2010; Peterson & Siegal, 1995, 1998). Peterson and Siegal (1995) found that most children (typical and developmentally-delayed) were capable of performing false-belief tasks by the mental age of 4 to 5 years of age. However, children who were deaf or autistic were not able to understand such tasks, even when they were significantly older (i.e., young teenagers). Ludlow and colleagues (2010)

suggested that the inability of deaf children and youth to recognize emotion in others might be a deficit and not simply a delayed ability. Therefore, the children with hearing loss in this study might not have used mother's facial expressions as a reference because they did not yet fully understand mother's emotions and the facial expressions that accompany them.

The second item, # 90, "If mother moves very far, child follows along and continues his play in the area she has moved to", was a behavioral item in which it was expected that children with hearing loss would receive a high score, indicating that this is a strong characteristic of children with hearing loss. That is, it was assumed that children with hearing loss have to use their vision to a greater extent than a hearing child to monitor mother's location. Therefore, if mother moves to a place where she is difficult to see, the child would feel the need to move closer to her so that he can visually monitor her. For the current study, though, this was not observed as the deaf sort q-sort descriptive value for item # 90 was 4.6 compared to the criterion value of 8.3. However, again, because the study observations were made in the child's home, it might be possible that the children had learned their mothers' home behaviors and routines and therefore did not feel the need to move locations. It is suspected that this behavior might be seen in more anxiety-provoking, unfamiliar environments.

In addition to examining behavioral items with large differences between the criterion sort and the deaf composite sort, it was of interest to determine which items had little to no difference between them. That is, small differences indicate items for which deaf children demonstrate attachment behaviors similarly to the hypothetical secure child. A difference value of .05 or smaller was used to select the items for this analysis, and 23

items met this criterion (see *Appendix C*). Fifteen of the 23 items could be considered “temperament/personality” items. Thus it appears that children with hearing loss demonstrate similar behaviors of temperament and personality as those of a secure child. The remaining items regarded interaction with other adults (five items), such as how the child responds to a visitor in the home, and interaction with mother (three items), such as laughing when mother teases. The small difference in these items indicates that children with hearing loss can demonstrate attachment behaviors just as strongly as the “hypothetical” secure child.

Two behavioral items with little difference between the sorts were of specific interest. Item # 29, “At times, child attends so deeply to something that he doesn’t seem to hear when people speak to him”, was an item of concern for children with hearing loss because it might be possible for the child’s hearing status to negatively affect observed behavior. That is, this behavior was ‘uncharacteristic’ of the secure child but was anticipated to be ‘characteristic’ of children with hearing loss. However, for the current study, the score for this item, 4.6, was nearly the same as the criterion sort’s score of 4.3. Thus, hearing status did not appear to influence the child’s behavior for this item.

Secondly, item # 43, “Child stays closer to mother or returns to her more often than the simple task of keeping track of her requires”, was an item in which it was anticipated to have a high score (i.e., be sorted most characteristic of child). As indicated earlier, it was suspected that the child with hearing loss would need to keep visual contact with mother. However, the children in the current study displayed this behavior similarly (score = 5.1) as the ‘hypothetical’ secure child (score = 4.7). That is, this behavior was not sorted as one that was characteristic of a child with hearing loss. Once again, the

children might have been familiar with their mothers' routine and did not need to stay close to mother. However, it is possible that this behavior might become more important for a child, thus leading to a higher score, in a more stressful environment.

For further analysis, it was of interest to determine if there were any differences between the early- and late-diagnosed groups for individual items. For many items, the deaf participants seemed to have a wide distribution of behavior scores. However, this most likely reflects the true range of attachment behaviors in the population. For example, item # 35 had a score range of 1-9, an average score of 5.5 and a mode of 4. The criterion score for item #35 was 4.3, which was closely matched by the current study's mode score of 4. Therefore, it was decided to examine the differences in most frequent score (i.e., mode) per item for each group. That is, are there individual item differences in mode scores (or most assigned pile placement) between the groups? If there are, it might imply that a 'characteristic' behavior of one group was 'uncharacteristic' of the other group.

Consistent with earlier classification, any item with an absolute difference of 2.5 or greater between modes of the two groups (i.e., early- and late-diagnosed) was considered for individual analysis. Sixteen items met this criterion (see *Appendix D*). Of these 16 items, 11 were in pre-determined clusters, five *proximity to mother*, three *smooth interaction with mother*, two *interaction with other adults*, and one *physical contact with mother*. For seven of these 11 cluster items, the early-diagnosed group had scores that were closer to the criterion sort scores than the late-diagnosed group, primarily for the proximity to mother and physical contact with mother clusters. For only two of the cluster items did the late-diagnosed group more closely match the criterion sort. For the

remaining items, there was no difference in modes or the modes were equally spaced from the criterion sort score. The average distance that the early-diagnosed group was from the criterion sort for these seven items was 1.2, or roughly 1 pile placement different than Waters' criterion sort scores. The late-diagnosed group, in contrast, had an average distance of 3.8 away from the criterion sort, or roughly four pile placements.

