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A Longitudinal Investigation of the Home Literacy Environment and Shared Book Reading in Young Children with Hearing Loss

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Abstract

Objectives—The principle goal of this longitudinal study was to examine parent perceptions of home literacy environment (e.g., frequency of book reading, ease of book reading with child) and observed behaviors during shared book reading (SBR) interactions between parents and their children with hearing loss (HL) as compared to parents and their children with normal hearing (NH) across three time points (12-, 24-, and 36-months old). Relationships were also explored among home literacy environment factors and SBR behaviors and later language outcomes, across all three time points for parents of children with and without HL.

Design—Participants were a group of parents and their children with HL (N = 17) and typically developing children with NH (N = 34). Parent perceptions about the home literacy environment were captured through a questionnaire. Observed parent behaviors and their use of facilitative language techniques (FLTs) were coded during videotaped SBR interactions. Children's oral language skills were assessed using a standardized language measure at each time point.

Results—No significant differences emerged between groups of parents (HL and NH) in terms of perceived home literacy environment at 12 and 36 months. However, significant group differences were evident for parent perceived *ease of reading to their child* at 24 months. Group differences also emerged for parental SBR behaviors for *literacy strategies* and *interactive reading* at 12 months and for *engagement* and *interactive reading* at 36 months, with parents of children with HL scoring lower in all factors. No significant relationships emerged between early home literacy factors and SBR behaviors at 12 months and oral language skills at 36 months for parents of children with NH. However, significant positive relationships were evident between early home

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Conflicts of Interest

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literacy environment factors at 12 months and oral language skills at 36 months for parents and their children with HL.

Conclusions—Although both groups of parents increased their frequency of SBR behaviors over time, parents of children with HL may need additional support to optimize SBR experiences to better guide their toddlers and preschoolers' language skills. Early intervention efforts that focus on SBR interactions that are mutually enjoyed and incorporate specific ways to encourage parent-child conversations will be essential as children with HL acquire language.

INTRODUCTION

The home literacy environment is broadly defined as varied interactive literacy-related experiences that occur across multiple contexts and is a key component for children's emergent language and literacy acquisition (Schmitt, Simpson, & Friend, 2011). Researchers have further defined the home literacy environment in terms of frequency of parent and child book reading (Senechal & LeFevre, 2001) and parents' provision of strategies while reading storybooks to their young children (Schmitt et al., 2011). Indeed, shared book reading (SBR) has been highlighted as one of the most important activities caregivers can do with their children (Joint Committee on Infant Hearing, 2013; National Association of Education for Young Children or NAEYC, 2012; National Early Literacy Panel, 2009). Frequency of daily SBR and engaging infants in interactive dialogue around a favorite storybook positively relate to preschool and early-school-age language, social-emotional, and general cognitive development for young typically developing children with normal hearing (NH) (Bus, van IJzendoorn, & Pellegrini, 1995; Senechal & LeFevre, 2001; Sonnenschein & Munsterman, 2002; Trivette, Dunst, & Gorman, 2010). In fact, the manner in which parents interact with their young children during SBR, rather than frequency of book reading alone, better predicts oral language learning in infants and toddlers with NH (Decker, Adamson, & Bakeman, 2006; Ozlem Ece Demir, Applebaum, Levine, Petty, & Goldin-Meadow, 2011; Pan, Rowe, Singer, & Snow, 2005; Zimmerman et al., 2009) and toddler and preschool children who are deaf or hard of hearing (DesJardin & Eisenberg, 2007; DesJardin et al., 2014).

Language acquisition is a transactional process between a parent and child influenced by various ecological factors (e.g., family income, home literacy environment). Young children whose parents scaffold or tailor their linguistic input to their children's communicative attempts tend to develop stronger oral language skills than children whose parents are less responsive (Baumwell, Tamis-LeMonda, & Bornstein, 1997). It also may be the case that children's oral language abilities affect parents' perceptions of their home literacy practices and the way they interact with their children (Chapman, 2000; Rowe, 2012; Sameroff & MacKenzie, 2003). For instance, some parents of very young children with hearing loss may not read as often to their children believing that their child does not have the language abilities to engage in storybook reading. This further restricts the associated conversational turns.

The primary goal of this study is to compare parents' perceived home literacy environment (e.g., frequency of book reading, ease of reading to child) and observed SBR behaviors in

two groups of parents, one group who has young children with HL and a second group who has children with NH across three time points (12, 24, and 36 months old) in order to determine whether HL impacts home literacy experiences and SBR behaviors during the early years. Relationships are also explored between early home literacy environment factors and SBR behaviors at 12 months and children's later language outcomes at 36 months for both groups of parents and their children. Families included in this study are a sub-set of parents and their young children with and without HL from the Development and Adaptive Behavior of Young Children with Hearing Loss (DABCHL) project designed to investigate multi-dimensional parent (e.g., parental stress, socio-economic status) and child (e.g., language and speech perception abilities) factors in relation to child outcomes for young children with mild to severe HL who all utilize hearing aids (Stika et al., 2014).

Very Young Children with Hearing Loss

Early detection of HL and prompt fitting of hearing aids and enrollment in early intervention can drastically influence oral language outcomes for young children identified with mild to severe HL (i.e., children with better-ear pure-tone averages between 25 and 75 dB HL, who typically receive benefit from hearing aids and do not qualify for a cochlear implant) (Fitzpatrick, Durieux-Smith, Eriks-Brophy, Olds, & Gaines, 2007; Yoshinaga-Itano, 2003; Yoshinaga-Itano, Sedey, & Coulter, 1998). However, there is considerable variability in oral language skills for young children with mild to severe HL who have undergone Newborn Hearing Screening and been fitted early with hearing aids (Stika et al., 2014; Tomblin, Oleson, Ambrose, Walker, & Moeller, 2014; Wake et al., 2005). Similar to young children with NH, home literacy environment experiences and observed SBR behaviors may partially account for individual differences in language skills for children who are identified with HL before six months of age. Understanding how these home literacy environment factors and SBR behaviors relate to spoken language skills during the early years will better guide professionals to support parents of very young children who are identified early with mild to severe hearing loss.

Shared Book Reading and Young Children with Normal Hearing

Shared book reading has been defined in two ways. One such way is the amount of time that a parent reads daily to a young child. For infants and toddlers with NH, frequency of parent-child book reading has been found to predict early language and later emergent literacy skills in the preschool years (Colombo, 2007; Karrass & Braungart-Rieker, 2007, Raikes et al., 2006). For example, Karrass and Braungart-Rieker (2007) investigated 87 parents (mothers and fathers) and their infants with NH at 4, 8, 12, and 16 months of age over the course of one year. Parent perception of frequency of SBR in their home at 8 months of age was positively linked to later expressive language skills at 12 and 16 months.

It has also been shown that the interactive process between parent and child during SBR, may better support children's language development than simply reading books aloud to children (Morrow, Freitag, & Gambrell, 2009; Wasik & Iannone-Campbell, 2013; Demir et al., 2011; Zimmerman et al., 2009). In a meta-analysis, Trivette and colleagues (2010) analyzed the effects of a number of SBR characteristics for both adults and children on oral language skills in young children (12 – 42 months old). Parental SBR behaviors, such as

providing positive feedback to a child during SBR interactions and utilizing higher level facilitative language techniques (e.g., open-ended questions) encouraged children's participation during SBR interactions. Children's engagement in the interaction was noted to benefit children's later oral language skills. This evidence suggests that simply reading to young children may not provide sufficient support to promote oral language learning, but that parental engagement involving two-sided conversations during SBR experiences may optimize children's language development (Wasik & Iannone-Campbell, 2013).

