

**ENGAGEMENT AND WORD LEARNING  
IN CHILDREN WITH AND WITHOUT  
HEARING LOSS: BOOKS AND  
TELEVISION**

by

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Master of Science, 2020  
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Fort Worth, Texas

Submitted to the Graduate Faculty of  
Harris College of Nursing and Health Sciences  
Texas Christian University  
in partial fulfillment of the requirements  
for the degree of  
Master of Science  
May 2020



## ACKNOWLEDGMENTS

This study was supported by the Texas Christian University Graduate Research and Travel Grants. A poster was presented at the American Speech-Language-Hearing Association Convention, Orlando FL 2019. I would like to express my gratitude to my Professor Dr. Emily Lund who was instrumental in defining my path of research.

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TEVLEISION

A Thesis for the Degree  
Master of Science


by  
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May 2020

## Introduction

Children with hearing loss, even those learning spoken language by using hearing devices like cochlear implants or hearing aids, experience inordinate difficulty learning words incidentally from their environments (Lund & Douglas, 2016; Moeller, 2000). However, the best alternative to environmental exposure for word learning in children with hearing loss is direct instruction (Lund & Douglas, 2016), which requires concerted effort on the part of a child's communication partner and is an unrealistic means of teaching all vocabulary knowledge that a child should know. Other mediums of instruction, such as book reading and television (TV) watching, represent possible avenues for increasing vocabulary in the population of children with hearing loss. Children within the U.S. report participating in both activities each week (e.g., Hofferth & Sanbery, 2001). Research has not yet indicated whether one medium (reading versus watching) leads to better word learning for children with hearing loss, or how children with hearing loss are likely to engage with either medium.

Time spent watching television, phones, tablets, e-readers, and computers is currently referred to as "screen time." Based on Nielsen's Television Household Universe Estimates, there are approximately 118.4 million televisions in the United States (Nielsen, 2017). Hofferth and Sandbery (2001), found the average U.S. child under the age of thirteen watches around 12:04 hours of television (TV) weekly. In contrast, the average U.S. child under the age of thirteen spent an average of 1:16 hours a week reading for pleasure or about 10 to 11 minutes per day (Hofferth & Sandberg, 2001). However, research tends to indicate that book reading is the most effective modality for encouraging language growth, emergent literacy, and reading achievement (Bus, Van Ijzendoorn, & Pellegrini, 1995). A perceived discrepancy in learning outcomes for young children participating in TV viewing versus book reading has been labeled the video



deficit. The video deficit describes the phenomenon of children ages 6- 24 months learning better from in-person demonstrations than when the same information is presented on a screen (Krcmar, 2010).

The video deficit idea has been extended to children beyond 24 months old; frequently children are encouraged to read rather than watch screens (e.g., Titelius, 2018). Children under the age of two learn new words more easily from social interaction than during television viewing, but extant research indicates children ages three to five years can acquire new vocabulary from television (Robbins & Ehri, 1994). Consequently, the American Academy of Pediatrics (AAP) does not discourage all screen exposure, but recommends that children older than two years engage in only two hours of screen time daily (AAP, 2016). However, it seems likely that recommendations on screen time do not take into account the possible learning benefits screens provide to certain types of language learners. If children who traditionally have trouble with language-based activities (e.g., children with hearing loss) are at least engaged by television, as a result of the movement and bright colors projected on screens, television might be a medium that can be better harnessed for teaching purposes. The purpose of this study is to compare the relation of engagement levels and word learning during television and book reading in children with hearing loss versus children without hearing loss.

### **Vocabulary and Word Learning Outcomes in Children with Hearing Loss**

Vocabulary knowledge predicts reading comprehension and later academic success in normal hearing children (Marulis & Neuman, 2010). Unfortunately, vocabulary knowledge is a documented deficit in children with hearing loss as compared to same-age peers with normal hearing (Lund, 2016; Tomblin et al., 2015). Children with cochlear implants, even those who receive implants at a young age, tend to know fewer words than their peers, despite having

scores on norm-referenced measures of language and vocabulary that fall within the “range of normal” (Lund, 2016; Werfel & Douglas, 2017; Lund, 2019). Children with mild to severe hearing loss also perform lower than same-age peers on measures of vocabulary, particularly as their better ear pure tone average becomes more severe (Tomblin et al., 2015). Overall vocabulary deficits in children with hearing loss, even those with well-developed spoken language skills, are likely linked to poorer word learning skills as compared to children with normal hearing. Infants and toddlers with cochlear implants tend to learn fewer words than children with normal hearing, as measured by looking paradigms and object selection (Houston, Stewart, Moberly, Hollich & Miyamoto, 2012; Robertson, von Hapsberg & Hay, 2017; Lund & Schuele, 2017). That difference in word-learning outcomes is maintained in preschool (Houston, Carter, Pisoni, Kirk & Ying, 2005; Walker & McGregor, 2013) and into the school-age years (Davidson, Geers & Nicholas, 2014; Stelmachowicz, Pittman, Hoover & Lewis, 2004).

Because communication is transactional (e.g., Sameroff, 1975), the number of words learned by children with hearing loss varies based on how those words are presented by a child’s communication partners. Lund and Douglas (2016) compared three means of inputting vocabulary words to children with hearing loss: direct instruction, follow-in labeling, and incidental labeling. Within this study, children learned best in direct instruction, and did learn via follow-in labeling. However, children did not learn words via incidental labeling. Bobzien (2015), examined the effectiveness of using repeated storybook reading paired with explicit teacher instruction to increase vocabulary knowledge in four preschool children with hearing loss. Children with hearing loss acquired the instructional vocabulary words that were explicitly taught, and learned far fewer words vocabulary words presented without explicit teaching episodes. (Bobzien,2015). Thus, it appears children with hearing loss demonstrate poor learning

outcomes from incidental and/or non-explicit contexts. It is possible though that semi-supported contexts, such as book reading or watching television, would support word learning in this group. Word learning in children with hearing loss via these mediums has been minimally explored, particularly with regard to learning from television.