As the early-diagnosed group had scores that were closest to the criterion sort, particularly for PM and PCM cluster items, it might be suggested that children who are early-diagnosed tend to seek out or prefer more physical contact with and/or proximity to mother than do children who are diagnosed later, but not at such a significant rate that it results in differences in security scores between the two groups. Interestingly, Koester and MacTurk (1991; as cited in Koester, 1994) found that hearing infants sought more physical contact with and proximity to mother after a reunion than did children with hearing loss. It is worth noting that the early-diagnosed group, and not the late-diagnosed group, tended to demonstrated more attachment behaviors that are consistent with hearing children. It might be that the mothers of early-diagnosed children encourage and/or facilitate this proximity-seeking behavior because they are aware of the child's hearing status whereas mothers of late-diagnosed children are unaware of this need by their child and are less likely to facilitate it.

Chapter V

Summary and Conclusions

The influence of childhood hearing loss on attachment development has not received much attention. The few studies on this topic indicate that children with hearing loss can develop secure attachment much like the general population. Several findings of this study provide evidence to support the conclusion that children with moderate-to-profound hearing loss are just as likely to develop secure attachment to their mother as their typical peers. First, the strength of the correlation between the deaf composite sort and the criterion sort (i.e., hypothetical secure child) was strong. Second, the average security score was consistent with past studies of typical children, particularly a meta-analysis of over 100 attachment studies using the AQS. Lastly, roughly two-thirds of the deaf participants demonstrated secure attachment behaviors, consistent with past studies of typically-developing children. Based on these results, it appears that children with hearing loss, in contrast to children with other neurological disabilities, are not at a significant risk for developing insecure attachment. Furthermore, results of this study expand previous findings by suggesting that the current early age of hearing loss identification has no influence on mother-child attachment development. Even with the early knowledge of hearing loss, mothers of children with hearing loss can bond with their children such that their interactions are consistent with attachment development in the typical population as measured by the observer AQS.

Strong correlations between the deaf and criterion sorts for *physical contact with mother*, *proximity to mother*, and *smooth interaction with mother* clusters also support the conclusion that children with hearing loss display attachment behaviors similarly to the ‘hypothetical’ secure child. The strength of the correlations of these clusters is impressive considering that the behaviors of both secure and insecure children were included in the composite sort. Interestingly, the deaf *interaction with other adults* cluster sort had only a moderately strong relationship to the criterion sort. Upon review of the *interaction with other adults* cluster items, it appears that children with hearing loss show less anxiety or fear about interacting with other adults than the ‘hypothetical’ secure child. Fear or anxiety around strangers is a strong component of attachment, especially noted with the Strange Situation task for young children. As an example of the differences in children with hearing loss and what would be anticipated of the ‘hypothetical’ secure child, the deaf sort descriptive score for item # 48, “Child readily lets new adults hold or share things he has, if they ask to”, was 6.9 compared to Waters’ criterion descriptive score of 6.0. Similarly, the deaf sort had a higher score on items reflecting enjoyment from physical contact with other adults than the ‘hypothetical’ secure child suggesting that deaf children are more accepting than the ‘hypothetical’ secure child of attention and interaction with adults other than mother. It could be speculated that children with hearing loss are used to interacting with adults other than mother to a greater extent than children without hearing loss because of ongoing appointments with speech-language pathologists, audiologists and other professionals. Therefore, children with hearing loss might not be as inhibited in their interactions with other adults as their hearing peers.

In addition to security scores and cluster analyses, individual items of the AQS were reviewed to determine if any differences existed. Of the items reflecting significant differences between the deaf composite sort and the criterion sort, two overlying themes were present. The first theme, 'wanting mother's attention', might suggest that children with hearing loss have less confidence in the availability of their mother. That is, Waters (1987) suggested that children who are wanting mother's attention and are more demanding of her might feel that she is not readily available to them. This could possibly be true for children with hearing loss because they might miss some of the auditory cues that a mother provides indicating her responsiveness or accessibility. By not being able to hear mother's response, especially when the child's visual monitoring of the mother is limited (e.g., mother's back is turned to the child), the child's anxiety level might increase for fear that mother is not going to meet his or her needs. The second apparent theme revealed from the review of individual AQS items was "willingness to follow suggestions/instructions", which suggested that children with hearing loss were less likely than a 'secure' child to follow mothers' suggestions. As discussed earlier, mothers of children with hearing loss have been shown to be more intrusive and demanding in their interactions with their children. The children, in turn, might react to this demanding behavior by being less willing to adhere to a mother's request or suggestion. An alternative explanation could be that the child did not hear the mother's request clearly.

A focus of this study was to determine if time of diagnosis (i.e., early or late) had any influence on attachment development. Interest in the effects of early diagnosis on attachment and mother-child interaction is not new. Lederberg and Mobley (1990) investigated the effects of age at diagnosis and found it had no influence on attachment

development. Although impressive at that time, the 10 month average age of diagnosis would be considered “late” by today’s standards (i.e., 6 months; Stuart et al, 2000). Nonetheless, results of the current study were consistent with past findings that children with hearing loss can develop secure attachment, regardless of when the hearing loss is diagnosed. If anything, children with an early diagnosis of hearing loss in this study tended to demonstrate proximity seeking and physical contact with mother more so than children who were diagnosed later.

A few limitations to the current study are worth consideration. First, the study had a small sample size. Although no differences between early and late groups were found, the effect size was small. As such, it might be possible that differences between these groups existed but were not strong enough to be seen in the current study. Second, ‘optimal’ AQS procedures were not completed for this study. That is, it was not feasible to have three visits by two observers, especially when the home visits occurred in different states. Nor was it possible to have two observers for all 21 observations. However, three hours of observation were completed for each subject, an amount that has been shown to be to obtain accurate AQS descriptive sorts on participants (van IJzendoorn et al., 2004).