Young children who demonstrate language delays, however, may require specific parental facilitative language techniques (FLT) to foster child communication attempts to support oral language development within the context of SBR (Whitehurst, Falco, & Lonigan, & Fischel, 1988; Zevenbergen & Whitehurst, 2003). The use of higher level FLT such as open-ended questions (i.e., asking questions that require more than one-word answers) seem to elicit more words from children who are at the early sentence level of language development (Mol, Bus, DeJong, & Smeets, 2008), whereas lower level FLT such as linguistic mapping (i.e. putting a child's non-word vocalization into words) may enhance language skills in young children with language challenges at the prelinguistic stage of development (Girolametto et al., 2002; Yoder, McCathren, Warren, & Watson, 2001). Within SBR contexts, parents may adjust their linguistic input with their infants by simplifying text concepts and maintaining attention during interactions. On the other hand, parents of preschool-age at risk populations may use more open-ended questions once the children acquire short sentences (Abraham et al., 2013; Price, van Kleeck, & Huberty, 2009).

Shared Book Reading and Young Children with Hearing Loss

Research on SBR is sparse for infants and toddlers with HL who are fitted with hearing aids (DesJardin et al., 2014; Zaidman-Zait & Dromi, 2007). In terms of frequency of book reading, in a recent cross-sectional study, DesJardin and her colleagues (2014) found no significant group differences for parental perceptions of frequency of reading at home (i.e., number of minutes per day) between parents of young children with HL (mean age = 25.8 months) and parents of a NH control group (mean age = 18.6 months), even after controlling for children's age. Furthermore, perceived frequency of SBR in the home was related positively to children's expressive oral language skills for this young group of children with HL at one point in time. The current study extends our earlier study by examining the perceived home literacy environment and parents' shared book reading behaviors in a sub-sample of the same parents and their young children over three time points to determine if the earlier findings remain the same or change over time. We further explore early factors as they relate to the children's later language outcomes.

Specific parental behaviors during SBR may also influence oral language skills for young children with HL. Hearing mothers of children with HL may demonstrate intuitive parenting skills, such as a natural sense to adjust their linguistic input to their children's language skills, which enhance interaction that ultimately furthers language development (Koester, Papousek, & Smith-Gray, 2000). Koester and colleagues suggest that, "...intuitive parenting is a proficient yet often overlooked communication technique used by parents when interacting with their toddlers with HL" (p. 56). For example, a mother may begin by asking

her child an open-ended question and, if the child does not respond, revert to a closed-ended question. In fact, hearing mothers of children with HL may intuitively adjust to their children's linguistic abilities by using more closed-questioning in order to compensate for their children's HL (Lederberg & Everhart, 2000). Recent findings from DesJardin and her colleagues (2014) suggest a similar trend. Parents of children with HL utilized more *literacy strategies* (e.g., pointing to and labeling pictures in books) and *teacher techniques* (e.g., questioning) during SBR interactions with their children than parents of children with NH, even after controlling for children's oral language skills. Furthermore, those specific behaviors were positively correlated to children's expressive language skills.

Children's language skills may also influence the ways in which parents interact with their children (Rowe, 2012). The on-going relationship between parent and child is not static, but is continually changing and evolving (Spiker, Boyce & Boyce, 2002). DesJardin and her colleagues (2014) found that parents of children with lower language abilities utilized more intentional *literacy strategies* (e.g., labeling pictures) and lower level FLTs (e.g., closed-ended questions) than parents of children with higher language skills. These lower level FLTs appeared to support their children's lower language skills. However, 75% of the parents of children with higher language abilities (>90 standard score on standardized language measure) were also utilizing lower level rather than higher level FLTs (e.g., open-ended questions). Young children with HL who are at risk for language development may need explicit language instruction tailored to their language abilities (Cruz, Quittner, Marker, & DesJardin, 2012; DesJardin et al., 2014). Thus, this study further explores parents' FLTs at 12 months as they relate to child auditory and expressive language outcomes at 36 months of age.

To our knowledge, the current investigation is the first longitudinal study to examine parent perceptions of the home literacy environment and parental SBR behaviors during storybook interactions in a young group of children with mild to severe HL (12 months to 36 months old) and compare those contributions to a typically developing NH cohort. A better understanding of the precise features of the home literacy environment such as the frequency of SBR and parental observed SBR behaviors may guide early intervention efforts. Results of this study extend both the findings of the DesJardin et al. (2014) and Stika et al. (2014) studies by exploring these factors over three time points (12, 24, 36 months old). We are particularly interested in the early home literacy factors at 12 months that may contribute to children's oral language development at 36 months. Identification of these factors may better guide professionals in early intervention as they mentor and coach families of very young children with mild to severe hearing loss who may experience language delays by 24 months of age (Stika et al., 2014). This early timeframe is an important extension of the prior research because it follows the children as they complete the transition from the pre-linguistic stage of language development to becoming competent verbal communicators.

Research Goals and Questions

The overall goal of this longitudinal study was to extend our current understanding of parent perceived home literacy environment and SBR behaviors on child language development by comparing groups of parents and their children with and without HL, over the children's first

three years. Findings from this study may help delineate how HL may impact home literacy environment and SBR practices. Furthermore, we explored whether early home literacy environment factors and observed parent SBR behaviors related to later spoken language skills for both groups of young children with and without HL. The purpose of this study was to address the following research questions:

1. Are there differences between groups of parents of young children with and without HL in terms of perceived home literacy environment at 12, 24, and 36 months of age?
2. Do parent and child SBR behaviors increase over time within each group and are there differences between groups (HL and NH) across time points?
3. For young children with and without HL, are there relationships between early perceived home literacy environment experiences, SBR behaviors, and FLTs during storybook interactions at 12 months and children's later spoken language skills at 36 months?

Materials and Methods

Participants

Parents and their children with and without HL comprised a sample of the larger DABCHL investigation (Stika et al., 2014). A number of the subjects from the larger investigation withdrew after the first time point due to parent and child unavailability to be videotaped for the storybook interaction or family transfer from the area. Despite attrition, statistical analyses performed on the two groups of this subsample indicate no significant differences between the subsample and the larger sample (Stika et al., 2014) on any child (e.g., age, race) or parent (e.g., age, household family income) demographic characteristics.

Parents—As shown in Table 1, 17 parents and their children with HL and thirty-four parents and their children with NH participated in this study. Two mothers in the HL group and two mothers in the NH group reported having bilateral or unilateral sensorineural HL of their own (ranging from moderate to severe). All of the mothers with HL utilized hearing aids and used spoken English as their primary mode of communication. No significant differences emerged between groups in terms of parent demographic variables. Parents were primarily Caucasian and married. Family income levels for both groups varied with mean income approximately \$50,000. However, a larger proportion of parents of the children with NH held postgraduate educational degrees than parents of children with HL (17.7% versus 11.8%). No significant correlations emerged between parent education level or family income and child spoken language skills for either group.

Children—As shown in Table 2, both groups of children were similar in terms of mean age in months at the first assessment point. There were also no differences between age of children at 24 or 36 months. The groups also did not differ in terms of race, ethnicity, or second language spoken in the home. Six parents of children with HL (35.3%) and five parents of children with NH (14.7%) indicated on a demographic form that, although

English was their first language, a second language was also spoken in the home. No children with known secondary disabilities were enrolled in the study.

Children with Hearing Loss—Out of 17 children with HL, 15 (88.2%) were identified through Newborn Hearing Screening procedures. Average age of identification of HL was approximately 2 months and children received their hearing aids at approximately 5 months. All children with HL presented with bilateral HL ranging from mild to severe HL. Degree of HL was reported by a licensed audiologist at the research site based on the unaided four-frequency pure tone average (PTA-4) (re: 500, 1000, 2000, and 4000 Hz) in the better ear. Hearing levels were in the moderate to severe range for slightly more than one third of the children (see Table 2).

At the time of study recruitment, all children with HL had been enrolled in a family-centered public or private intervention program for at least three months. Fourteen of the 17 parents (82.4%) indicated that they had an Individual Family Service Plan (IFSP) and ten of the 17 parents (58.9%) indicated that their child was receiving additional speech and language therapy on a weekly basis. However, children varied with respect to the number of private or public speech-language therapy sessions that they received each week. The majority of children received home visits (79.4%) and/or participated in a private or public deaf-infant program (20.6%) at least once a week. Children's average length of participation in early intervention at the time of testing was 4.1 months at the first time point (12 months). The children used auditory-oral methods of communication although two children also utilized signs to support their oral language.