### **Television and children with hearing loss**

Television can be used as a medium that supports rapid word learning for objects, actions, and attributing words (Rice et.al., 1990). Rapid word learning occurs when a person learns a new word after only a few exposures (Carey, 1978). After age two, the American Academy of Pediatrics acknowledges that children can rapidly learn from television viewing, particularly if television shows are well-designed (AAP, 2016). In children with normal hearing, for example, Rice and colleagues determined that the show *Sesame Street* led to positive learning outcomes in preschool children (Rice et al., 1988). Rice (1990) experimentally determined that there are developmental effects for word learning during television watching: for example, three year old children do not sustain word learning gains from television shows as well as five year old children. However, some researchers tend to rebut the notion of television being a source of educational learning for children. Shin (2004) discussed television as being a non-beneficial modality in the academic setting, as children spent less time engaged with homework, studying, and leisurely reading.

Research does not yet define what children with hearing loss learn from television. More than 25 years ago, Maxon and Welch (1992) concluded a child's degree of hearing loss and language skill level could be tied to understanding of TV program content. Since the time of that study, however, both educational programming on television and amplification technology (and consequently, language outcomes) have improved (Rice, et al., 1998). If children with hearing

loss can learn new vocabulary words via television programming, particularly educational programming, this outcome is important information for parents and educators to have.

Television therefore should be explored as an avenue of increasing vocabulary knowledge in children. Television can grant new learning opportunities and experiences that children may not otherwise receive.

### **Book reading and children with hearing loss**

Storybook reading is linked to language growth, emergent literacy, and reading achievement (Bus, Van Ijzendoorn, & Pellegrini, 1995). Book reading is a particularly rich context for intentionally-taught vocabulary and for incidental learning, as storybooks include words children typically do not encounter in their everyday experiences (Snow et.al., 1998). Shared parent-child book interactions are seen as an advantageous context for language learning and are considered to be important contributors to a child's early literacy growth (Bus, 2001). However, Coyne, Simmons, Kame'enui, & Stoolmiller, (2004) demonstrated that not all children benefit equally from shared storybook reading. Children with small vocabularies as well as poor language comprehension skills were less likely than peers with larger vocabularies to learn words during read-alouds. This finding is relevant for children with hearing loss, who tend to have lower vocabulary knowledge than their peers.

For children with hearing loss, shared book reading is critical for emergent literacy development. Reynolds & Werfel (2020) determined that children with hearing loss who engaged more frequently with text during a shared book reading activity had high scores on measures of phonological awareness, vocabulary, and print concept knowledge. Another study on mother-child story book interactions with preschool children with hearing loss determined that children needed more than one opportunity to explore and interact with a book before

engaging interest in book reading (Kaderavek & Pakulski, 2007). These findings document the necessity to foster engagement during shared book reading tasks to support emergent literacy development.

It is possible that factors particular to individual children consequently affect learning from television versus storybook reading. The size of a child's vocabulary, for example, likely influences how much he or she can learn from a semi-supported medium (e.g., Coyne et al., 2004). Similarly, a child's nonverbal intelligence, as it represents a child's general learning abilities may affect words learned (e.g., Lund, Douglas, & Schuele, 2015). Finally, a child's familiarity with a medium or even characters in a story (given that children with hearing loss benefit from repetition; Bobzien et al., 2015) may also influence word learning outcomes from television versus book reading.

## **Engagement**

A possible factor, beyond auditory access and language knowledge that would influence word learning from books and television includes engagement. The construct of engagement can be defined as the amount of time a child spends interacting with the environment in a developmentally and contextually appropriate manner, at different levels of competence (McWilliam, 2008). Engagement, thus, may be key for understanding outcomes related to book reading versus television watching in children with low vocabulary knowledge. It is possible that, because television is more visually engaging, that children with hearing loss (who have weaker language skills) will be more attentive and engaged with the story presented than during book reading. This engagement could be true if a parent is primarily reading the words on the page verbatim, rather than asking the child to converse about the book.

Engagement, however, has not been studied in a word-learning context so much as in a classroom context. The Engagement Classroom Model focuses on the importance engagement plays in the level of participation at home, school, or in the community. When children are not engaged, they are missing opportunities for learning (McWilliam, 2008). Philip & Duchesne (2008) break down engagement into three more specific sub-constructs: cognitive engagement, behavioral engagement, and social engagement. Cognitive engagement involves processes such as sustained attention, mental effort, and often includes self-regulation strategies during a particular task. Behavioral engagement relates to the time a child is actively involved in a task. Social engagement refers to a child's interaction with others during a task. Thus, a child may engage with a task at varying levels by applying mental energy to the task, responding behaviorally to the task, and interacting with others engaged in a task. Theoretically, a child's engagement with a book or with television could influence his or her learning opportunities in those contexts as well.

Overall engagement in the classroom is correlated with academic success in older school-aged children (Philip & Duchesne, 2008; McWilliam 2008). Extant research, however, does not report on how engagement models might relate specifically to language learning, particular for children with language-learning disabilities. Thinking about how a medium captures and engages a young child's attention is important, however, because it seems likely that for children with language-learning difficulties, books may be less appealing than television. Children with hearing loss may have difficulty following auditory cues both during read-alouds and television viewing as a result of prior auditory deprivation. However, television shows present the story line in a visual form, which may be more likely to hold the attention of young viewers, if those viewers are already oriented toward visual cues. Within this study, we aim to determine how

engagement interacts with two mediums (books and television) to yield word learning for children with and without hearing loss.