Another possible limitation was that the observations were completed in the home. Although this is an often used condition, the home observation might not have been the most conducive to eliciting of a child’s attachment behavior, especially for children with hearing loss. Therefore, future considerations for attachment studies in children with hearing loss might consider conducting the observations in unfamiliar environments to elicit stronger, or more visible, attachment behaviors.

Lastly, the age range of the study was broad. Van IJzendoorn and colleagues (2004) indicated that as the age of the participant increases, the validity of the AQS decreases. Unfortunately, certain AQS items that are considered blatant indicators of secure attachment might not be commonly demonstrated by older children. For example, an older child might be less likely to “cry when mother leaves him at home with a baby sitter” compared to an infant or young child. Van IJzendoorn and colleagues (2004) have even suggested that age-specific criterion sorts (e.g., infant, toddler, preschooler) might be more appropriate for evaluating attachment security in various ages. Therefore, future studies might consider having a more restrictive age range for participation to ensure that observations are truly reflective of attachment behavior.

To expand on the current findings, future studies should consider having a longitudinal component. If mother-child dyads can be enrolled near diagnosis of hearing loss, then the child’s attachment behavior can be monitored over time. In addition to examining mother-child attachment, a longitudinal study might also include a component examining the attachment patterns of children with hearing loss to their teachers and peers. Research has shown that children with hearing loss can form different attachments to their parents (e.g., secure with mother, insecure with father), and that these attachment patterns are strongly influenced by the parent’s attitude about the hearing loss (Hadadian, 1995). Therefore, it could be that a child with hearing loss can develop secure attachment with the mother but fail to form secure attachments to others, such as the father, teachers or peers. As noted previously, approximately 90% of children with hearing loss are born to hearing parents who presumably have minimal, if any, experience with hearing loss. Furthermore, nearly 60% of children with hearing loss attend a general education

classroom with hearing peers (Gallaudet Research Institute, 2011). Therefore, it is possible that many of these teachers have had little to no experience in teaching children with hearing loss. This lack of experience might be reflected in how the teacher interacts with the child, thus influencing the teacher-child attachment pattern. Furthermore, if the teacher has a negative perception of hearing loss, it is possible that peers in the classroom might adopt the teacher's attitude, also affecting the interactions and attachments that a child with hearing loss will have with his/her peers.

Based on the results of this study, it appears that at least early relationships between mothers and children with hearing loss develop typically. We know that children and adolescents with hearing loss have more difficulty with behavior (Barker, et al., 2009; Bess, Dodd-Murphy, & Parker, 1998; Stevenson, et al., 2011) and drug/alcohol abuse (Locke & Johnson, 1981; Titus, Schiller, & Guthmann, 2008) than those in the general population. Therefore, the question remains, why and when does the breakdown in social development occur? That is, when children with hearing loss begin interacting with normal hearing children, is there a breakdown in communication? Or, perhaps, there are subtle or not so subtle bullying messages. The effects of bullying on children with hearing loss are just beginning to gain the attention of the research community (Weiner & Miller, 2006).

As noted earlier, children with hearing loss are known to have difficulty in social interactions with their peers. Language ability has been shown to influence attachment security (van IJzendoorn, et al., 1995) as well as social competence (Mendez & Fogle, 2002). It might be that the children with hearing loss who experience the greatest difficulties in social settings are also the ones who have insecure attachment. Therefore, it

is of interest to learn if there are links between children with low language abilities, insecure attachment, and poor social interactions.

Poor communication has not only led to poor social interactions in children with hearing loss, but also to an apparent increase in substance abuse (Guthmann & Sandberg, 1998; Titus, et al., 2008). Particularly, it has been suggested that children with hearing loss lack sufficient access to discussions about the dangers of drugs and alcohol as well as prevention materials. Locke and Johnson (1981) showed that of older high-school students with hearing loss, 70% had used alcohol at least occasionally, with 90% of those students consuming alcohol at or before 14 years of age. In regards to drug use, only 60% had reported using drugs, but all of these students had experimented with drugs at or before 14 years of age. Thus, it appears that children with hearing loss not only struggle with social interactions, but also have a greater risk for succumbing to the influences of alcohol and drug abuse. It is unknown if and how factors such as attachment (e.g., parent-child, teacher-child, and peer-child) play a part in these social problems.

It is known that language ability has an influence on attachment and social competence. It is reasonable to suspect that when a child lacks efficient communication, social isolation could follow. Isolation has been reported because of lack of ability to communicate with class-mates (Angelides & Aravi, 2006). Isolation by peers was suggested as one potential factor that led to the increase in substance abuse by adolescents with hearing loss (Angelides & Aravi, 2006) as was the desire to fit-in (Dick, 1996; as cited in Guthmann & Sandberg, 1998).

In summary, the results of this study suggest that the earliest of social relationships, those between mother and child, can develop in a typical fashion. Thus we

are left with trying to determine why and when the social development of these children goes astray. Perhaps with early identification and the enhanced technologies available to children with hearing loss today, the negative social outcomes once revealed by earlier studies will dissipate. Future studies will make that determination.