Measures

Demographic Information and Parental Perception of SBR—Demographic information was obtained through the completion of a questionnaire booklet, which parents filled out at their convenience prior to each of their child's scheduled research visits. The data obtained included parent (e.g., age, marital status, household family income) and child (e.g., age at identification of HL, age of enrollment in early intervention) variables. As part of the booklet, parents answered three questions using a Likert-type scale 1-5 that pertained to their perceptions of home literacy experiences. These questions included, "How many minutes per day do you read to your child?" (1 = no time to 5 = >30 minutes), "To what extent is it easy to read to your child daily?" (1 = very difficult to 4 = very easy), and "To what extent does your child seem to enjoy looking at storybooks with you?" (1 = not at all to 5 = extremely). The mean score for each item was used in the data analyses.

Parent-Child SBR Interactions—Parents and their children were videotaped during a storybook interaction. For the interaction at 12 months, parents and their children were provided with three picture books that included *Where's Spot?* (Hill, 1980), *What Shall We Do With the Boo Hoo Baby* (Cowell & Godon, 2000), and *That's Not My Puppy: It's coat is too hairy* (Watt, 2009). At 24 months and 36 months, parents and their children were provided with two books without words: *Umbrella* (Franson, 2007) and *A Boy, a Dog, and a Frog* (Mayer, 2003). Parents were instructed to "read with your child as you would normally do at home when you have free time". They could choose either book to begin and then

continue with the other book(s) when they finished with the first book. The picture books were selected purposefully to engage young children's developmental interests (Pierrousakos & DeLoache, 2003). The wordless picture books were selected to elicit parental linguistic input and child language. Similar books have been used in prior parent-child interaction studies with young children with NH (DeTemple & Snow, 1996; Weizman & Snow, 2001) and with HL (DesJardin & Eisenberg, 2007). The parent-child interactions were conducted in a quiet playroom. Interactions were videotaped using a digital camera (Canon Optura 30) mounted on a shelf in the playroom. Parents wore a SHURE Brothers Wireless Microphone and were seated near the child on either a carpeted or soft tiled floor. An omnidirectional boom microphone centrally fixed to the ceiling of the room also was used to ensure optimal acoustic information for the recordings. The researcher ended the SBR interactions only after the allotted time of ten minutes or if a child wanted to leave the room.

Preschool Language Scale - Fourth Edition (PLS-4) (Zimmerman, Steiner, & Pond, 2002)—At all three time points, the children were administered the Preschool Language Scale-4 (PLS-4) by certified speech-language pathologists with extensive experience testing young children with HL. The PLS-4 is a standardized psychometrically sound instrument constructed to assess receptive and expressive language skills over time in children from birth to 6 years 11 months (Zimmerman & Castilleja, 2005). The test is individually administered and includes tasks that assess skills in the areas of preverbal behaviors, as well as linguistic skills in the areas of semantics, morphology, syntax, and integrative language skills to measure auditory comprehension and expressive communication in young children. The PLS-4 is commonly used with children in NH populations and children with HL (Ching et al., 2010; DesJardin et al., 2014; Fitzpatrick et al., 2007). Children's Auditory Comprehension (AC) and Expressive Communication (EC) language standard scores (SSs) were used in all analyses.

Procedures

Recruitment—Recruitment and testing for parents and children were conducted at two research sites as part of the larger DABCHL investigation. Both sites received Institutional Review Board approval for this study. Families and their children with HL from birth to age 18 years are seen at these sites for a range of comprehensive services for children with HL that include diagnosis, audiological testing, and speech-language therapy follow-up services. Parents and their children with HL were recruited from the clinical population (e.g., computer generated lists, clinician referrals, posted fliers, child find programs). The children with NH were siblings of children with HL who participated in other studies conducted at the research sites, were children of professionals working at one of the sites, or were recruited from outside the center through advertisements.

Data Preparation

Transcription and reliability—All parent and child speech, vocalizations, and signs produced were transcribed verbatim by research assistants under the direction of the first and second authors using the Codes for the Human Analysis of Transcripts (CHAT) transcription system (CLAN program; MacWhinney, 2000). The transcriptions were analyzed for parents'

use of lower- and higher-level FLT's using the *Codes for Facilitative Language Techniques* (DesJardin & Eisenberg, 2007) (see Table 3 for a description of each FLT). Proportional scores for each FLT were calculated and used in the analyses so that less talkative, yet very responsive parents were not penalized. Proportional data were calculated by dividing the total number of occurrences for each language technique by the overall number of parents' linguistic attempts.

The videotaped interactions were analyzed using the *Responsive Adult-Child Engagement During SBR* (RACED-SBR) scale (DesJardin, 2011; see Appendix A). This scale was designed specifically to measure parent and child behaviors that have been shown to predict oral language development in populations of young children with NH. An in-depth adaptation of the *Adult-Child Interactive Reading Inventory* (DeBruin-Parecki, 2008), geared for preschool-aged children, the RACED-SBR targets more specific behaviors that may better relate to oral language skills in younger children (infants and toddlers). The RACED-SBR scale consists of four sections: (1) adult and child *engagement* (six adult behaviors and five child behaviors), (2) adult *literacy strategies* (four adult behaviors), (3) adult *teacher techniques* (five adult behaviors), (4) adult and child *interactive reading* (five adult behaviors and seven child behaviors), and (5) child *guided reading* (five child behaviors) (see Appendix A for each subscale item). For the videotaped interactions, the first author and her research assistants rated each adult and child item on a Likert-type scale ranging from 0 “*no evidence*” (i.e., no evidence of parent behavior), to a 3 “*most of the time*” (i.e., four or more times during the interaction). A total mean score for each parent and child SBR subscale was calculated and used in the analyses. Cronbach coefficients for each subscale suggested high internal consistency for each subscale (ranging from 0.88 to 0.92).

To establish inter-rater agreement of transcription and coding for FLT's at 12 months, a second research assistant transcribed in full 20% of the randomly selected videotaped data. This included eight parent-child NH dyads and four parent-child HL dyads. The calculation of word-by-word correspondence yielded a high reliability between transcribers, ranging from 88 to 93% agreement for parents' and children's intelligible verbal utterances. Inter-rater agreement for FLT's at 12 months was 90 to 94%. Coding of SBR behaviors consisted of the same 20% samples and ranged from 90 to 92% agreement for SBR behaviors at each time point. The use of a high-quality wireless microphone, initial transcriber training and ongoing transcription and coding review may have positively influenced the reliabilities obtained.

Results

Preliminary Analyses

Parental and child demographic data—Family income level and parent education level were not significantly related to the main outcome variable (spoken language skills) at 36 months for either the group of children with HL or the group with NH. For children with HL, child factors such as, age at identification, degree of hearing loss, and age at entry into early intervention were also not significantly associated with the receptive (AC) and expressive (EC) language standard scores (SSs). Thus, these family and child factors were not included in the subsequent analyses. For both groups of parents, there were also no

significant differences between those parents who documented that they spoke a second language and parents who reported English-only homes for any of the home literacy environment factors, nor for parent or child SBR behaviors. There were no significant differences in spoken language skills at 36 months of age between groups of children who spoke a second language in the home and children who spoke English-only.

Children's oral language skills—Independent sample t-test statistics for children's receptive (AC) and expressive (EC) language standard scores on the PLS-4 are reported in Table 4 for all three time points. No significant differences emerged between the two groups for either the AC or EC SSs at 12 months of age. However, similar to results from the larger group of participants in the overall DABCHL investigation (Stika et al., 2014), significant differences were evident between groups for both AC and EC SSs at 24 and 36 months of age. Overall, the group of young children with NH demonstrated significantly higher spoken language skills (both AC and EC) at 24- and 36-months compared to the children with HL.

Length of SBR interaction—There were no significant differences between groups in terms of length of SBR interactions at each time point (12 months: HL = mean 4.75 minutes; NH = mean 4.44 minutes, 24 months: HL = mean 7.32 minutes; NH = mean 7.00 minutes, and 36 months: HL = mean 9.38 minutes, NH = mean 9.17 minutes). Both groups of parents and their children were involved with the storybooks approximately 4 minutes at 12 months, 7 minutes at 24 months, and 9 minutes at 36 months of age.