## **Purpose**

It is important to establish a link between engagement and word learning in television and book reading for children with and without hearing loss. If children learn more from one medium than another, that finding is important information. If engagement with one medium (books or television) predicts learning in children with or without hearing loss, that finding is also important information. If general educators, speech-language pathologists, audiologists, and teachers of the deaf are able to capitalize on television viewing or book reading as a beneficial means for language development in children with hearing loss, they could have resources to increase vocabulary size that do not involve time-intensive direct instruction. The purpose of this study is to explore the relation of engagement levels and word learning during television and book reading in children with and without hearing loss. Three research questions were addressed: (a) Do children with and without hearing loss learn more words during book reading versus television watching? (b) Is the number of words learned correlated with measures of engagement (time on task and engagement rating)? and (c) Is the number of words learned correlated with prior vocabulary knowledge, nonverbal intelligence, or number of character names already known?

## **Methods**

### **Participants**

Twenty-one children were recruited for this study from two large cities in the southern United States. Eleven children with hearing loss who wore bilateral amplification (hearing aids or cochlear implants) and a group of ten age-matched, normal hearing children both male and female. Across both groups, no child had any parent-reported concomitant diagnosis affecting cognitive and/or language development (e.g., Down syndrome or Autism Spectrum Disorder). The children in the group of children with hearing loss had a mean age of 61.73 ( $SD= 12.48$ ), used English as their primary language, and were currently enrolled in speech language services. All children had sufficient spoken language skills to participate in the experimental tasks. Average age of identification for children for whom that data was available was 18 months, and all children had been using their amplification devices for at least two years. The age-matched normal hearing children had a mean age of 62.40 ( $SD= 13.07$ ), spoke English as their primary language, and passed their hearing screening prior to the start of the study.

## **Procedures**

Each participant attended one study visit lasting up to 90 minutes conducted by the student principal investigator, faculty mentor principal investigator and a trained research assistant. At the beginning of the study, three descriptive published and standardized assessments were administered evaluating the constructs of speech perception, expressive language, and non-verbal intelligence. Descriptive measures were followed by administration of the experimental TV viewing and book reading tasks. The experimental tasks, in their entirety, included a prior word knowledge assessment, a book reading activity and/or television viewing activity followed by a posttest, a break, and a final test (delayed post-test). Table 1, displays the order of task administration. Half of the children participated in the book activity first, and the other half participated in the television activity first. Engagement and time-off task were monitored through



video camera recordings and scored after the session. Each activity and measure is described in more detail below.

<b>Order of Instruments in Session</b>	<b>Time</b>
<b>Early Speech Perception Task</b>	5 min
<b>Prior Word Knowledge Assessment (20 words)</b>	5 min
<b>Expressive One Word Picture Vocabulary Test and Primary Test of Nonverbal Intelligence</b>	15 min
<b>Book or TV experimental activity</b>	15 min
<b>Immediate Test of Word Knowledge</b>	5 min
<b>Activity Break</b>	5 min
<b>Final Test of Word Knowledge</b>	5 min
<b>Book or TV experimental activity</b>	15 min
<b>Immediate Test of Word Knowledge</b>	5 min
<b>Activity Break</b>	5 min
<b>Final Test of Word Knowledge</b>	5 min
<b>Retest Word Knowledge</b>	5 min

Table 1. Order of task administration

**Standardized, published measures.** First, each child was assessed with the Early Speech Perception Task (ESP; Geers & Moog, 2012). The ESP is a standardized test of speech perception for children who are deaf or hard of hearing. This assessment is typically used by audiologist to measure the effects of a hearing aid or cochlear implant as a proxy for speech perception abilities. In our study, the ESP examined speech perception abilities in both children with hearing loss and children with normal hearing. In this test, a child is asked to label each monosyllabic word on a picture card. Once the child demonstrates knowledge of each of the

pictures on the card, the researcher presents each word and asks the child to point to the representative picture (thus confirming receptive knowledge and familiarizing the child with the location of the picture on the card). Next, a computer program produces a CVC word without audiovisual cues at a controlled loudness level, and children are asked to identify the picture representing the word. Using the scoring metric provided in the manual, a child must be able to correctly identify 24 out of 36 words to reach the speech perception level rated as “Level 4-consistent word identification,” which is the highest level of speech perception. Each participant in this study scored a 4, indicating that each child could consistently identify CVC words from a closed set without audio-visual cues.

Next, two norm-referenced measures were administered to provide a description of children’s vocabulary knowledge and nonverbal intelligence. Expressive vocabulary was assessed by the Expressive One Word Picture Vocabulary Test 4<sup>th</sup> edition (EOWPVT-4; Brownell, 2010). The EOWPVT is a standardized expressive vocabulary measure for children. During administration, a researcher prompts the participant to label simple picture cards. The second measure was the Primary Test of Nonverbal Intelligence (PTONI; Erler & McGhee, 2008). The PTONI is a standardized, norm-referenced nonverbal intelligence measure for children. During administration, the participant is asked to select the picture that does not match the other images or select the item that is different.

