Print Referencing Intervention During Shared Storybook Reading for Preschool Children with Hearing Loss

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Print Referencing Intervention During Shared Storybook Reading for Preschool Children with Hearing Loss

by

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ABSTRACT

The purpose of the current study was to evaluate the effectiveness of a print referencing book-reading intervention among children with hearing loss. Two preschool children with hearing loss who are developing listening and spoken language participated in this single subject study. The children participated individually in print referencing book-reading intervention (10 minute session once a week for 7 weeks). Assessment of children’s print knowledge skills occurred at the beginning of each session. Print referencing book-reading intervention was associated with gains in conceptual print knowledge. Further study is needed in this area.
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CHAPTER 1
INTRODUCTION

Literacy outcomes among children with hearing loss are notoriously poor compared to that of their same-aged typically developing peers. Literacy skills encompass reading and writing. Empirical evidence in children with hearing loss indicates that skills in reading have not improved over the past several decades despite advances in technology. The median reading level of children with hearing loss has plateaued on average at the third grade level (Qi & Mitchell, 2012). Writing outcomes are also impaired for children with hearing loss as a group. For example, generally fewer than half of children with cochlear implants score within the average range on measures of writing (Geers & Hayes, 2011). There is a strong need, therefore, for research that seeks to improve literacy outcomes for children with hearing loss.

Emergent Literacy as a Precursor for Literacy

During the emergent literacy period, which begins at birth and continues through about the end of preschool (Justice & Ezell, 2004), children acquire essential precursory skills that are necessary in order to become successful in formal schooling. Emergent literacy encompasses oral language, phonological awareness, and print knowledge skills (National Early Literacy Panel [NELP], 2008). This set of skills can predict elementary school reading outcomes for
children with normal hearing (Senechal & LeFevre, 2002). Emergent literacy skills predict the probability of later reading difficulties, indicating that a deficit in these areas may put a child at risk for limited literacy achievement. Therefore, we can conclude that the poor literacy outcomes for children with hearing loss likely begin in preschool with deficits in these emergent literacy skills.

It is a long-established finding that children with hearing loss have deficits in phonological awareness and oral language skills (Kyle & Harris, 2011; Miller, 1997; Moeller et al., 2007; Most, Aram, & Andorn, 2006; Sterne & Goswami, 2000). However, only recently has research emerged to indicate that children with hearing loss have deficits in print knowledge. These deficits appear to be specific to one area of preschool print knowledge skills – conceptual print knowledge. Print knowledge is defined as knowledge about the forms and functions of written language and of letters and their corresponding sounds. Print knowledge includes two components of knowledge including: (a) alphabet knowledge and (b) conceptual print knowledge (Justice, Bowles, & Skibbe, 2006; Justice & Ezell, 2001; Teale & Sulzby, 1986). Print knowledge emerges as the child begins to interact with print in everyday environments prior to the onset of systematic literacy instruction (Mason, 1980; Sulzby, 1985; Vukelich, 1994).

Alphabet knowledge consists of letter-name and letter-sound knowledge. Letter-name knowledge encompasses knowing the labels for alphabet symbols. Letter-sound knowledge involves knowing the links between alphabet letters and their speech sounds. (e.g., the letter B makes the /b/ sound). Teaching alphabet
knowledge often includes simple memorization-type tasks (e.g., alphabet flashcards).

Conceptual print knowledge consists of an understanding of how print works, as well as the features of written words. This includes knowledge of both book and text conventions. Examples of book conventions include knowing where the front of the book is, that pages are turned from left to right, and that the left page is read first. Text conventions are knowing that text is read from left to right and top to bottom and that the text should be read and not the pictures (Justice & Ezell, 2001). Examples of features of written words include, a space is indicative of separate words, that some words are longer than others, and that written words represent spoken words (Justice & Ezell, 2001). Teaching conceptual print knowledge differs from the memorization-based alphabet knowledge instruction, such that the conceptual instruction is often embedded in more complex literacy tasks such as shared-book reading (Justice & Ezell, 2004).