Between-Group Analyses

Research Question 1

Are there differences between groups of parents of young children with and without HL in terms of perceived home literacy environment at 12, 24, and 36 months of age?

A series of 2 (child hearing status) $\times$ 3 (time points) repeated measures analyses of variance (ANOVAs) was utilized to investigate main effect of time, main effect of groups, and interaction between time and group for the three items of parents perceived home literacy environment. To minimize the chances of Type I errors in the ANOVA results where main interaction effects were evident, Bonferroni corrections were applied to the post hoc analyses.

For *ease of reading stories to child*, significant effects were evident for both time ($F = 19.95$; $p = .000$, $\eta^2 = .540$) and group ($F = 4.19$; $p = .048$, $\eta^2 = .107$). No significant interaction between time and group was evident ($F = 2.51$; $p = .122$, $\eta^2 = .067$). Although both groups of parents increased their perception for *ease of reading stories to child* over time, further analyses revealed significant differences between groups at 24 months ($F = 4.21$; $p = .051$). Parents of children with HL perceived reading to their children at 24 months more difficult than parents of children with NH. In fact, 93.8% of the parents of children with HL at 24 months indicated *some difficulty to very difficult* whereas only 73.5% of parents of children with NH indicated *some difficulty to very difficult* on a five-point Likert-type scale.

For *minutes per day reading with /child*, no significant differences were evident for group ($F = 1.89$; $p = .180$, $\eta^2 = .066$) or time $\times$ group interaction ($F = .468$; $p = .500$, $\eta^2 = .017$).

However, significant effects were noted for time ($F = 6.82$; $p = .015$, $\eta^2 = .202$). Specifically, both groups of parents of children with and without HL mean scores significantly increased over time in terms of their perception of minutes per day reading with their child.

For *how much child enjoys storybook reading*, no significant differences were evident for group ($F = .245$; $p = .625$, $\eta^2 = .009$) or time $\times$ group interaction ($F = .340$; $p = .713$, $\eta^2 = .012$). However, significant effects were noted for time ($F = 7.53$; $p = .003$, $\eta^2 = .367$). Specifically, both groups of parents of children with and without HL significantly increased mean scores over time in terms of their perception of how much the child enjoys storybook reading.

Research Question 2

Do parent and child SBR behaviors increase across time within each group and are there differences between groups (HL and NH) at each time point?: A series of 2 (child hearing status) $\times$ 3 (time points) repeated measures analyses of variance (ANOVAs) was utilized to investigate main effects of time, main effects of group, and time $\times$ group interactions for parent and child SBR behaviors (see Table 5 for mean scores and group comparisons for each parent and child SBR behavior across time points). To minimize the chances of Type I errors in the ANOVA results where main interaction effects were evident, Bonferroni corrections were applied to the post hoc analyses.

Across time points: Significant differences were evident between time points for parent behaviors in terms of *engagement* ($F = 5.87$; $p = .005$, $\eta^2 = .203$), *literacy strategies* ($F = 36.53$; $p = .000$, $\eta^2 = .624$), *teacher techniques* ($F = 13.35$; $p = .000$, $\eta^2 = .372$), and *interactive reading* ($F = 13.56$; $p = .000$, $\eta^2 = .376$). A significant interaction was evident between time and group for *engagement* ($F = 4.65$, $p = .036$, $\eta^2 = .090$) and *literacy strategies* ($F = 4.44$, $p = .018$, $\eta^2 = .168$). Significant group differences were evident at 12 months ($F = 5.06$, $p = .029$) and 36 months ($F = 11.00$, $p = .002$) for *engagement* and at 36 months ($F = 9.08$; $p = .004$, $\eta^2 = .10$) for *literacy strategies*. Further post hoc analyses utilizing Bonferroni correction revealed that parents of children with NH provided their children with more *engagement* behaviors at 12 and 36 months and more *literacy strategies* at 36 months than parents of children with HL.

Group differences: No significant group main effects were evident for parent SBR behaviors in terms of *engagement* ($F = .531$; $p = .470$, $\eta^2 = .011$), *literacy strategies* ($F = .262$; $p = .611$, $\eta^2 = .006$), or *teacher techniques* ($F = 1.14$; $p = .291$, $\eta^2 = .024$). However, group differences emerged for *interactive reading* ($F = 5.14$; $p = .028$, $\eta^2 = .100$). Specifically, significant main effects emerged between groups at 12 months ($F = 10.14$; $p = .003$) and 36 months ($F = 8.47$; $p = .006$). Further post hoc analyses utilizing Bonferroni correction revealed that parents of children with NH provided their children with significantly more *interactive reading* behaviors than parents of children with HL at 12 and 36 months of age.

In terms of child SBR behaviors, both groups of children increased in all three SBR behavior subscales across time points; *engagement* ($F = 11.02$, $p = .000$, $\eta^2 = .334$), *interactive reading* ($F = 23.26$, $p = .000$, $\eta^2 = .508$), and *guided reading* ($F = 25.02$, $p = .000$, $\eta^2 = .526$).

As child age increased, both groups of children significantly increased their SBR behaviors. No significant time $\times$ group interaction was evident for each of the child SBR subscales. Significant differences were noted between groups at 36 months ($F = 4.81$, $p = .033$) for the SBR subscale, *guided reading* (see Table 5). Further item analyses using independent samples tests revealed that preschool age children with HL scored lower for specific items, *points to/comments on pictures* ($HL = 1.75$; $NH = 2.00$; $t = .901$, $p = .018$), *displays positive nonverbal feedback* ($HL = 2.19$; $NH = 2.39$; $t = .793$, $p = .022$), and *displays overall enjoyment of SBR interaction* ($HL = 2.63$; $NH = 2.85$; $t = 1.26$, $p = .007$) compared to children with NH at 36 months.

Classical eta-squared values typically range from .01 to .09 in social science research (Richardson, 2010). As reported by Richardson (2010), for partial eta-squared values, .01 is considered to be a small effect size, .06 a medium effect size, and .14 a very large effect size. Therefore, for parent SBR behaviors, *interactive reading* (12 and 24-months) are considered a medium effect size and *literacy strategies* (36-months) is approaching a large effect size. For child SBR behaviors, *guided reading* (36-months) is considered a medium effect size. Overall, parents of toddlers with NH scored higher in terms of *interactive reading* behaviors and parents of preschoolers with NH scored higher in terms of *literacy strategies* compared to parents of children with HL. Children with NH at 36 months scored higher in *guided reading* compared to their peers with HL.

Parental FLTs (12 months only)—Independent sample t-tests were performed to compare group means using proportional scores for lower level and higher level FLTs (see Table 6). No significant differences were seen between the groups of parents in terms of parent total utterances during SBR and proportional scores for lower and higher level FLTs. Significant differences were only noted between groups for *linguistic mapping* ($t = -1.69$; $p = .017$).

Research Question 3

For young children with and without HL, are there relationships between early perceived home literacy environment experiences, SBR behaviors, and FLTs during storybook interactions at 12 months and children's later spoken language skills at 36 months?: A series of Pearson product-moment correlations were conducted to explore the relationships between home literacy environment factors, FLTs at 12 months, and SBR behaviors with children's AC and EC language SSs at each time point, for both groups of parents and their children with HL (see Table 7) and with NH (see Table 8).