**Experimental measures.** To create the television watching and book reading tasks, two storylines from *Blaze and the Monster Machines* series (Nick. Jr., 2019) were selected. Episodes selected included *Bouncing Bull Racetrack* (Borkin et al., 2017) and *Epic Sail* (Borkin et al., 2014), because each had a corresponding book, *Rootin’ Tootin’ Racetrack* (Berrios, 2017) and *Wind Power* (Berrios, 2016). The experimenter-created, prior word knowledge assessment was

based on 20 words found in the *Blaze* books and television shows. One book and corresponding TV episode (*Wind Power* and *Epic Sail*) shared ten words while the other book and TV show (*Rootin' Tootin' Racetrack* and *Bouncin' Bull Race Track*) shared the other ten words. Each word list contained two character names, two words likely familiar to the participant, nouns, and nonsignificant differences in age of acquisition (Kuperman, Stadthagen-Gonzalez, & Brysbaert, 2012). The words chosen for *Wind Power* and *Epic Sail* were Stripes (*character name*), AJ (*character name*), monkey, boat, vine, wave, mast, mainsheet, reel and frame. The words chosen for *Rootin' Tootin' Racetrack* and *Bouncin' Bull Race Track* were Starla (*character name*), Blaze (*character name*), hat, map, geyser, cliff, piston, boiler, tracks and bull. Two PowerPoint presentations were created; a prior word-knowledge assessment list A and prior word knowledge assessment list B. Lists contained the same items, but in a different, randomized order of presentation. In both PowerPoint presentations each slide depicted a still-picture photo of the designated vocabulary word and a motion-picture of the same vocabulary word. During the task, the participant was asked, "What is this \_\_\_\_\_?" The number of prior words known were documented by the examiner with a correct "+" or incorrect "-". Thus, the dependent variable from this task was the number of words known by the participant. A secondary dependent variable was the number of character names previously known by each participant.

For the activity, an examiner read one *Blaze* book for approximately 12 minutes to the child, or the child watched approximately 10 minutes of a *Blaze* TV episode with the researcher. Half the children were read the book first (*Wind Power* or *Rootin Tootin Racetrack*) and half watched the TV episode first (*Epic Sail* or *Bouncing Bull Racetrack*). If the participant was first read *Wind Power* they would then watch *Bouncing Bull Racetrack* and vice versa. This

counterbalance was used to ensure word learning was not dependent on story line structure or other varying reasons within participants.

After completion of either the book or TV activity, the participant sat at the computer and labeled 10 words that corresponded to the vocabulary words found in the book or television episode. Immediately following the activity the child was administered a post test assessment with the same 10 words. The researcher prompted the child by saying, “What is this?” Upon completion of the post test, the child took a five-minute break. During this break, the child colored, played with playdough, or went to get a drink of water. After the break, the child was given a final test of word knowledge using the same 10 words. The participant was then asked to complete book reading or TV (whichever had not been completed first) and follow the same post-assessment procedures. Only one participant was unable to complete the entire study, therefore, only data from the activity completed was included in the results.

### **Engagement and Time-Off Task**

Following the participant’s involvement in the study, engagement was measured in two ways by viewing videos of participants during the study: an engagement rating scale (perceived social engagement during the tasks; Appendix A) and concrete measure of time-off tasks (behavioral engagement; Appendix B).

The engagement rating scale was created by the student principal investigator based on a review of the engagement literature. Participants received an engagement score for both television and book reading tasks. A five-point scale was based on overall interactions through gestures, commenting, and establishment of joint attention with the examiner. A one indicated no gestures, comments, joint attention, and constant redirections necessary from the examiner with

majority of time seeming inattentive. A five represented independent use of gestures, comments, consistent joint attention, and no redirections with majority of time spent attentive to the task. The examiner rated each child's engagement and scored accordingly.

The concrete measurement of time-off task was measured using video timing. Each child received a time-off task measure for the book and television task. The examiner intensively monitored the child's eye gaze and measured the time that the participant glanced off the book or television activity. The examiner calculated each child's time-off task for the duration of each activity.

### **Data Analysis**

To ensure validity and reliability across all standardized assessments, experimental tasks, engagement scores, and time-off task calculations, two different research assistants scored each individual task separately. The initial scoring for assessments was completed while the participant was actively involved in the experiment. Initial scoring for engagement scores and time-off task was completed retrospectively by reviewing the video footage for all 21 participants. The second research assistant re-scored assessments by reviewing the video footage from the session, and guaranteed that no mistakes were made on the initial score sheet. This research assistant obtained eleven participant videos and documented an engagement score and calculated time-off task. The final research assistant followed the exact procedures as the second research assistant and collected engagement and time-off tasks scores. The first rater's scoring was deemed appropriately reliable and used for all later analysis.

### **Results**

Of the 21 participants, 20 children took part in all assessments and tasks for the completion of the study. One participant was called into class and unable to complete the second full activity, so data for only 20 participants are presented here. The study sought to answer the following questions: (a) Do children with and without hearing loss learn more words during book reading versus television watching?, (b) Is the number of words learned correlated with measures of engagement (time on task and engagement rating)? and (c) Is number of words learned correlated with prior vocabulary knowledge, nonverbal intelligence, or number of character names already known.

To answer the first question, if children with and without hearing loss learned more words during book reading versus television watching, a repeated-measures analysis of variance was conducted. The between-subjects independent variable included group membership (CI, AM, or VM), and within subjects independent variable included time (pre-test, post-test or delayed posttest) and medium (television or books). The dependent variable was number of words expressively identifies in the experimental task. Figure 1 illustrates the number of words learned in each medium over time.

Results indicated a main effect of group membership ( $F(1, 19) = 118.59, p < .001$ ) and a main effect of time ( $F(2, 19) = 7.05, p = .002$ ). There was no main effect of medium or any interaction effect between variables, although the medium by group interaction approached significance (Medium x Group:  $F(1, 19) = 3.483, p = .07$ ). Thus, children with and without hearing loss were as likely to learn from television as they were to learn from books, and regardless of group membership, both groups were likely to learn. Children with normal hearing started and ended the study with higher vocabulary knowledge than did children with hearing loss.