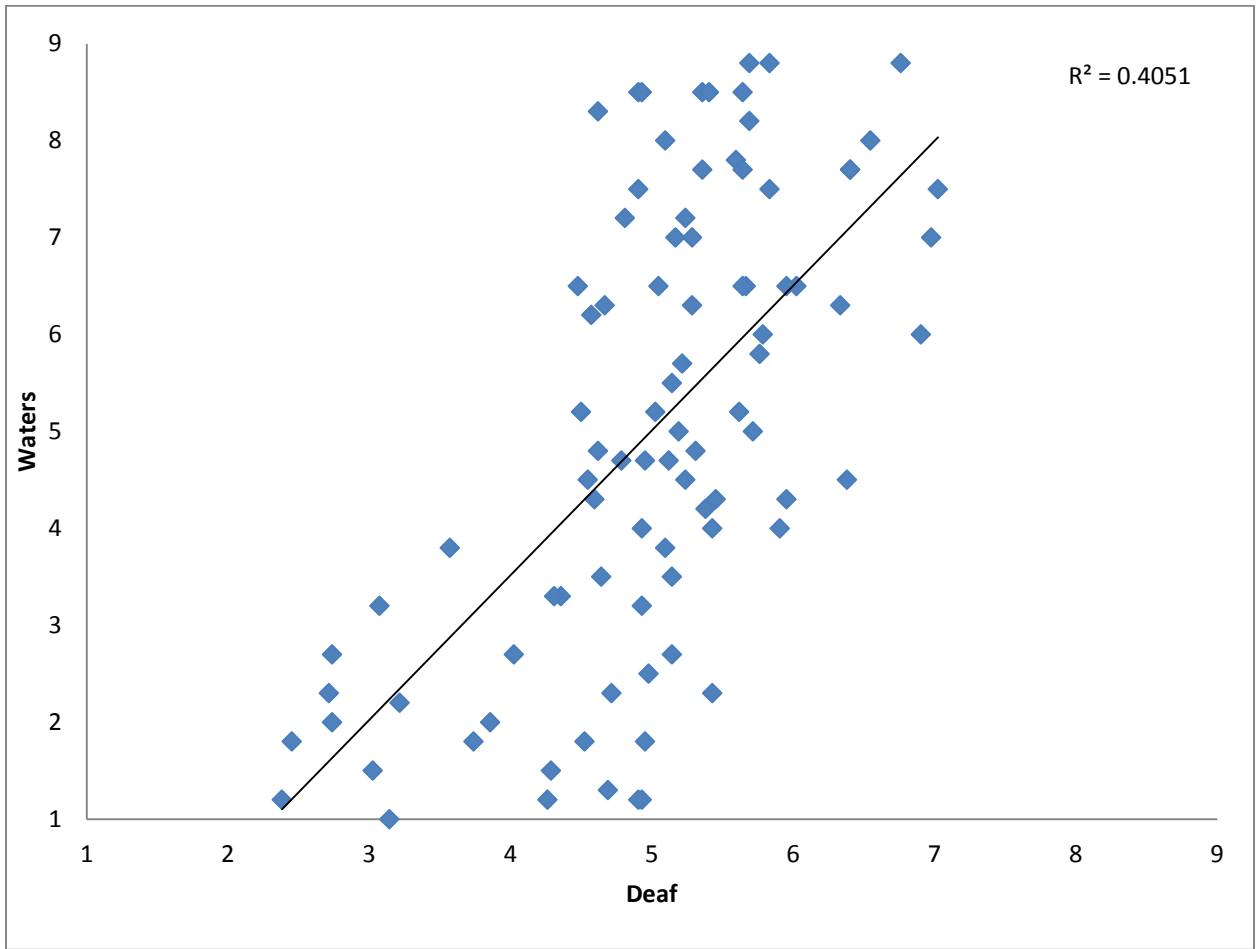


Figure 3: Correlation of Deaf Composite Sort to Waters' Criterion Sort ($r = .64$).