As shown in Table 7, for parents of children with HL, no significant relationships were found between 12 month variables and 24 month language skills. However, significant associations were evident between 12 month factors and 36 month AC language outcomes including; *child enjoyment for SBR* ($r = 0.51$; $p < .05$), *parent engagement* ($r = 0.54$; $p < .05$), *teacher techniques* ($r = 0.50$; $p < .05$), and higher level FLTs ($r = 0.65$; $p < .01$). Similarly, 12 month variables positively related to 36 month EC language outcomes included; *child enjoyment* ($r = 0.60$; $p < .05$) and *interactive reading* ($r = 0.54$; $p < .05$). Secondly, 24 month variables positively related to AC and EC outcomes at 36 months included; *frequency of*

book reading ($r = 0.54$; $p < .05$, $r = 0.61$; $p < .05$, respectively), *ease of reading to child* ($r = 0.53$; $p < .05$, $r = 0.58$; $p < .05$, respectively), *parent engagement* ($r = 0.56$; $p < .05$ for AC only) and *literacy strategies* ($r = 0.54$; $p < .05$ for AC only). Significant strong positive relationships were also evident at 36 months for all of the parent SBR behaviors and children's language skills at 36 months, ranging from $r = 0.60$; $p < .05$ to $r = 0.80$; $p < .01$.

As shown in Table 8, for parents of children with NH, only one significant relationship was shown between 12 and 24 month home literacy environment or parent SBR variables and either 24 or 36 month language outcomes. A significant positive relationship was evident for child enjoyment at 12 months and AC language skills at 24 months ($r = 0.45$; $p < .05$). However, many significant associations were evident between 36 month factors and 36 month child language outcomes. More specifically, a significant positive relationship was found between *frequency of SBR* at 36 months and AC and EC skills at 24 and 36 months, *ease of reading* at 36 months and child AC at 24 months and EC at 36 months, and *child enjoyment* at 36 months and child EC language skills at 36 months old for the group of parents and their children with NH.

Relationships were also explored between children's language skills at each time point. Correlations between children's AC and EC language SSs at 12 months and AC and EC at 36 months did not reach significance for either the group of children with or without HL. Significant relationships were evident between AC and EC at 24 months and AC and EC at 36 months, ranging from $r = 0.63$; $p < .05$ to $r = 0.84$; $p < .01$ for children with HL (see Table 7) and ranging from $r = 0.55$; $p < .01$ to $r = 0.73$; $p < .01$ for children with NH (see Table 8).

Discussion

This longitudinal study examined the differences between two groups of parents and their young children with and without HL in terms of perceived home literacy environment experiences (e.g., frequency of book reading, ease of reading books to their children) and observed parental SBR behaviors across three time points (12, 24, and 36 months). Overall, consistent with research findings regarding parents of typically developing children with NH (Trivette et al., 2010), as child age increased, parent and child SBR behaviors increased as well. However, significant group differences for parent SBR behaviors were evident by 24 months of age. We further investigated the relationships between early factors such as parental perceived home literacy environment experiences, and observed SBR behaviors and FLTs, and spoken language outcomes at 36 months for both groups of very young children with and without HL.

Our first research question examined parents' perceptions of home literacy environment experiences between groups across three time points. Overall, both groups of parents of children with and without HL indicated an increase in frequency of book reading, ease of reading storybooks to child, and *child enjoyment of storybook reading* over three years. Although no differences were noted for any of the perceived home literacy factors when the children were 12 and 36 months, significant differences were evident between groups at 24 months in terms of parents' perception of *ease of reading storybooks to child*. In fact, 93.8% parents of children with HL, as compared to 71.4% for parents of children with NH,

indicated *some difficulty* to *very difficult* on a five-point scale. There were no significant differences between groups of children in terms of oral language level at 12 months old. However, by 24 months, children with HL in this study had significantly lower spoken language standard scores compared to their NH peers. As highlighted in transactional theories (Chapman, 2000; Sameroff & MacKenzie, 2003), it could be the case that children's oral language skills influenced their parent perceptions and behaviors. For the parents of children with HL in this study, the second year of life may be more challenging as the children begin to display a widening gap in language abilities compared to their peers with NH. In fact, 9 of the 17 children with HL showed a lower standard score at 24 months compared to 12 months as measured by the PLS-4. These findings suggest that decrements in a child's language abilities, as the child matures, may have adversely influenced the parent's perception of difficulty when reading to the child during the SBR session. The significant differences that exist at 24 months in terms of perceived difficulty reading storybooks to their children, however, were not evident at 36 months. It is possible that by this age, the children may have acquired oral language skill level at which parents could be more conversant with their children during SBR.

Our second research question asked whether parent and child SBR behaviors increased over time within each group and if differences emerged between groups across time points. Overall, as child age increased, parents and children in both groups demonstrated more SBR behaviors over time. It could be the case that the types of storybooks, books with words at 12 and 24 months of age versus books without words at 36 months of age, may have influenced the way parents interacted with their children, eliciting more parental linguistic utterances and child spoken language (DeTemple & Snow, 1996; Weizman & Snow, 2001). Utilizing books without words, parents of children with NH displayed significantly more *engagement* behaviors at 36 months. Specifically, in terms of *engagement*, parents of children with NH scored higher for the items; makes continued effort to engage child in interaction and *monitors child comprehension*.

Similarly, parents of children with NH showed more *interactive reading* behaviors when their children were 12 and 36 months old. Particularly, in terms of *interactive reading*, parents of children with NH scored higher for the items: follows child's lead, utilized appropriate speed and volume of speech and *allows time for child to process new information* compared to the parents of children with HL. When the children were 36 months old, parents of children with NH scored significantly higher in the areas of *literacy strategies* compared to parents of children with HL. Specifically, parents of children with NH scored higher in terms of providing their children with more positive verbal feedback, continued effort to engage child and posing and soliciting questions about the storybook to monitor child's comprehension. As in other populations of children with NH within SBR contexts (Abraham et al., 2013; DeTemple, 2001; Price et al., 2009), parents of children with NH in this study may have adjusted their linguistic input (e.g., soliciting questions to monitor comprehension) and behaviors (e.g., allowed more overall wait time for the child to process the new information) to their age-appropriate language skilled toddler and preschool-age children.

On the other hand, similar to findings with hearing parents of children with HL (DesJardin et al., 2014; Koester et al., 2000; Lederberg & Everhart, 2000), parents in this study may be intuitively adjusting their linguistic input to their infants and toddlers who demonstrated significantly lower oral language skills by providing their children with less literacy strategies (e.g. use of questioning) and more lower level FLT's (i.e., linguistic mapping) than children with higher language abilities. Indeed, significant differences were noted in terms of parents' FLT's at 12 months for parents' use of linguistic mapping. Parents of children with HL were providing their infants with more utterances comprised of linguistic mapping (parent states or interprets child's vocalization that was not recognizable as a word or phrase) compared to parents of infants with NH. These same strategies have been documented as facilitative techniques for language development in populations of younger children with NH (Trivette et al., 2010; Wasik & Iannone-Campbell, 2013) and with specific communication challenges (Girolametto et al., 2002; Yoder et al., 2001). Similar to findings of parents with infants with HL (Ambrose, Walker, Unflat-Berry, Oleson, & Moeller, 2015) and infants with NH in at risk populations (Abraham et al., 2013), parents in this study may have intuitively tailored their interactions with their very young children who displayed limited language skills.

Moreover, children with NH at 36 months were also demonstrating more guided reading behaviors (e.g., pointing to and commenting on pictures, overall enjoyment of SBR experience) during storybook sharing with their parents than their peers with HL. Accordingly, preschool-age children with NH who overall demonstrated oral language skills within a typical developing range were also able to point to and comment on the pictures in the book and thus, displayed more enjoyment for the interaction and more two-way conversations with their parents compared to the overall group of children with HL.

Our third research question explored the relationships between early factors at 12 months (e.g., home literacy environment, observed SBR behaviors) and children's AC and EC language scores at 36 months old in the group of parents and their children with and without HL. Similar to research with young children with NH (Karrass & Braungart-Rieker, 2007), significant relationships emerged between *frequency of book reading* at 36 months and children's AC and EC language skills at 24 and 36 months for parents and their young children with NH in this study. Additionally, children's AC and EC language skills at 24 months were positively related to *ease of reading* at 36 months. No significant relationships emerged between any of the parent early SBR behaviors and later child language scores for parents and children with NH.