**Print Knowledge in Children with Hearing Loss**

To date, only four studies have studied print knowledge in children with hearing loss who use amplification and spoken language. A major limitation in this area of research is that three of these four studies have focused primarily on alphabet knowledge, with little attention to conceptual print knowledge. These studies are detailed below.
First, Easterbrooks, Lederberg, Miller, Bergeron, and Connor (2008) studied emergent literacy skills three- to six-year children with hearing loss. The study sample included 32 children who attended auditory-oral classrooms and 12 who attended total communication programs; the majority of these children used cochlear implants. They found that the performance of children with hearing loss performed similarly to children with normal hearing on a variety of measures of alphabet knowledge. Similar performance was determined by comparing the sample’s scores to the standardized tests’ normative sample.

Similarly, DesJardin, Ambrose, and Eisenberg (2009) studied emergent literacy skills in a group of preschool and early school-age children with cochlear implants. Again, this group of researchers found that the children with hearing loss performed comparably to peers with normal hearing on measures of alphabet knowledge. Comparable performance in this study also was determined by comparison to the standardized test’s normative sample.

Finally, Ambrose, Fey, and Einsenberg (2012) examined 24 preschool children with hearing loss who use cochlear implants compared to preschool children with normal hearing on measures of print knowledge. In this study, print knowledge was measured using the Test of Preschool Early Literacy (TOPEL) Print Knowledge subtest, which mainly examines alphabet knowledge. Results showed that preschool children with hearing loss who use cochlear implants performed similarly to preschoolers with normal hearing. In this study, similar performance was determined by comparison to a control group of same-aged children with normal hearing.
Alphabet knowledge, however, is only one facet of print knowledge. Werfel, Lund, and Schuele (2015) provided a preliminary picture of the conceptual print knowledge skills of preschool children with hearing loss. Participants included eight preschool children with hearing loss who attended an auditory-oral preschool and eight preschool children with normal hearing.

Five print knowledge measures were administered. The following subtests from the Phonological Awareness and Literacy Screening-PreK were utilized: Letter Names, Letter Sounds, and Print and Word Awareness (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004). In addition, the Print Concepts and Concepts of written words subtest from the Preschool Word and Print Awareness Assessment were administered (PWPA; Justice & Ezell, 2001). The results of the study found that print concept knowledge and concepts of written words among children with hearing loss are both areas of deficit compared to their normal hearing peers; however, there was no difference found between groups on measures of alphabet knowledge.

The average performance of preschool children with hearing loss on measures of conceptual print knowledge appears to looks quite different than the average performance of preschool children with normal hearing. Conceptual knowledge of book and text conventions, thus, represent areas of weakness for children with hearing loss when compared to their normal hearing peers (Werfel et al., 2015). As a result, there is a great need for intervention research in the area of conceptual print knowledge for children with hearing loss in order to
provide evidence-based recommendations for appropriate emergent literacy interventions for this population.

**Print-Referencing Intervention**

One print concept knowledge intervention that has been effective with children with normal hearing is print referencing (Justice & Ezell 2000; Justice & Ezell 2002; Justice & Ezell 2004; Justice, Kaderavek, Ean 2009; Zucker, Justice, & Piasta 2009). There is evidence that children who are at risk for reading deficits, including those with language disorders, can acquire conceptual print knowledge through participation in a particular type of shared book reading with an adult, print referencing (Justice & Ezell, 2002; Justice & Ezell, 2004; Lovelace & Stewart, 2007; Zucker, Justice, & Piasta, 2009). Print referencing refers to an adult’s use of verbal and nonverbal cues to refer a child’s attention to the forms, features, and functions of written language. Print referencing can be used to help children acquire written language awareness, including conceptual print knowledge, during the emergent literacy period (Justice & Ezell, 2004). In terms of print referencing, a cue refers to an adult behavior that implicitly or explicitly directs a child’s attention to some feature of written language. These cues are embedded into a shared storybook reading interaction between an adult and a young child.