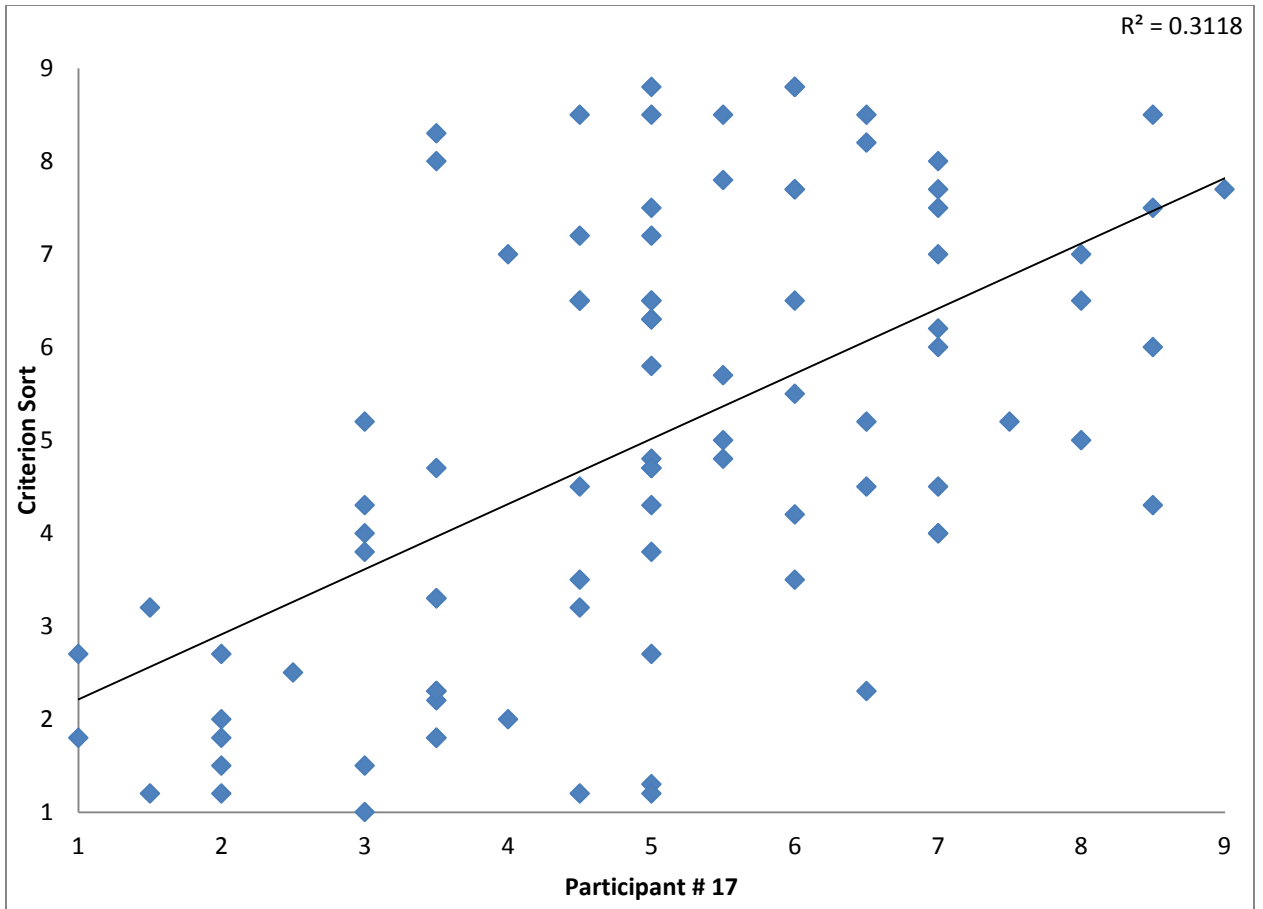


Figure 4: Correlation of Participant # 17 and Waters' Criterion Sort (security score = .56).