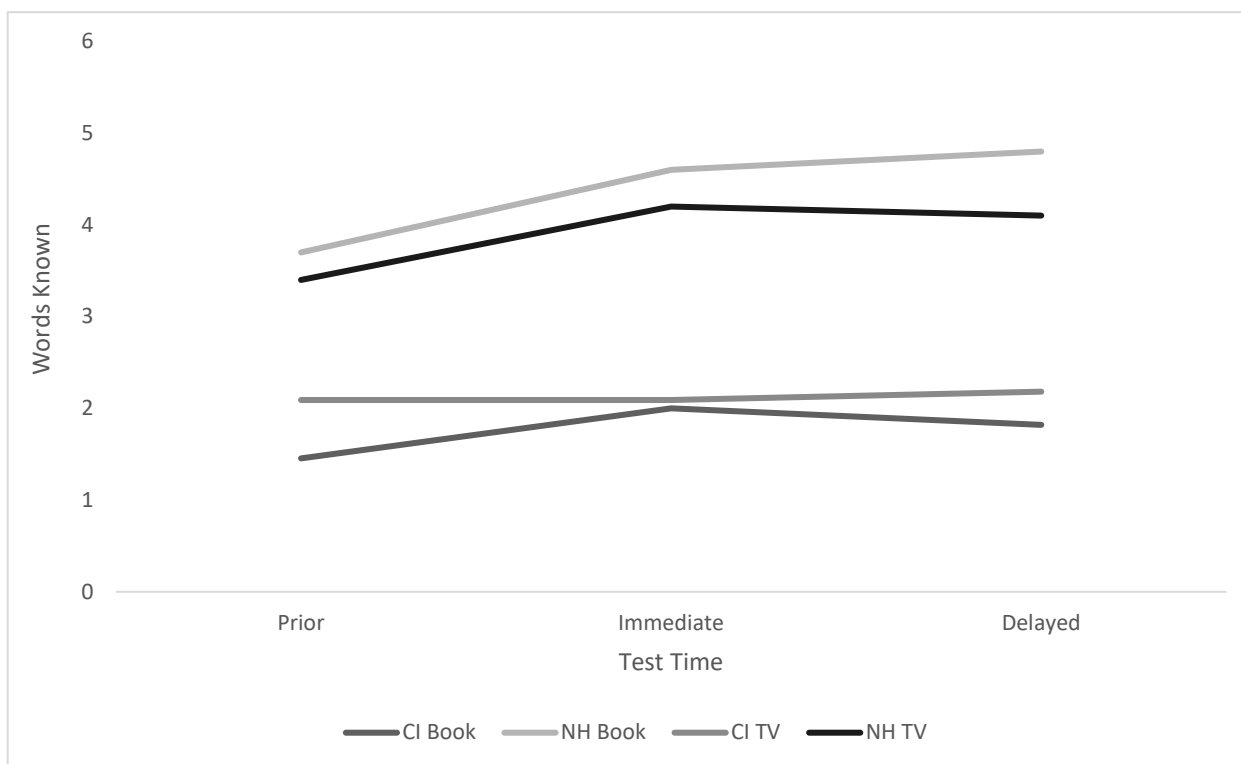


Figure 1: Words Learned in Book Reading and Television Viewing Over Time

To address the second research question, if the number of words learned correlated with measures of engagement (time on task and engagement rating). First, a non-parametric Spearman's rho was used to measure the association between words learned and engagement across mediums. Engagement was classified as an ordinal variable. To address the relation between time off task and performance, Pearson correlations were conducted.

Results for the group of children with hearing loss are presented in Table 2. The only significant relations in this analysis included the relation between time off task during book reading and engagement rating during book reading ( $p = -.658$ ), and engagement ratings for book reading and for television ( $p = .785$ ). Thus, if children were not on-task during book reading, they were also rated as "not engaged" during book reading. Surprisingly, the same significant correlation was not found for television watching. However, engagement ratings (indicative of

social engagement) were correlated for television and book reading, meaning that children who were likely to engage socially during task \ presentation were as likely to exhibit that engagement regardless of medium.

Results for the group of normal hearing children are presented in Table 3. The only significant relations in this analysis included relation between engagement score during television and time off task with the book ( $p = -.651$ ). Thus, if a child was more engaged with the TV episode, they were rated “not engaged” during book reading. In particular the group of older normal hearing children demonstrated this phenomenon.

	<b>Words Learned Book</b>	<b>Time Off-Task Book</b>	<b>Time Off-Task TV</b>	<b>Engagement TV<sup>a</sup></b>	<b>Engagement Book<sup>a</sup></b>
<b>Words Learned TV</b>	.458	-.032	.087	.221	.228
<b>Words Learned Book</b>		-.143	-.086	.000	-.061
<b>Time Off-Task Book</b>			.486	-.544	<b>-.658*</b>
<b>Time Off-Task TV</b>				-.121	-.010
<b>Engagement TV</b>					<b>.785*</b>

Table 2. Hearing Loss Group, Words Learned across Medium Note. \* Indicates a significant correlation

	<b>Words Learned Book</b>	<b>Time Off-Task Book</b>	<b>Time Off-Task TV</b>	<b>Engagement TV<sup>a</sup></b>	<b>Engagement Book<sup>a</sup></b>
<b>Words Learned TV</b>	.169	-.181	-.015	-.505	-.354
<b>Words Learned Book</b>		.033	.042	-.082	.066
<b>Time Off-Task Book</b>			-.208	<b>-.651*</b>	-.367
<b>Time Off-Task TV</b>				.052	-.283
<b>Engagement TV</b>					.609



Table 3. Normal Hearing Group, Words Learned across Medium \* *Indicates a significant*Normal Hearing Group, Words Learned across Medium *correlation*

	TV Engagement	Bk Engagement	TV Time Off Task	BK Time Off Task
<b>CI</b>	3.5	3	2.08	1.63
<b>NH</b>	3.4	2.5	1.36	1.05

Table 4. Time off task and Engagement Rating *Note.* Units of measure for time-off-task were minutes

To answer the third research question, if the number of words learned correlated with prior vocabulary knowledge, nonverbal intelligence, or number of character names (as a proxy for television show familiarity) already known, a Pearson correlation was calculated for each of the variables (Table 5). Those results are shown in Tables 6 and 7. Across the group of children with hearing loss and the group of children with normal hearing, the only significant correlation was between words learned from television and character name knowledge for children with hearing loss. In this case, that correlation was negative, meaning that children who knew more character names were less likely to learn new words from TV if they had a hearing loss.