Print-referencing cues can be nonverbal or verbal. There are five key types of print-referencing cues, two nonverbal and three verbal. Nonverbal references include pointing to print and tracking print when reading. Pointing to...
print can be the adult either pointing to narrative print or print embedded in illustrations. Tracking print is when the adult follows the print with a finger (or pointer) while reading the narrative text. Verbal references comprise questions about print, comments about print, and requests about print.

For example, a question about print could be, “What letter is this?” A comment about print would be, “That is an A”. An example of a request about print is, “Show me where the A is.”

Print referencing intervention has been found to be effective in improving conceptual print knowledge across multiple populations, including preschoolers with language impairment, Down syndrome, and Spanish-speaking children with language impairment (Lovelace & Stewart, 2007; Bysterveldt et al., 2006; Pratt et al., 2014). Lovelace & Stewart (2007) examined the effectiveness of print referencing intervention for five preschool children whose primary diagnosis was language impairment. The intervention occurred two times per week during a ten minute shared reading activity. They found that the use of non-evocative, explicit print referencing cues during shared book reading resulted in improved print concept knowledge skills for preschool children with language impairments. Bysterveldt, Gillon, and Moran (2006) examined the effects of a six-week shared book reading intervention that encompassed four sessions per week for 10 minutes among preschool children with Down syndrome. Parents were instructed to utilize print referencing techniques whereby they brought the child’s attention to targeted letters and sounds within words and drew their attention to the initial sound in words during a shared book reading activity. Participants included
seven preschoolers with Down syndrome who attended an early intervention center. Results showed that a majority of the preschool children with Down syndrome demonstrated significant improvements on phonological awareness and letter knowledge. Pratt, Justice, Perez, and Duran (2014) found that the majority of participants whose caregivers implemented ¡Leamos Juntos!, a parent-implemented print referencing intervention, showed significantly greater improvements from pre-test to post-test over an eight week period. Participants included 13 Spanish-speaking children with language impairment. Three areas of print knowledge were measured including, print-concept knowledge, alphabet knowledge, and letter-sound knowledge. Spanish-speaking children with language impairment showed significantly greater improvement from pre-test to post-test in two out of three print knowledge measures (print-concept knowledge and alphabet knowledge) compared to children whose caregivers employed their typical home-literacy practices.

No studies to date have evaluated the effects of print referencing intervention for children with hearing loss. In light of the poor literacy outcomes and conceptual print knowledge skills in this population, it is vital to validate effective emergent literacy interventions for this population. The purpose of the current study was to evaluate the effectiveness of a print referencing book-reading intervention, which has been shown to be effective for other populations, among children with hearing loss.
CHAPTER 2

METHOD

All study procedures were approved by the University of South Carolina Institutional Review Board. The current study utilized a single-subject, multiple baseline design.

Participants

Two preschool children with hearing loss completed the study. Demographic information about the participants is described in detail below.

**Ryan.** Participant 1: Ryan¹ (male; aged 5;5 at the study outset) was diagnosed with cerebral palsy at birth and failed his newborn hearing screening bilaterally. At follow-up, he was diagnosed with bilateral mild to moderate sensorineural hearing loss at 10 months of age and fit with bilateral hearing aids at 12 months of age. Approximately two and a half years later, he had two additional ABRs completed and was subsequently diagnosed with bilateral profound hearing loss per audiological report. Ryan received a cochlear implant in his left ear at 3;9 and in his right ear at 4;9. Both his implants were Cochlear Corporation Nucleus 6. Ryan has aided thresholds in the normal hearing range bilaterally from 500-4,000 Hz per audiological report. His speech awareness

¹ Names have been changed to protect confidentiality.
threshold was 20dB bilaterally. Ryan utilizes vocalizations, 5% signing, and gestures to communicate. At the time of the study, his diagnoses also included speech and language delay secondary to bilateral sensorineural hearing loss. He was enrolled in a general education kindergarten classroom with a one-on-one aide and received auditory-verbal therapy for one hour a week, and speech-language intervention at school. He also receives occupational and physical therapy.