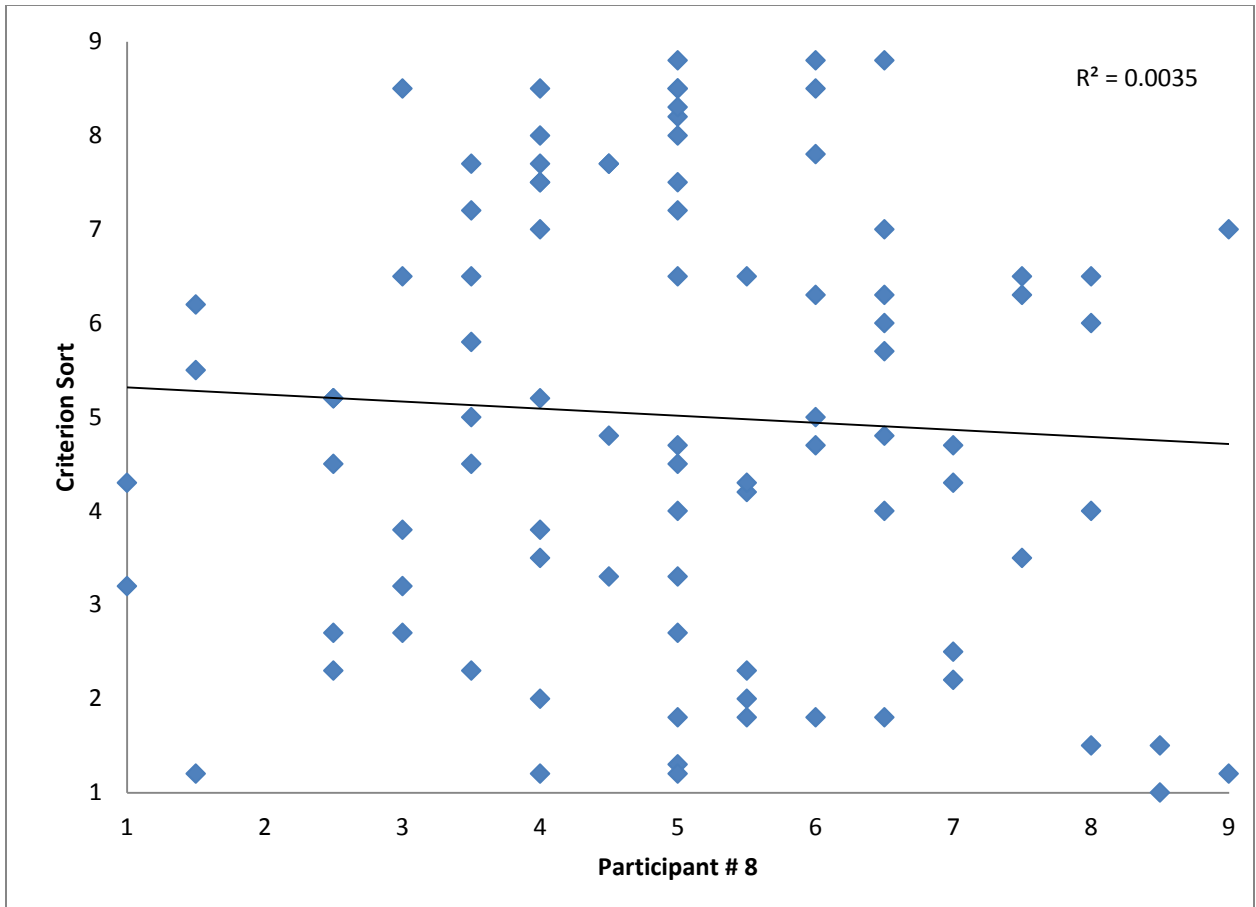


Figure 3: Correlation of Participant # 8 and Waters' Criterion Sort (security score = -.06).

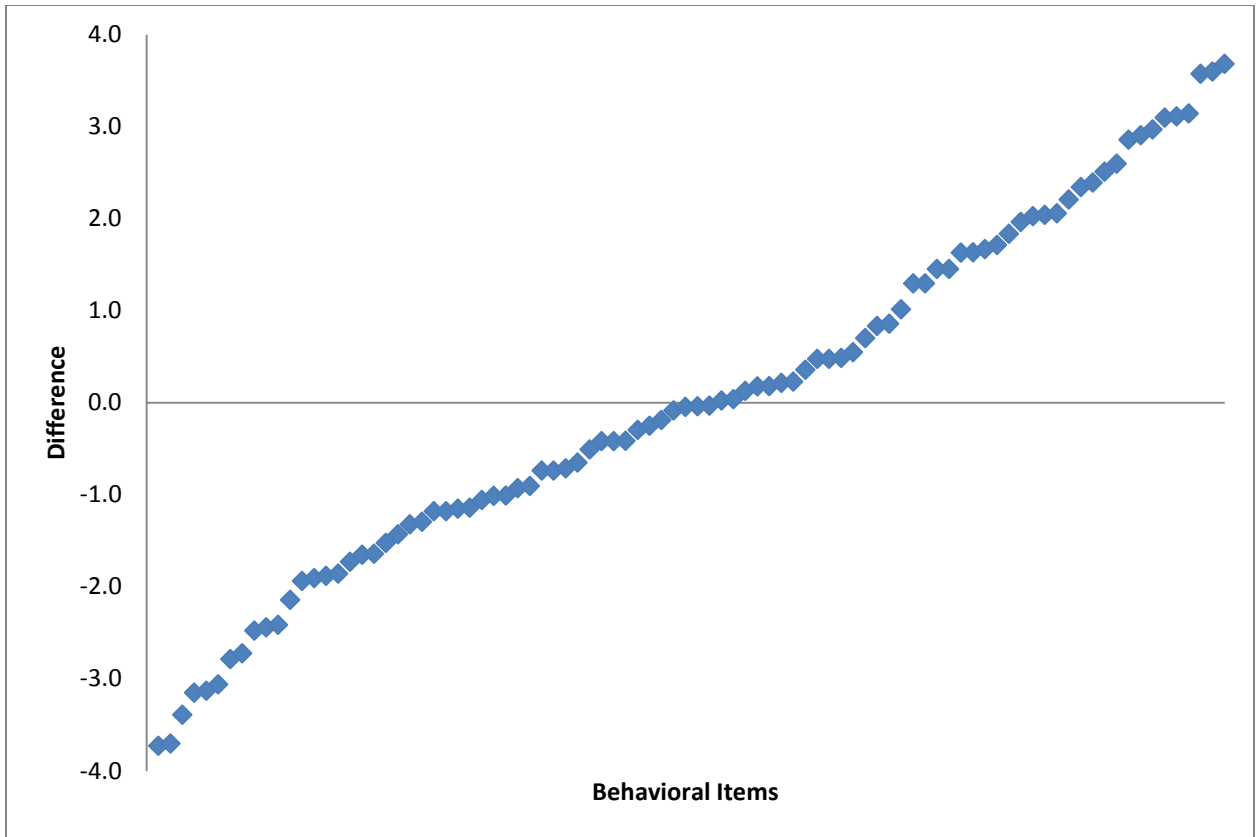
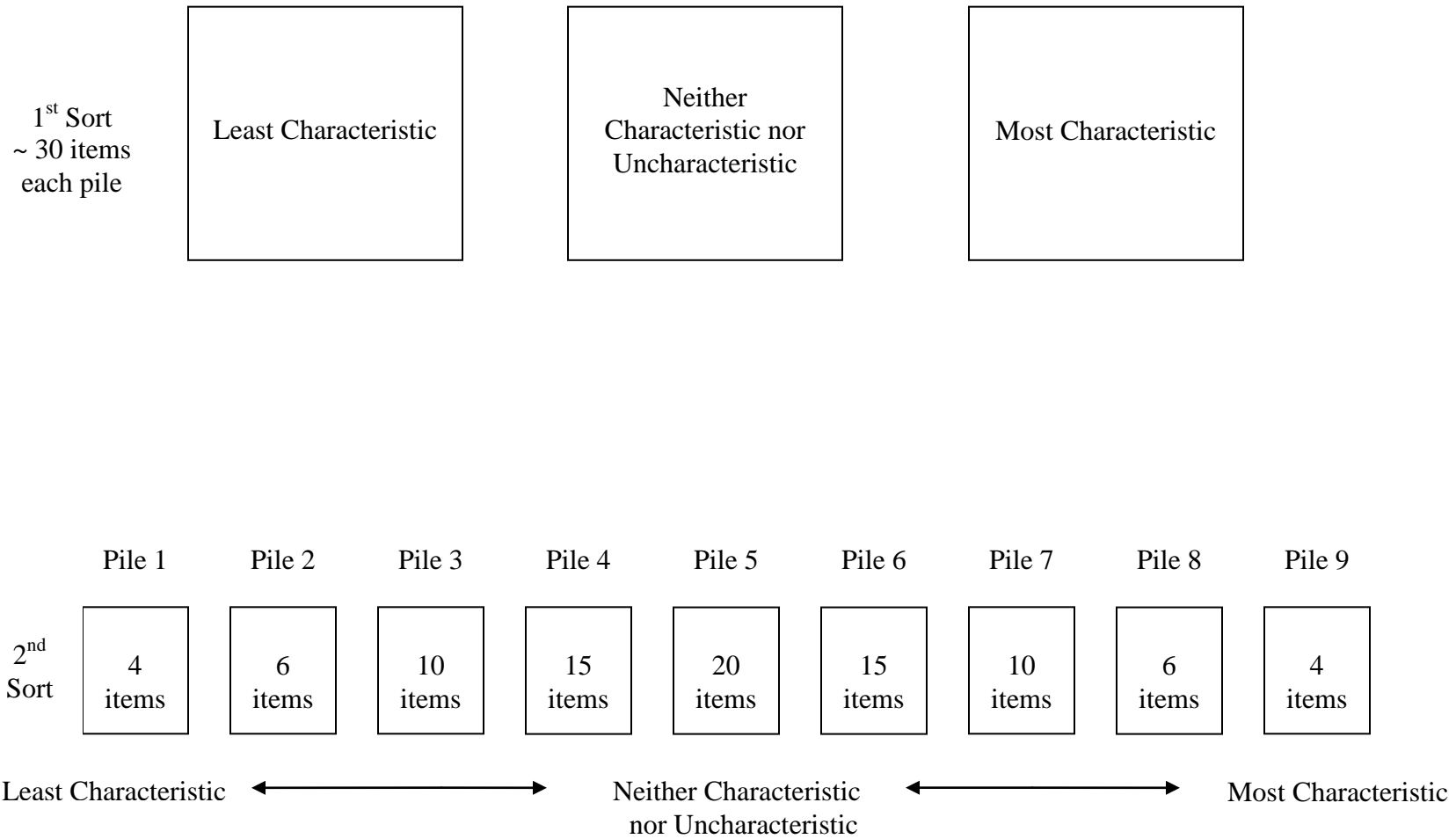