Interestingly, there was not a significant correlation in either group for words learned from TV with words learned from books, meaning that although children were learning, those learning more from TV were not necessarily those learning more from books (i.e., some children learned more from one medium, some from another).

	Prior Vocabulary Knowledge	EOWPVT	PTONI	Characters Known
<b>HL</b> <b>n = 11</b>	1.3	92.36* (13.67)	98.00* (14.00)	.27* (.47)
<b>NH</b> <b>n = 10</b>	1.9	117.90* (9.87)	113.00* (12.60)	1.30* (1.16)

Table 5. Prior Word Knowledge, EOWPVT, PTONI, Characters Known

	<b>Words Learned Book</b>	<b>EOWPVT</b>	<b>PTONI</b>	<b>Character Names</b>
<b>Words Learned TV</b>	.458	.240	.078	<b>-.640*</b>
<b>Words Learned Book</b>		.404	-.406	-.261
<b>EOWPVT</b>			-.374	.108
<b>PTONI</b>				-.405

Table 6. Hearing Loss Group, Word Learning, Correlation with EOWPVT, PTONI, Character Names \* Indicates a significant correlation

	<b>Words Learned Book</b>	<b>EOWPVT</b>	<b>PTONI</b>	<b>Character Names</b>
<b>Words Learned TV</b>	.169	.451	.231	-.146
<b>Words Learned Book</b>		.262	-.034	-.201
<b>EOWPVT</b>			.423	.187
<b>PTONI</b>				-.320

Table 7 Normal Hearing, Word Learning Correlation with EOWPVT, PTONI, Character Names

Overall findings indicated children with normal hearing began the task knowing more words than children with hearing loss, yet the number of words learned across mediums was about the same, regardless of group membership. The measure of engagement was not a strong predictor of learning in either context. Predictors that were hypothesized to influence learning, including nonverbal intelligence, expressive language scores, and previous knowledge of character names, did not significantly correlate with number of words learned for either television or book reading.

## Discussion

The purpose of this study was to determine the relation between engagement and word learning during television and book reading in children with and without hearing loss. Both groups of participants demonstrated word learning in both television viewing and book reading contexts, and children with hearing loss tended to know more words before and after the task than children with normal hearing. However, engagement was not a clear predictor of which child learned words and in which medium. Overall, it is encouraging that each group demonstrated word learning in both mediums, as it supports the idea that educators could harness television as a tool for learning, even for children with hearing loss.

**Engagement.** There was no evidence of engagement or time on task correlating with word learning for either group. Further, engagement ratings and time-on-task ratings were not always correlated within medium; in other words, there was not a significant correlation between engagement and time off task for television in either group, and there was not a significant correlation between engagement and time on task for book reading for children with normal hearing. This may be an indication that the constructs of cognitive engagement and behavioral engagement, in this study represented as time on task, and social engagement, in this study represented as engagement rating, are not interchangeable.

During the television task, some children demonstrated digital or “zombie” engagement. This kind of engagement, which was time-on-task engagement but not rated as engagement on the rating scale, indicated that children entered into a trance-like state and did not break eye contact with the screen. It is possible that in this case, children were responding to societal expectations about television watching. The social expectations of interacting with another person while watching television are minimal. It is difficult to hold conversations, point to pictures, or comment on a television show without missing content. Therefore, children may

have chosen not to engage socially during television watching based on experiences watching TV.

For book reading, the cognitive, behavioral, and social expectations of reading one-on-one appeared to shift how engagement manifested in the session. Social norms for reading a book one-on-one often require the listener to actively participate, comment, and communicate with the reader; it is not uncommon for a reader to converse with a listener during reading (Hargrave & Sénéchal, 2000). During book reading, there are more natural opportunities for pausing and reciprocal communicative acts which motivate children to communicate with the reader; the story can pause while conversation occurs outside of the story. Thus, it would be reasonable to see a discrepancy between engagement ratings and time-off-task ratings for some children; when some children engage socially, it may look like time off task.

For the hearing loss group, engagement ratings for TV viewing and book reading were correlated. That is, children who were most engaged socially with television were also those who were most socially engaged in book reading. There was also a strong, but not perfect correlation in this group only between engagement in book reading and time on task during book reading. It is possible that children who were likely to be engaged during these tasks were those children for whom social engagement was part of their normal routines at home.

In the group of children with normal hearing in particular, a surprising finding was that children were more engaged with television than with books. This was possibly a result of the book and television show selection: children with normal hearing in the study were slightly older than the late-preschool age range targeted by the television show. This show was selected for its inclusion of STEM-based words that children were unlikely to know. For children with hearing loss, who tend to have lower language knowledge than children with normal hearing, it is

possible that the level of the show was commiserate with their current language skills. The children in the normal hearing group may have, however, believe the show was beneath the linguistic level that would capture their interest.