**Jack.** Participant 2: Jack (male; aged 4;9 at the study outset) was diagnosed with sensorineural hearing loss at one month of age and fitted with hearing aids at 1 month. He has borderline to mild thresholds for 250-500Hz, sloping to a moderately severe to severe hearing loss from 750-6,000Hz on the left ear and profound hearing thresholds for the right ear per audiological report. Per MRI reading doctor determined he likely has an absent or deficient cochlear nerve on the right side. Jack received a cochlear implant in his right ear at 4 years old and is currently amplified with the use of a hearing aid and an FM system in his left ear. His cochlear implant is a Cochlear Corporation Nucleus 6 and hearing aid is a Phonak Naida BTE. With implant use alone, Jack has normal hearing to mild hearing loss per audiological report. His speech awareness threshold was 20dB bilaterally. He communicates with 100% spoken language and he has been exposed to both English and Gujarati equally. At the time of the study, Jack had speech and language delays, secondary to bilateral sensorineural hearing loss, including bilateral auditory neuropathy spectrum
disorder (ANSD), was enrolled in an oral Pre-K classroom for 2.5 hours a day, and received auditory-verbal therapy for one hour a week.

**Experimental Design**

The current study utilized a single subject, multiple baseline design. The study design included one experimental condition (i.e., intervention) for each participant. Maturation effects were addressed by the relatively short duration of the study, approximately 2 months. In addition, therapy sessions for the participants did not involve a conceptual print knowledge goal. Research sessions took place in an individual therapy room at a speech-language pathology clinic. The authors and trained lab assistants completed assessment and intervention sessions. Children participated individually.

**Measures**

**Descriptive assessment.** Prior to baseline, each child participated in an assessment to describe literacy skills. The assessment included two emergent literacy measures: Phonological Awareness and Literacy Screening-PreK (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004) and Preschool Word and Print Awareness Assessment (PWPA; Justice & Ezell, 2001). In addition, the most recent audiological assessment and speech-language evaluation were obtained from patient files. The participants’ descriptive assessment scores are presented in Table 1.

**Probe assessments.** The probe assessment was a curriculum-based progress monitoring measure developed for this study. At the beginning of each session,
### Table 2.1 Participants' Descriptive Assessment Scores

<table>
<thead>
<tr>
<th>Measure</th>
<th>Ryan</th>
<th>Jack</th>
</tr>
</thead>
<tbody>
<tr>
<td>PALS-PreK Upper-Case Alphabet Recognition</td>
<td>1/26</td>
<td>26/26</td>
</tr>
<tr>
<td>PALS-PreK Lower-Case Alphabet Recognition</td>
<td>0/26</td>
<td>24/26</td>
</tr>
<tr>
<td>PALS-PreK Letter Sounds</td>
<td>0/26</td>
<td>3/26</td>
</tr>
<tr>
<td>PWPA Print Concepts</td>
<td>0/12</td>
<td>6/12</td>
</tr>
<tr>
<td>PWPA Words in Print</td>
<td>0/12</td>
<td>0/12</td>
</tr>
<tr>
<td>PLS-5 Auditory Comprehension*</td>
<td>50</td>
<td>88</td>
</tr>
<tr>
<td>PLS-5 Expressive Communication*</td>
<td>61</td>
<td>75</td>
</tr>
</tbody>
</table>

**Notes:** *Standard Score. PALS-PreK= Phonological Awareness Literacy Screening PreK; PWPA= Preschool Word and Print Awareness Assessment; PLS-5= Preschool Language Scales 5th edition.