Several significant associations were evident for the group of parents and their young children with HL. Similar to parents and their children with NH, *frequency of book reading* at 24 months was positively related to children's AC and EC language scores at 36 months for parents and their children with HL. *Ease of reading* to the children at 24 months was also positively related to children's AC and EC language scores at 36 months. Although it appears from prior analyses reported in this paper that 93.8% parents of children with HL perceived reading storybooks to their children *somewhat to very difficult*, *parent perception of ease of reading* positively relates to language outcomes for this population of parents and their children with HL. Parents' perceived child enjoyment of SBR at 12 months was also

positively related to children's AC and EC language scores at 36 months. It could be the case that children who enjoy storybooks as infants are also read to often and this activity is important to their language growth over time. Yet, the sheer amount of book reading is critical as the children become toddlers. Although we cannot infer causation (a limitation in correlational analyses), if a parent perceives that reading storybooks to their child is difficult, SBR experiences may be limited with the child, and thus, limited SBR experiences could possibly impact the child's language development.

Additionally, whereas observed SBR parent behaviors (*engagement, teacher techniques, and higher level FLT*s) at 12 months were positively related to AC language scores, *interactive reading* at 12 months was positively associated with children's EC language scores at 36 months. Similar to recent research in a young population of children with HL (DesJardin et al., 2014), positive relationships were evident between parents' use of positive verbal feedback and continual attempts to maintain close proximity with their infants during shared book reading interactions and preschool age AC language scores. Additionally, intentional book reading techniques, such as relating the content of the book to the infant's prior experiences and soliciting predictions throughout the storybook, are essential for preschool age children's EC language outcomes. Moreover, as in populations of infants with cochlear implants (Cruz et al., 2012), although many of the parents in this study were utilizing more linguistic mapping to support their infants with HL than parents of children with NH, specific higher level techniques (e.g., parallel talk and expansions) at 12 months seemed to better support their children's AC language skills at 36 months. Further, similar to populations of very young children with NH (Trivette et al., 2010; Wasik & Iannone-Campbell, 2013; Zevenbergen & Whitehurst, 2003; Zimmerman et al., 2009), higher expressive language scores at 36 months were positively related to parents' use of *interactive reading* behaviors at 12 months, such as providing their infants with opportunities to hold the book, responding to child's vocalizations, and following the child's lead (e.g., parallel talk), while *parent engagement* behaviors such as continued effort to engage child in storybooks and *literacy strategies* such as poses questions about the storybook at 24 months also were positively related to children's AC language scores at 36 months for parents and their children with HL.

Other Limitations and Future Research Directions

One limitation of this study concerns the small sample sizes of parents and their children with HL, resulting in reduced statistical power. Some of the families of children with HL who entered the study when the child was 12 months of age withdrew over the course of the study for a variety of reasons. Due to the smaller sample size for parents and children with HL, statistical analyses were limited. It is possible that other early child (e.g., type of early intervention) and family (e.g., perceived parental stress) factors may have a stronger influence on later spoken language skills in this young population of children. Validation of the findings of this study in a larger sample of parents of children with HL will be useful in future research.

In addition, as mentioned earlier, children with NH in this study demonstrated significantly higher spoken language skills than the children with HL at the 24- and 36- month testing

points. It is important to note, however, that although the range of language skills varied within the group of children with HL, mean scores were approaching or in the range of normal performance at 24 months (AC mean SS = 88.6; EC mean SS = 95.7) and at 36 months (AC mean SS = 95.7; EC mean SS = 93.1). It could be the case that the children with HL may not have differed significantly from the children with NH at 36 months of age if more of the NH children were in the average range rather than in the above-average range.

Moreover, self-report measures of parents' perceptions (e.g., perceived home literacy experiences) should be used with caution (Akey, Marquis, & Ross, 2000). However, parent questionnaires offer researchers and practitioners valuable information to describe parents' perception of a given situation (home literacy experiences) that may advance our understanding of the relationships between perception and observed behaviors. Furthermore, some families of both the HL and NH group indicated that they spoke a second language in the home. It could be the case that parents who speak another language in the home may feel less comfortable reading and talking to their children in front of cameras, if they are not fluent in English. Further research is warranted to investigate home literacy practices within the families' home environment. In addition, it may be fruitful to explore other child and family factors at various time points and parents' perceived home literacy experiences and SBR behaviors in a much more diverse sample of parents and their young children with various cultural backgrounds (McNaughton, 2006).

Implications for Practitioners

Best practices for professionals working with families of children with HL are to support families in creating optimal language learning environments for their young children (Joint Committee on Infant Hearing, 2013; Moeller, Carr, Seaver, Stredler-Brown, & Holzinger, 2013). Important findings from this study shed light on recommendations and practices for professionals working with young children with HL and their families in early intervention (EI). For example, results from this study indicated that overall language skills at 12 months (based on the PLS-4) appeared similar between the two groups. However, at 24 months, overall language skills appeared to be more divergent. This finding is not unexpected because language skills at 12 months are not well solidified, and even for language measures which may have predictive validity for children tested at older ages, many measures lack precision for one year olds (Xue, Bandel, Vogel & Boller, 2015). Being aware of this possibility informs professionals to view language outcomes cautiously at such an early age. Parents must be counseled carefully about common patterns of language development, the children's specific therapy needs, and skills that will need to be strengthened over time to support their child's language development.

The first three years of life post-identification of HL is a critical time for parents and caregivers as they adjust to the new knowledge gained about an infant with a HL and ways to best support their child's language acquisition. During this time, parents may be feeling overwhelmed (e.g., increased caregiving demands, choice of communication modality) and experience stressful situations (e.g., finding and obtaining early intervention services) (Lederberg & Golbach, 2002; Quittner et al., 2010). All of the parents of children with HL in this study indicated some level of difficulty reading storybooks to their young toddlers. By

this developmental stage, some of the children were demonstrating significant delays in spoken language skills compared to their peers with NH. Additional support and guidance from professionals in EI and speech-language pathology may be needed for families of 24-month old children with HL to guide families in creating the optimal listening and learning environment while reading storybooks to their children.

Findings from this study also provide strong, albeit not absolute, evidence from naturalistic SBR observations that strategies embedded into storybook interactions may need to be intentionally taught to parents and supported while caregivers are reading with their young children with HL. Parents' perceptions of their children's enjoyment of SBR when the children were infants were significantly related to their children's preschool language outcomes. Overall, SBR needs to be an interactive activity when the child is ready for listening and learning. Strategically setting up the listening and learning environment to promote SBR times when the parent and child with HL can both enjoy the interaction is crucial (Lartz & Meehan, 2014). When parents keep the child's social-emotional well being in mind during SBR, children are apt to be more engaged with the books (Bus, 2003).

Furthermore, parent SBR behaviors and FLT's may need to be explicitly modeled for some parents of infants with HL, with planned time to practice strategies embedded in their home SBR routines. For instance, parent SBR engagement behaviors (e.g., close proximity to child, provide positive feedback) need to be encouraged, while interactive techniques (e.g., give child opportunity to hold book, respond to child vocalizations) and higher level facilitative techniques (e.g., parallel talk, open-ended questions) can be intentionally demonstrated and reinforced during SBR events for young children with HL (DesJardin & Ambrose, 2010; Friedman, Woods, & Salisbury, 2012; Hanft, Rush, & Shelden, 2004, Lartz & Meehan, 2014). By the time children reach their second birthday, they may be more at risk for language delays and this may also impact how a parent interacts with their child. Thus, SBR behaviors and FLT's demonstrated by EI professionals before 24-months may be crucial. Specific SBR behaviors such as ways to sustain a child's interest and attention, and opportunities for a child to hold the book while listening and responding to the story are important to embed in SBR experiences (Gardner-Neblett & Gallagher, 2013). For young active children with HL, breaking the shared reading sessions into smaller segments during the day and allowing more wait time between questions is also important. Furthermore, results from this study suggest that by the time children with HL reach 36 months of age, they may show less enjoyment for SBR interactions with their parents than do their peers with NH. Therefore, the early years represent a critical time for parents to build early connections with storybooks that involve their children in positive and constructive ways. Multiple, enjoyable, SBR opportunities support an optimal language-learning environment for parents to guide their young children with HL in developing spoken language skills.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Demographic Characteristics of Parents