**Television and Book Reading for Children with Hearing Loss.** For both groups, the number of words learned from TV and the number of words learned from books were not significantly correlated. Thus, it appears that the children who are likely to learn words from television are not necessarily the same children likely to learn words from books. Further, that learning was not correlated with vocabulary size or nonverbal intelligence. For children only in the hearing loss group, learning from television was negatively correlated with the number of character names known by children at the start of the show. This was a surprising finding: children with hearing loss who were familiar with *Blaze and the Monster Machines* were less likely to learn words from the television show than children who were unfamiliar with the show.

**Vocabulary and Word Learning in Children with Hearing Loss.** Findings are consistent with the literature that children with normal hearing know more words than children with hearing loss (Lund, 2016; Tomblin et al., 2015). Although both groups learned in each medium, the number of words learned was not substantial. If children learned words during the show or book, they learned, on average, only one new word. This is also consistent with the literature: many children need repetition to retain multiple new words, particularly in story context (e.g., Bobzien et al., 2015). To ensure new vocabulary remains in the child's semantic network, explicit instruction and repeated exposure to the word are critical for the retention and later use of the word. Thus, combining explicit instruction through semi-supported and engaging constructs may be another way to facilitate word learning. If book reading and/or

television watching are to be used as a means of teaching children new vocabulary, repeated readings of books or watching of television episodes would probably best serve that purpose.

Clinically, it would be difficult to draw conclusions from this preliminary study about teaching new words children with hearing loss through reading or television. However, this study may provide initial evidence that children with hearing loss are able to learn in semi-supported contexts such as television viewing, and to learn as well as children with normal hearing. Thus, there may be a reason to incorporate television parent-training programs when working with this high-risk population. Parent-mediated television could support the initial integration of a new word to existing representations of the word. The ability to pause the show, ask open-ended questions, and explicitly discuss the meaning of words could help enforce lexical organization of new vocabulary words. Multiple exposures and repetitions of the word could help organize and store the new words into long-term memory, leading to future ease of retrieval and frequent use of the word (Leach & Samuel, 2007).

**Limitations and Future Directions.** The limitations of this study can lead to future research directions. First, this study was based on *Blaze and the Monster Machines*, a STEM based television show that may not be entertaining for all children. *Blaze and the Monster Machines* was selected as the target storyline because the words found in the book and television show were likely to be unknown even to the participants with normal hearing (e.g., anemometer). In a future study, finding a balance between an interesting topic and creating individualized word lists specific to each child could help account for learning differences that might be based on show preference.

As a second possible future direction, an in-depth interview and analysis of television in the household would allow researchers to understand how television is used in the home. Many

caregivers were hesitant to describe television with respect to their daily routines and therefore, television was not explicitly discussed in the forms. This limitation made it difficult to understand the use of television in the home (i.e., as a babysitter or constantly in the background) and the amount/ duration of exposure throughout the day. Another factor influencing child behavior may be whether a child has a habit watching television without restrictions versus children with specific allotted times throughout the day to watch (i.e., reward system), as this might affect child engagement.

Third, a limitation of this study was that children only read the book and watched the television show one time. Implementing a repetitive task of exposure to each medium over more than one sitting could determine whether between-group differences in word learning and engagement emerge over a period of time. By assessing a repetitive activity, we could properly determine if a child preferred one medium over the other and in turn learned more vocabulary due to increased engagement. Lastly, this study included only eleven children with hearing loss. In future studies, include a larger sample size of children with cochlear implants and hearing aids to age-matched peers to determine if group membership is important for word learning across mediums.

In conclusion, this study sought to look at the potential differences in word learning from television versus book reading, and to understand the role engagement played in the amount of words learned in either context. The results of this study indicated that children learned new vocabulary words in both contexts, and engagement was not a sufficient indicator of determining which child would learn and in which medium. Although more research is necessary to establish the most effective method to increase vocabulary through television, this study demonstrates

preliminary evidence to use TV along with book reading as another tool for educating children with and without hearing loss.



## References

- Berrios, F., & Burch, B. (2016). *Wind power!* New York: Golden Book.
- Berrios, F., & Foley, N. (2017). *Rootin tootin racetrack!* New York: Golden Books.
- Bus, A. G., Van Ijzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research*, 65(1), 1-21.
- Bus, A.G. (2001) 'Joint Caregiver-child Story Book Reading: A Route to Literacy Development', in S.B. Neuman and D.K. Dickinson (eds) *Handbook of Early Literacy Research*, pp. 179–91. New York
- Brownell, R (2000a). *Expressive One-Word Picture Vocabulary Test*. Novato, CA: Academic Therapy Publications.
- Brownell, R (2000b). *Receptive One-Word Picture Vocabulary Test*. Novato, CA: Academic Therapy Publications.
- Coyne, M. D., Simmons, D. C., Kame'enui, E. J., & Stoolmiller, M. (2004). Teaching vocabulary during shared storybook readings: An examination of differential effects. *Exceptionality*, 12, 145–162.
- Davidson, L. S., Geers, A. E., & Nicholas, J. G. (2014). The effects of audibility and novel word learning ability on vocabulary level in children with cochlear implants. *Cochlear Implants International*, 15(4), 211-221.
- Ehrler, D. J., & McGhee, R. L. (2008). *Primary Test of Nonverbal Intelligence (PTONI)*. Austin, TX: Pro-Ed.
- Hargrave, A. C., & Sénéchal, M. (2000). A book reading intervention with preschool children who have limited vocabularies: The benefits of regular reading and dialogic reading. *Early Childhood Research Quarterly*, 15(1), 75-90.
- Hofferth, S. L., & Sandberg, J. F. (2001). How American children spend their time. *Journal of Marriage and Family*, 63(2), 295-308.
- Houston, D. M., Stewart, J., Moberly, A., Hollich, G., & Miyamoto, R. T. (2012). Word learning in deaf children with cochlear implants: effects of early auditory