Figure 4: Score differences between Waters' criterion sort and deaf composite sort.

Appendix A

Depiction of sorting method.



Appendix B

Items with a difference score equal to or greater than |2.5|.

Behavioral Item	Waters' Criterion Sort	Deaf Composite Sort	Criterion & Composite Score Differences	Effect Size
18. Child follows mother's suggestions readily, even when they are clearly suggestions rather than orders.	8.5	5.4	3.1	1.6
21. Child keeps track of mother's location when he plays around the house.	8.8	5.8	3.0	2.0
28. Child enjoys relaxing in mother's lap.	7.5	4.9	2.6	1.2
31. Child wants to be the center of mother's attention. If mom is busy or talking to someone, he interrupts.	2.5	5.0	-2.5	-1.1
33. Child sometimes signals mother (or gives the impression) that he wants to be put down, and then fusses or wants to be picked right back up.	1.3	4.7	-3.4	-6.1
34. When child is upset about mother leaving him, he sits right where he is and cries. Doesn't go after her.	1.2	4.9	-3.7	-15.6
38. Child is demanding and impatient with mother. Fussing and persists unless she does what he wants right away.	1.2	4.3	-3.1	-1.3
41. When mother says to follow her, child does so.	8.5	5.6	2.9	2.1

42. Child recognizes when mother is upset. Becomes quiet or upset himself. Tries to comfort her, Asks what is wrong, etc.	8.2	5.7	2.5	2.9
53. Child puts his arms around mother or puts his hand on her shoulder when she picks him up.	8.5	5.4	3.1	2.7
60. If mother reassures him by saying “It’s OK” or “It won’t hurt you”, child will approach or play with things that initially made him cautious or afraid.	8.5	4.9	3.6	4.0
61. Plays roughly with mother. Bumps, scratches, or bites during active play. (Doesn’t necessarily mean to hurt mom).	1.8	4.5	-2.7	-1.5
69. Rarely asks mother for help.	2.3	5.4	-3.1	-2.4
70. Child quickly greets his mother with a big smile when she enters the room. (Shows her a toy, gestures, or says “Hi, Mommy”).	8.0	5.1	2.9	1.4
71. If held in mother’s arms, child stops crying and quickly recovers after being frightened or upset.	8.8	5.7	3.1	3.1
74. When mother doesn’t do what child wants right away, child behaves as if mom were not going to do it at all. (Fusses, gets angry, walks off to other activities, etc.)	1.5	4.3	-2.8	-1.4
77. When mother asks child to do something, he readily understands what she wants. (May or may not obey).	7.7	5.4	2.3	1.6
80. Child uses mother’s facial expressions as good source of information when something looks risky or threatening.	8.5	4.9	3.6	4.5