Children completed the progress monitoring measure. The progress monitoring measure consisted of a short book of a nursery rhyme in which the examiner embedded questions about print and word concepts (e.g., Show me where I should start to read; Show me just one word on this page) adapted from the PALS-PreK (Invernizzi, Sullivan, Meier, & Swank, 2004). Thus, each book assessed the participant’s conceptual print knowledge skills. The examiner presented a colored nursery rhyme book. At the beginning of each session, the examiner held up the progress monitoring book and said, “Let’s read this rhyming book together. I want you to help me read it” and then handed the book to the participant. The examiner then administered items for each page and then read that page. A probe assessment form was developed with ten items. The order of
these ten items was randomized for each book. After the conclusion of intervention, children participated in three maintenance sessions. A total of 20 books were developed, each approximately 5 pages plus title page. Participant responses were recorded in real time. For each administration, the participant’s response on each item was categorized as correct or incorrect. Total correct scores were tallied. Performance on the progress monitoring measure was graphed following each session. See Appendix A for the progress monitoring measure assessment items and a sample book.

**Conceptual Print Knowledge Intervention**

The print referencing intervention during shared storybook reading was based on recommendations of Justice and Ezell (2004). Each conceptual print knowledge intervention consisted of reading two books individually with the child, using ten print referencing behaviors in each book, five verbal and five nonverbal print references, one day a week for seven weeks, resulting in a total of 140 teaching episodes. Breit-Smith, Justice, McGinty, and Kaderavek (2009) reported robust effects of print knowledge intervention that lasted between 96 and 216 teaching episodes. The researcher read the book and utilized pre-determined print references but did not utilize any other language interactions in the book reading. If a child attempted to engage in other interactions, the researcher responded with “uh-huh” and redirected attention back to the protocol. Pages were labeled with the print referencing behavior to be utilized to aid in fidelity of intervention. Each intervention session lasted approximately ten minutes. Intervention concluded when children (a) scored at 90% accuracy or above on
the progress monitoring measure for two consecutive sessions or (b) completed all seven sessions. See B for an example of one of the intervention books used.

**Intervention materials.** Published children’s picture books for the intervention were selected based on their high print salience. The Print Salience Metric (PSM) was utilized for book selection. Books with high print salience include large font size, few words on each page, and text embedded in the illustrations. These features lend to adult mediations of knowledge about print. Print Salience Metric for each book was calculated following Zucker, Justice, and Piasta (2009). The average PSM score for intervention books was 2.96 (range: 0.80 – 7.75). The PSM score for each book utilized in the intervention is presented in Table 2.

**Procedures**

After pre-testing, children participated in baseline assessment using the progress monitoring measure of print and word awareness until a stable baseline of at least three points was established. Once a stable baseline was established, the print referencing book-reading intervention based on Justice and Ezell (2004) was initiated. After completing intervention, participants completed three maintenance condition progress monitoring assessments. Video analysis of 25% of sessions for each participant was completed to assess inter-observer agreement and procedural fidelity (reported below).

**Procedural fidelity.** Procedural fidelity was measured in 25% of intervention and progress monitoring sessions. Percentages of compliance with the intervention
Table 2.2 Print Salience Measure of Intervention Books

<table>
<thead>
<tr>
<th>Book</th>
<th>PSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busy Boats</td>
<td>1.00</td>
</tr>
<tr>
<td>Commotion in the Ocean</td>
<td>3.43</td>
</tr>
<tr>
<td>Click Clack Quackity-Quack</td>
<td>3.81</td>
</tr>
<tr>
<td>Dear Zoo</td>
<td>0.80</td>
</tr>
<tr>
<td>Does a Kangaroo have a Mother too?</td>
<td>4.59</td>
</tr>
<tr>
<td>Doggies</td>
<td>2.77</td>
</tr>
<tr>
<td>Goldilocks and Just One Bear</td>
<td>7.75</td>
</tr>
<tr>
<td>I am Amelia Earhart</td>
<td>1.57</td>
</tr>
<tr>
<td>Little Blue Truck</td>
<td>2.46</td>
</tr>
<tr>
<td>Moo Baa La La La</td>
<td>2.77</td>
</tr>
<tr>
<td>The Noisy Airplane Ride</td>
<td>1.89</td>
</tr>
<tr>
<td>Pete the Cat: The Wheels on the Bus</td>
<td>2.61</td>
</tr>
<tr>
<td>Roaring Rockets</td>
<td>1.25</td>
</tr>
<tr>
<td>Storm Song</td>
<td>4.70</td>
</tr>
</tbody>
</table>
protocol were calculated collectively and individually for each participant. Overall procedural fidelity for the intervention sessions was 100%. Procedural fidelity for participant 1 for the intervention sessions and progress monitoring measures were 100%. Procedural fidelity for participant 2 for the intervention sessions and progress monitoring measures were 100%. 
CHAPTER 3