Parent Characteristics		Hearing Loss (<i>n</i> = 17)	Normal Hearing (<i>n</i> = 34)
Age in years <i>M</i> (<i>SD</i>)		31.7 (4.8)	32.3 (5.5)
Range in months		23 - 40	19 – 43
Gender <i>n</i> (%)	Fathers	0 (0.0%)	2 (5.9%)
	Mothers	17 (100.0%)	32 (94.1%)
Race <i>n</i> (%)	Caucasian	11 (65.6%)	29 (87.6%)
	African-American	2 (11.8%)	3 (8.6%)
	Asian	2 (11.8%)	1 (2.9%)
	Other	2 (11.8%)	1 (2.9%)
Ethnicity <i>n</i> (%)	Hispanic	4 (25.0%)	4 (11.5%)
	Non-Hispanic	13 (75.0%)	30 (88.5%)
Highest education level			
	High School	1 (5.9%)	3 (8.8%)
	Some College	7 (41.2%)	8 (22.5%)
	College Degree	7 (41.2%)	17 (51.0%)
	Postgraduate	2 (11.8%)	6 (17.7%)
Household annual income			
	\$49,000	4 (23.6%)	12 (35.3%)
	\$50,000	7 (41.1%)	13 (38.3%)
	\$100,000	6 (35.3%)	9 (26.5%)
Marital Status	Married	13 (76.5%)	24 (71.4%)
	Single or Living w/partner	3 (17.7%)	10 (28.6%)
	Divorced	1 (5.9%)	0 (0.0%)

Table 2

Demographic Characteristics of Children

Children Characteristics		Hearing Loss (<i>n</i> = 17)	Normal Hearing (<i>n</i> = 34)
Age in months <i>M</i> (SD) at Time point 1		13.5 (1.63)	12.9 (1.37)
Range in months		11 - 16	10 - 19
Gender <i>n</i> (%)	Male	9 (52.9%)	16 (47.1%)
	Female	8 (47.1%)	18 (52.9%)
Race <i>n</i> (%)	Caucasian	11 (64.7%)	29 (85.3%)
	African-American	1 (5.9%)	2 (5.7%)
	Asian	2 (11.8%)	1 (2.9%)
	Other	2 (11.8%)	2 (5.7%)
Ethnicity <i>n</i> (%)	Hispanic	5 (29.4%)	7 (20.0%)
	Non-Hispanic	11 (31.6%)	27 (80.0%)
Bilingual home	Yes	6 (35.3%)	5 (14.7%)
	No	11 (64.7%)	29 (85.3%)
Newborn Hearing Screening <i>n</i> (%)		15 (88.2%)	
Hearing Loss <i>n</i> (%)			
Mild (PTA-4 = 21-39 dB)		6 (35.3%)	
Moderate (PTA-4 = 40-54 dB)		4 (23.5%)	
Moderate to Severe (PTA-4 = 55-69 dB)		6 (35.3%)	
Severe (PTA-4 = 70-89 dB)		1 (5.9%)	
Age Identified with Hearing Loss <i>M</i>		1.9 months	
Range in months		(birth – 4)	
Age at Hearing Aid Use <i>M</i> (range)		5.2 months	
Range in months		(1 – 10)	
Age of enrollment in Early Intervention		5.0 months	
Range in months		(3 – 10)	
PTA-4 unaided		50.37 (35-76)	

PTA-4 = Pure tone average threshold (hearing level from 500 Hz to 4000 Hz for both ears).

Table 3

Description and Examples for each Facilitative Language Technique (FLT)

Facilitative Language Techniques	Description	Example
Lower-Level FLTs		
Linguistic mapping	Putting into words or interpreting the child's vocalization that is not recognizable as a word.	Child looks at book and vocalizes —mother says, “doggie.”
Comments	Statement or phrase that signals that a message has been received or an utterance to keep conversation going.	Mother says, “yeah!” or “good job.”
Imitation	Repeating verbatim the child's preceding vocalization without adding any new words.	Child says, “baby” and mother says, “yes baby.”
Label	Stating the name for a toy, picture, or object.	Father says, “There is a doggie.”
Directive	Tells or directs child to do something.	Mother says, “Look!” or “Sit down here.”
Closed-ended question	Stating a question in which the child can only answer with a one-word response.	Father asks child, “Is that your favorite book?”
Higher-Level FLTs		
Parallel Talk	Parent talks aloud about what the child is directly doing, looking at, or referencing.	Child is looking directly at a the picture of a frog and parent says, “The frog is hiding.”
Open-ended question	Parent provides a phrase/question in which the child can answer using more than one word.	While looking at the storybook, parent says, “What is happening in this picture?”
Expansion	Parent repeats child's verbalization providing a more grammatical and complete language model without modifying the child's word order or intended meaning.	Child says, “baby cry” and the caregiver says, “The baby is crying.”
Expatiation	Same as Expansion, but parent adds new information to the child's utterance.	While looking at the picture – child says, “swim water” and mother says, “Yes, we are going swimming at the beach. This summer we are going to the beach.”
Recast	Caregiver restates the child's verbalization into a question format.	Child says, “puppy gone” and the caregiver says, “Is the puppy gone?”

Table 4

Summary Scores for Children's Oral Language Skills for 12, 24, and 36 months

	HL (n = 17) <i>M (SD)</i>	NH (n = 34) <i>M (SD)</i>	F-scores	P-values
12 months				
AC Standard Score <i>M (SD)</i>	94.1 (10.65)	97.0 (10.37)	.039	.344
AC Standard Score <i>range</i>	73 – 121	90 – 121		
EC Standard Score <i>M (SD)</i>	102.7 (14.34)	108.4 (9.54)	4.72	.095
EC Standard Score <i>range</i>	77 – 128	92 – 137		
24 months				
AC Standard Score <i>M (SD)</i>	88.6 (15.09)	101.4 (14.16)	.291	.005
AC Standard Score <i>range</i>	61-118	77 – 136		
EC Standard Score <i>M (SD)</i>	95.7 (14.70)	104.1 (13.81)	.088	.055
EC Standard Score <i>range</i>	66-124	73 – 129		
36 months				
AC Standard Score <i>M (SD)</i>	95.7 (20.84)	110.4 (12.44)	5.00	.003
AC Standard Score <i>range</i>	50 – 129	81 – 142		
EC Standard Score <i>M (SD)</i>	93.1 (16.59)	110.9 (13.66)	.580	.000
EC Standard Score <i>range</i>	55-119	77 – 138		

AC = PLS-4 Auditory Comprehension; EC = PLS-4 Expressive Communication

Table 5

Summary statistics and between group comparisons for parent and child SBR subscales across three time points

	HL (n = 17) <i>M (SD)</i>	NH (n = 34) <i>M (SD)</i>	<i>F-scores</i>	<i>P-values</i>	<i>Eta-squared</i>
Parent SBR Behaviors					
Engagement T1	12.71 (3.95)	12.09 (3.28)	3.82	.060	.01
Engagement T2	12.41 (3.66)	12.75 (2.82)	3.59	.064	.01
Engagement T3	13.12 (3.81)	14.94 (1.89)	11.00	.030	.06
Literacy Strategies T1	5.80 (3.63)	4.97 (2.31)	6.70	.013	.07
Literacy Strategies T2	6.94 (3.26)	7.64 (2.68)	1.74	.193	.00
Literacy Strategies T3	7.76 (2.53)	10.00 (2.21)	9.09	.004	.10
Teacher Techniques T1	3.13 (3.73)	1.74 (2.26)	11.58	.109	.03
Teacher Techniques T2	3.24 (3.14)	3.19 (2.25)	5.68	.951	.02
Teacher Techniques T3	5.41 (4.19)	4.45 (3.12)	3.05	.362	.00
Interactive Reading T1	8.06 (4.98)	9.62 (2.65)	10.14	.003	.10
Interactive Reading T2	9.50 (4.35)	11.56 (2.50)	3.60	.064	.05
Interactive Reading T3	11.58 (3.5)	12.78 (2.36)	8.47	.006	.10
Child SBR Behaviors					
Engagement T1	10.60 (4.89)	9.76 (3.19)	6.32	.479	.03
Engagement T2	11.94 (3.65)	11.44 (3.58)	.049	.644	.00
Engagement T3	13.53 (2.35)	12.84 (2.54)	.000	.361	.00
Interactive Reading T1	2.10 (1.92)	1.68 (1.14)	.263	.655	.00
Interactive Reading T2	3.23 (2.26)	4.00 (2.81)	.048	.384	.00
Interactive Reading T3	5.29 (3.98)	6.50 (3.76)	1.02	.301	.00
Guided Reading T1	4.75 (3.69)	5.06 (2.68)	3.74	.787	.02
Guided Reading T2	7.05 (3.26)	7.59 (3.45)	.001	.602	.00
Guided Reading T3	8.17 (3.74)	10.03 (2.40)	4.28	.040	.07