81. Child cries as a way of getting mother to what he wants.	1.8	5.0	-3.2	-2.0
88. When something upsets the child, he stays where he is and cries.	1.2	4.9	-3.7	-4.0
90. If mother moves very far, child follows along and continues his play in the area she has moved to. (Doesn't have to be called or carried along; doesn't stop play or get upset.)	8.3	4.6	3.7	3.1

Appendix C

Items with a difference score equal to or less than $|\cdot 05|$.

Behavioral Item	Waters' Criterion Sort	Deaf Composite Sort	Criterion & Composite Score Differences
3. When he is upset or injured, child will accept comforting from adults other than mother.	4.8	4.6	0.2
9. Child is lighthearted and playful most of the time.	6.5	6.0	0.5
12. Child quickly gets used to people or things that initially made him shy or frightened him.	6.0	5.8	0.2
24. When mother speaks firmly, or raises her voice at him, child becomes upset, sorry, or ashamed about displeasing her.	4.5	4.5	0.0
27. Child laughs when mother teases him.	6.3	6.3	0.0
29. At times, child attends so deeply to something that he doesn't seem to hear when people speak to him.	4.3	4.6	-0.3
30. Child easily becomes angry with toys.	2.3	2.7	-0.4
37. Child is very active. Always moving around. Prefers active games to quiet ones.	4.8	5.3	-0.5
39. Child is often serious and businesslike when playing away from mother or alone with his toys.	4.7	5.0	-0.3
43. Child stays closer to mother or returns to her more often than the simple tasks of keeping tracks of her requires.	4.7	5.1	-0.4

45. Child enjoys dancing or singing along with music.	5.2	5.6	-0.4
46. Child walks and runs around without bumping, dropping, or stumbling.	5.7	5.2	0.5
51. Child enjoys climbing all over visitor when he plays with them.	4.7	4.8	-0.1
52. Child has trouble handling small objects or putting small things together.	3.8	3.6	0.2
56. Child becomes shy loses interest when an activity looks like it might be difficult.	2.7	2.7	0.0
58. Child largely ignores adults who visit the home. Finds his own activities more interesting.	3.2	3.1	0.1
62. When child is in a happy mood, he is likely to stay that way all day.	5.5	5.1	0.4
66. Child easily grows fond of adults who visit his home and are friendly to him.	7.0	7.0	0.0
73. Child has a cuddly toy or security blanket that he carries around, takes it to bed, or holds when upset.	5.2	5.0	0.2
84. Child makes at least some effort to be clean and tidy around the house.	5.0	5.2	-0.2
85. Child is strongly attracted to new activities and new toys.	7.5	7.0	0.5
87. If mother laughs at or approves of something the child has done, he repeats again and again.	5.8	5.8	0.0
89. Child's facial expressions are strong and clear when he is playing with something.	6.5	6.0	0.5

Appendix D

Item modes with a difference equal to or greater than |2.5| between early- and late-diagnosed groups.

Item/Description	Waters' Criterion Sort	Mode for Early	Mode for Late	Difference Between Modes
14. When child finds something new to play with, he carries it to mother or shows it to her from across the room.	7.8	7.0	2.5	-4.5
15. Child is willing to talk to new people, show them toys, or show them what he can do, if mother asks him to.	7.7	5.5	8.0	2.5
21. Child keeps track of mother's location when he plays around the house.	8.8	8.0	4.5	-3.5
24. When mother speaks firmly, or raises her voice at him, child becomes upset, sorry, or ashamed about displeasing her.	4.5	3.5	6.0	2.5
31. Child wants to be the center of mother's attention. If mom is busy or talking to someone, he interrupts.	2.5	7.0	2.0	-5.0
35. Child is independent with mother. Prefers to play on his own; leaves mother easily when he wants to play.	4.3	1.0	7.5	6.5
39. Child is often serious and businesslike when playing away from mother or alone with his toys.	4.7	4.0	6.5	2.5
40. Child examines new objects or toys in great detail. Tries to use them in different ways or to take them apart.	6.5	3.5	7.0	3.5
41. When mother says to follow her, child does so.	8.5	6.5	4.0	-2.5

44. Child asks for and enjoys having mother hold, hug, and cuddle him.	7.7	6.0	3.5	-2.5
58. Child largely ignores adults who visit the home. Finds his own activities more interesting.	3.2	5.0	1.0	-4.0
59. When child finishes with an activity or toy, he generally finds something else to do without returning to mother between activities.	3.8	3.0	7.0	4.0
61. Plays roughly with mother. Bumps, scratches, or bites during active play. (Doesn't necessarily mean to hurt mom).	1.8	7.0	4.0	-3.0
65. Child is easily upset when mother makes him change from one activity to another.	1.8	6.0	3.0	-3.0
69. Rarely asks mother for help.	2.3	3.5	6.0	2.5
72. If visitors laugh at or approve of something the child does, he repeats it again and again.	4.5	7.0	4.0	-3.0

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