RESULTS

Figure 1 displays the probe assessment progress monitoring data for both participants. For both participants, performance during the baseline condition was 0% correct, performance increased during the intervention condition, and these increases were maintained after intervention was withdrawn. Each participant’s pattern of performance is discussed in detail below.

Ryan

Ryan’s responses across all probe assessments are displayed in Figure 1. Baseline data was established with no change in performance (0% correct) across sessions one through four. The intervention was introduced in session four. Ryan’s progress monitoring score began to improve in session five (1/10 i.e., 10% correct) and maintained at about that level throughout the intervention condition. In session nine, Ryan got 2/10 or 20% correct, his highest percentage correct throughout the study. In session 10 a decline was observed. Observation indicated that this decline was due to Ryan’s behavioral non-compliance during the session. In the following session, his percent correct returned to the previous level of 20% correct. His behavior was observed to be compliant in these sessions. Importantly, when intervention was withdrawn, Ryan’s percentage
Figure 3.1 Progress Monitoring Data for Both Participants
correct did not return to baseline level during the maintenance condition; he maintained the gains observed during the intervention condition.

At study outset, Ryan utilized signs, gestures, and vocalizations to communicate. Ryan’s family was debating what the best method of communication would be for him (e.g., American Sign Language or an Augmentative Alternative Communication Device). During the study, Ryan’s parents and therapists began to note increased behavioral issues due to frustration with his inability to communicate his wants and needs effectively. Ryan exhibited his frustration by hitting, biting, throwing papers, refusal to participate in activities and book readings, tantrums, etc. Ryan’s non-compliant behavior was also noted in multiple intervention sessions during the study. For example, in session 10, Ryan exhibited non-compliant behavior during the progress monitoring measurement exhibited by throwing the materials off of the desk, refusal to put on his cochlear implant, and hitting the clinician. Ryan’s non-compliant behavior likely played a factor in his ability to make progress during the study and attributed to some of the decreases seen in his scores.

Jack

Jack’s responses across all probe assessments are displayed in Figure 1. Baseline data was established with no change in performance (0% accuracy) across sessions one through three. After intervention was initiated, accuracy increased to 2/10 correct (20% accuracy), indicating a clear increase in understanding of conceptual print knowledge. Jack continued on an upward
trajectory throughout the remainder of the intervention sessions, although his performance was somewhat variable, but he continued to improve overall. During the maintenance condition, Jack continued to demonstrate improvement in his conceptual print knowledge. He achieved his highest percentage of accuracy (70% accuracy) on the final maintenance condition measure. It is remarkable that Jack’s conceptual print knowledge skills consistently increased throughout the duration of the intervention and continued to increase during maintenance condition, even after the intervention had been withdrawn. It should be noted that the intervention dose for Jack was higher than for Ryan. Jack’s mother reported using the print referencing techniques that she observed during the intervention sessions at home while participating in shared book reading with Jack, whereas Ryan’s family did not use the techniques at home.
CHAPTER 4