Table 6

Summary statistics and group comparisons for parental facilitative language techniques at 12 months

	HL (n = 17) <i>M (SD)</i>	NH (n = 34) <i>M (SD)</i>	<i>F-scores</i>	<i>P-values</i>	<i>Eta-squared</i>
Total Parent Utterances	104.21 (40.28)	79.91 (41.78)	.049	.071	.00
Proportional Score for Higher Level FLTs	.28 (.14)	.31 (.20)	3.29	.09	.01
Open-ended question	.09 (.13)	.08 (.10)	1.29	.639	.03
Expansion	.00 (.00)	.00 (.00)	.933	.642	.03
Expatiation	.00 (.00)	.00 (.00)	1.91	.524	.01
Recast	.01 (.04)	.00 (.00)	3.33	.407	.02
Parallel Talk	.19 (.15)	.21 (.13)	1.62	.654	.01
Proportional Score for Lower Level FLTs	.73 (.19)	.72 (.14)	2.37	.862	.00
Closed-ended question	.17 (.11)	.18 (.08)	.471	.612	.02
Imitation	.01 (.02)	.01 (.02)	.434	.363	.01
Labels	.07 (.05)	.05 (.04)	.584	.512	.01
Directive	.20 (.14)	.24 (.14)	.010	.393	.01
Comment	.28 (.10)	.23 (.09)	1.16	.099	.01
Linguistic Mapping	.10 (.02)	.01 (.01)	6.16	.017	.07

Table 7

Correlation Matrix for Home Literacy Environment, SBR Subscales, FLTs (T1) and Children's Language Skills Across Time Points for Parents and their Children with Hearing Loss

Home Literacy Environment, Parent SBR Subscales and FLTs During Storybook Interactions	Children's Language Skills HL (n = 17)					
	Auditory Comprehension			Expressive Communication		
	12m	24m	36m	12m	24m	36m
Home Literacy Environment						
Frequency of SBR (T1)	-.38	-.28	.36	-.17	-.15	.32
Frequency of SBR (T2)	-.20	-.16	.54 *	-.10	.15	.61 *
Frequency of SBR (T3)	-.42	.34	.15	-.28	.19	.26
Ease of SBR with child (T1)	.04	-.10	-.15	.11	-.27	.07
Ease of SBR with child (T2)	-.08	.23	.53 *	-.10	-.25	.58 *
Ease of SBR with child (T3)	.08	.17	.25	-.10	.25	.24
Child Enjoyment of SBR (T1)	-.04	.22	.51 *	-.02	.07	.60 *
Child Enjoyment of SBR (T2)	-.29	.10	.11	-.10	-.12	.38
Child Enjoyment of SBR (T3)	-.14	-.08	-.13	-.10	-.36	-.04
Parent SBR Subscales						
Engagement (T1)	-.01	.40	.54 *	-.12	.12	.35
Engagement (T2)	-.02	.66 **	.56 *	-.07	.52 *	.40
Engagement (T3)	.12	.56 *	.71 **	.07	.46	.60 *
Literacy strategies (T1)	.16	.49	.38	.12	.28	.21
Literacy strategies (T2)	-.03	.75 **	.54 *	-.01	.49	.40
Literacy strategies (T3)	.42	.67 **	.80 **	.40	.56 *	.75 **
Teacher Techniques (T1)	.04	.45	.50 *	-.25	.27	.36
Teacher Techniques (T2)	-.04	.53 *	.41	-.11	.27	.24
Teacher Techniques (T3)	-.02	.43	.65 **	-.20	.35	.41
Interactive Reading (T1)	.41	.34	.33	.42	.38	.54 *
Interactive Reading (T2)	.24	.49 *	.31	.40	.56 *	.40
Interactive Reading (T3)	.50 *	.56 *	.70 **	.54 *	.67 **	.71 **
Lower Level FLTs (T1)	-.03	.22	-.30	.07	-.04	-.29
Higher Level FLTs (T1)	-.09	.27	.65 **	-.22	-.05	.24
PLS AC SS (T1)	-	.19	.23	.78 **	.33	.35
PLS EC SS (T1)	.78 **	.22	.24	-	.44	.50 *
PLS AC SS (T2)	.19	-	.68 **	.22	.84 **	.68 **
PLS EC SS (T2)	.33	.84 **	.63 *	.44	-	.67 **

*** $p < .001$

*
 $p < .05$

**
 $p < .01$

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Table 8

Correlation Matrix for Parent Home Literacy Environment, SBR Subscales, FLTs and Children's Language Skills Across Time Points for Parents and their Children with Normal Hearing

Home Literacy Environment, Parent SBR Subscales and FLT's During Storybook Interactions	Children's Language Skills NH (n = 34)					
	Auditory Comprehension			Expressive Communication		
	12m	24m	36m	12m	24m	36m
Home Literacy Environment						
Frequency of SBR (T1)	-.07	.07	-.17	.26	-.20	-.23
Frequency of SBR (T2)	-.22	.22	.32	-.23	.16	.28
Frequency of SBR (T3)	-.07	.44 *	.44 *	-.01	.34	.47 **
Ease of SBR with child (T1)	.32	-.24	-.17	.26	-.21	-.23
Ease of SBR with child (T2)	.04	-.09	-.13	.01	-.02	-.10
Ease of SBR with child (T3)	.11	.41 *	.33	.00	.41 *	.33
Child Enjoyment of SBR (T1)	-.17	.18	.23	-.08	.36	.31
Child Enjoyment of SBR (T2)	.25	.33	.25	.19	.35	.21
Child Enjoyment of SBR (T3)	.24	.01	.19	.16	.17	.38 *
Parent SBR Subscales						
Engagement (T1)	-.11	.18	.25	-.17	.03	.28
Engagement (T2)	.13	.38	.23	.03	.17	.05
Engagement (T3)	.25	-.07	-.11	-.03	-.15	.00
Literacy strategies (T1)	-.09	-.06	.04	-.05	-.04	-.01
Literacy strategies (T2)	-.13	.08	.04	-.16	.04	-.14
Literacy strategies (T3)	.05	-.04	.15	-.06	-.04	.22
Teacher Techniques (T1)	.36	.13	.15	.30	.03	.13
Teacher Techniques (T2)	-.01	-.02	.02	-.25	.09	.15
Teacher Techniques (T3)	.05	-.18	-.11	-.01	-.14	.07
Interactive Reading (T1)	-.10	.06	.12	-.14	.03	.16
Interactive Reading (T2)	.01	-.11	-.09	-.05	-.04	-.04
Interactive Reading (T3)	-.33	-.30	-.18	-.14	-.25	-.08
Lower Level FLT's (T1)	.19	.26	.32	.28	.19	.10
Higher Level FLT's (T1)	.19	.05	.12	.15	-.12	.10
PLS AC SS (T1)	---	.13	.14	.70 **	.20	.18
PLS EC SS (T1)	.70 **	.05	.04	---	.26	.07
PLS AC SS (T2)	.13	---	.73 **	.05	.69 **	.56 **
PLS EC SS (T2)	.20	.69 **	.62 **	.26	---	.59 **

*** p < .001

* p < .05

** p < .01