- experience. *Developmental Science*, 15(3), 448–461.
- Kaderavek, J. N., & Pakulski, L. A. (2007). Mother—child story book interactions: Literacy orientation of pre-schoolers with hearing impairment. *Journal of Early Childhood Literacy*, 7(1), 49-72.
- Krcmar, M. (2010). Can social meaningfulness and repeat exposure help infants and toddlers overcome the video deficit?. *Media Psychology*, 13(1), 31-53.
- Lund, E. (2015). Vocabulary knowledge of children with cochlear implants: A meta-analysis. *Journal of Deaf Studies and Deaf Education*, 21(2), 107-121.
- Lund, E. (2018). Pairing new words with unfamiliar objects: Comparing Children With and Without Cochlear Implants. *Journal of Speech, Language, and Hearing Research*, 1-12.
- Marulis, L. M., & Neuman, S. B. (2010). The effects of vocabulary intervention on young children's word learning: A meta-analysis. *Review of Educational Research*, 80(3), 300–335. Mayer, C. (2007).
- Maxon, A. B., & Welch, A. J. (1992). The role of language competence on comprehension of television messages by children with hearing impairment. *The Volta Review*, 94(3), 315-326.
- McWilliam, R. A., & Casey, A. M. (2008). *Engagement of every child in the preschool classroom*. Baltimore, MD: Paul H. Brookes Publishing Company.
- Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics*, 106(3), e43-e43.
- Nielsen. The total audience report Q1, (2017). The Nielsen Company (US), LLC., New York, NY. 2017
- Philp, J., & Duchesne, S. (2016). Exploring engagement in tasks in the language classroom. *Annual Review of Applied Linguistics*, 36, 50-72.
- Rice, M. L., & Woodsmall, L. (1988). Lessons from television: Children's word learning when viewing. *Child Development*, 420-429.
- Robbins, C., & Ehri, L. (1994). Reading storybooks to kindergarteners helps them learn new vocabulary words. *Journal of Educational Psychology*, 86, 54–64.
- Robertson, V. S., & Hay, J. S. (2017). The Effect of Hearing Loss on Novel Word Learning in

- Infant-and Adult-Directed Speech. *Ear and hearing*, 38(6), 701-713.
- Shin, N. (2004). Exploring pathways from television viewing to academic achievement in school age children. *The Journal of Genetic Psychology*, 165(4), 367-382.
- Snow, C., Burns, M. S., & Griffin, P. (1998). Preventing reading difficulties in young children. Washington, DC: National Academy Press.
- Stelmachowicz, P. G., Pittman, A. L., Hoover, B. M., Lewis, D. E., & Moeller, M. P. (2004). The importance of high-frequency audibility in the speech and language development of children with hearing loss. *Archives of Otolaryngology–Head & Neck Surgery*, 130(5), 556-562.
- Valkenburg, P. M., & Vroone, M. (2004). Developmental changes in infants' and toddlers' attention to television entertainment. *Communication Research*, 31(3), 288-311.
- Whitehurst, G. J., Arnold, D. S., Epstein, J. N., Angell, A. L., Smith, M., & Fischel, J. E. (1994). A picture book reading intervention in day care and home for children from low-income families. *Developmental Psychology*, 30(5), 679.

## Appendix

Rating Scale	Description
1	<i>Extremely engaged</i> ; always comments when appropriate, no redirecting to TV or book activity, maintains eye contact with book or screen during the 12-minute activity without prompting, independently sits at computer or table.
2	<i>Very engaged</i> ; often comments when appropriate, needs a few reminders to redirect attention to TV or book activity, maintains eye contact with book or screen during the 12- minute activity with minor redirection, independently sits at computer or table.
3	<i>Somewhat engaged</i> ; inconsistently comments when appropriate, some redirecting to the TV or book, inconsistent eye contact with TV or book during each 12-minute activity, some fidgeting, some inappropriate dialogue during activity, independently sits at computer or table.
4	<i>Slightly engaged</i> ; never comments when appropriate, needs constant redirecting to the TV or book, does not maintain eye contact with TV or book during each 12-minute activity, fidgeting, constantly talking with others while activity is continuing, inconsistently sits at the computer or table.
5	<i>Not at all engaged</i> ; never comments when appropriate, even with constant redirection to the TV or book does not watch/read, does not maintain eye contact with TV or book during each 12-minute activity, fidgeting, constantly talking with others while the activity is occurring, unable to sit independently at the computer or table.

Appendix A. Engagement Rating Scale: Books and Television

Total Time of Video – Time- Off Task = Total Amount of Time on Task

Appendix B. Time-Off Task Formula: Books and Television

**ABSTRACT****ENGAGEMENT AND WORD LEARNING IN CHILDREN WITH AND WITHOUT  
HEARING LOSS: BOOKS AND TELEVISION**

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This study examined the relation of engagement and word learning during television and book reading in children with and without hearing loss. Eleven children with hearing loss and ten age-matched children completed measures of speech perception, expressive vocabulary, and nonverbal intelligence to determine predictors of word learning in both mediums. A children's book and corresponding television show were used to assess expressive word learning and engagement levels, which was measured by a rating scale and time-off task. Children with normal hearing knew more words than children with hearing loss prior to watching videos, but the number of words learned across both mediums was similar, regardless of group membership. For normal hearing children, engagement was not correlated with word learning, and was near ceiling for both tasks. For children with hearing loss, engagement and time on task similarly did not predict learning. The hypothesized predictors of expressive vocabulary and nonverbal intelligence did not correlate with word learning outcomes. Overall findings indicated that children, with or without hearing loss, are as likely to learn new words from television as from book reading.