DISCUSSION

The purpose of this research paper was to evaluate the functional relation between print referencing book-reading intervention and conceptual print knowledge among preschool children with hearing loss. Although this relation has been reported for many groups of children, to date no research has evaluated the effects of print referencing intervention for children with hearing loss. The results of this study indicate that print referencing intervention delivered in a one-on-one session by a clinician is associated with gains in conceptual print knowledge for preschool children with hearing loss. Importantly, these gains were observed over a very short total intervention duration, only 7 weeks. These findings add to previous research that has evaluated print referencing intervention with various populations of children (Bysterveldt et al., 2006; Justice & Ezell 2002; Justice & Ezell 2004; Lovelace & Stewart, 2007; Pratt et al., 2014; Zucker, Justice, & Piasta 2009).

Intensive individual print referencing intervention was associated with an increase in conceptual print knowledge skills for these two preschool children with hearing loss. Although both participants made gains during the intervention condition compared to the baseline condition, the magnitude of the gains differed
substantially. Possible reasons for these observed differences in response are posited below.

Ryan’s average baseline condition performance was 0%, and his average intervention condition performance was 10%. Visual analysis of this data indicated a clear increase in performance immediately upon initiation of the intervention. This increase, however, quickly plateaued and no additional progress was observed. Three possible reasons for this plateau are proposed. First, Ryan has additional diagnoses to hearing loss. One of these diagnoses is cerebral palsy, which affects his gross and fine motor skills. Many of the responses on the progress monitoring measure require precise pointing. Although we do not think that this contributed to Ryan’s ability to participate in the intervention sessions, it is important to note. Second, Ryan has little functional spoken language. His oral language scores for both expression and comprehension fall at the first percentile when compared to his chronological age. It is possible that more advanced language skills may be a prerequisite to demonstrating conceptual print knowledge. The majority of the items to which Ryan responded correctly were “Show me just one word on this page” and “Show me the first word on this page.” It is possible that his vocabulary and conceptual knowledge were not advanced enough to support success on other items, such as “Show me the second word on this page” or “Show me the space between two words.” Finally, Ryan’s behavior and compliance during the sessions likely influenced his ability to make progress. His ability to participate and engage in the weekly sessions was often limited by off-task behaviors, such as, throwing
materials, leaning out of the chair, or refusal to participate altogether. However, he was able to increase his conceptual print knowledge skills compared to baseline condition. When Ryan demonstrated on-task behavior in sessions, he was able to demonstrate some improvement on the progress monitoring measure.

Jack’s average baseline condition performance was 0%, and his average intervention condition performance was 35%. Additionally, Jack’s skills continued to increase in the maintenance condition, with an average performance of 63%. Thus, Jack demonstrated significant improvement in his conceptual print knowledge skills throughout the study. Data for Jack indicates that correct responses on the progress monitoring measure improved markedly after only one 10 minute shared book reading session that included the print referencing procedure. He continued to learn these skills as the intervention was implemented each week. Three possible factors in Jack’s significant improvements in conceptual print knowledge are proposed. First, during all of the weekly sessions, it was observed that Jack was an active participant during the shared storybook reading. He maintained attention to the task and was motivated to answer the questions from the progress monitoring measures correctly. Second, Jack has much stronger expressive and receptive language skills than Ryan and therefore was likely able to understand the more advanced language seen in some of the items. Lastly, Jack’s mother reported that she had begun to implement print referencing techniques at home during their shared book readings. Justice, Weber, Ezell, and Bakerman (2002) examined fifteen
preschool children’s responsiveness to their parents’ use of verbal print references (i.e. questions, comments, & requests about print) during shared-book reading interactions. They found that preschool children responded to approximately 60% of parents’ verbal print references during a shared reading interaction featuring a rhyming book. This higher intervention dose likely contributed to Jack’s overall progress made throughout the duration of the study and aided his ability to generalize the concepts.

Results of this study suggest that conceptual print knowledge learning in preschool children with hearing loss requires implementation of a systematic, explicit print referencing intervention. Both participants in this study had an initial baseline of 0% for the print concepts assessed at the onset of the study. This level of performance suggests that, although these children regularly engaged in shared book reading activities in speech-language therapy sessions and at home, shared book reading that is not specifically focused on print does not lead to conceptual print knowledge for children with hearing loss. Instead it was not until the participants engaged in a weekly, 10-minute explicit conceptual print knowledge intervention that they made improvements in conceptual print knowledge. Explicit references to print, therefore, were necessary in order for these children with hearing loss to acquire conceptual print knowledge skills. Informally during intervention sessions, both participants’ parents indicated that they had never thought to talk about the print when they read with their child.
Clinical Implications

The print referencing intervention during shared storybook reading was designed based on recommendations of Justice and Ezell (2004). For this initial investigation, we made no modifications specific to children with hearing loss. Thus, it appears that instruction that is effective for children with language impairment, Down syndrome, and Spanish-speaking children with language impairment can also be used to improve conceptual print knowledge skills for preschool children with hearing loss. It should be noted, however, that Jack’s mother reported utilizing print referencing strategies at home, even though we did not train her or ask her to do so. Jack made substantial progress over the relatively short duration of the intervention. Parent training of print referencing strategies should be evaluated as (a) a supplement to clinician-led print referencing intervention and (b) the primary print referencing intervention for children with hearing loss in future studies.

Both participants benefitted from the selection of age appropriate intervention books that had high print salience, were visually appealing, covered topics that interested them, such as animals and transportation. Clinicians should select children’s books that have a high print salience measure and are also of interest to the child in order to increase participation and promote on-task behavior. Clinician’s can and should utilize Zucker et al.’s (2009) Print Salience Metric as a guide for selecting appropriate books for print referencing interventions for children with hearing loss.
Future Directions

Our findings have important implications for intervention research for children with hearing loss. Further research should examine the effects of shared book reading and print referencing on conceptual print knowledge skills of preschool children with hearing loss among a larger participant pool. Additional work also is needed to determine the optimal amount of repetition necessary to learn concepts. Work that utilizes Warren, Fey, and Yoder's (2007) framework for determining optimal treatment intensity would be an important addition to our knowledge of the critical print-referencing dose for children with hearing loss. In addition, research should be completed on the effectiveness of parent-led print referencing intervention during shared storybook reading among children with hearing loss. It is essential that intervention provide early support to preschool children with hearing loss to obtain satisfactory print knowledge skills as these are essential in order to become successful in formal schooling. The present findings indicate that print referencing intervention during shared storybook reading is an effective method for improving conceptual print knowledge skills among preschool children with hearing loss.
REFERENCES


based teacher child storybook reading and explicit print referencing.


APPENDIX A
Example Progress Monitoring Measure
Humpty Dumpty

Hold up book and say, “Let’s read this rhyming book together. I want you to help me read it.” Hand the child the book.

Administer items on each page and then read that page.

1. [cover] Show me the name or the title of this book. Point to the name of the book.
   
2. [page 1] Where should I start to read on this page?

3. [page 1] Then which way do I go?

4. [page 2] Show me the first word on this page.

5. [page 2] Now show me the second word on this page.

6. [page 2] Now show me the last word on this page.

7. [page 3] Show me the space between two words.

8. [page 3] Now show me just one letter on this page.
9. [page 4] Point to each word as I read.

10. [page 5] Show me just one word on this page.

Note: The same items are used on each progress monitoring measure, in randomized orders for different books.

Figure A.1 Humpty Dumpty
APPENDIX B

Intervention Book Example: Moo Baa La La La

Figure B.1 Moo Baa La La La
“No, no!” you say, “that isn’t right."

The pigs say

**OINK**

all day and night.

Rhinoceroses *SNIORT* and *SNIFF*

and little dogs go

*RUFF RUFF RUFF!*

Some other dogs go

**BOW WOW WOW!**

And cats and kittens say

**MEOW!**

A horse says

**NEIGH.**
QUACK!
says the duck.