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## Impact of Television on the Language Development of Young Children

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IMPACT OF TELEVISION ON THE LANGUAGE DEVELOPMENT OF YOUNG  
CHILDREN

by

Courtney E. Daly

A Thesis Submitted in Partial Fulfillment  
of the Requirements for a Degree with Honors  
(Communication Sciences and Disorders)

The Honors College

University of Maine

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## ABSTRACT

Today, children are growing up immersed in television screen media, which has been shown to have both positive and negative effects on language development. Young children are considered developmentally vulnerable, and today, they are growing up highly immersed in digital media. Strict guidelines by the American Academy of Pediatrics (AAP) suggest that limiting the use of screen time. However, there is limited current research on the effect of coviewing while watching television programs on the language development of children. This investigation sought to contribute to efforts aimed at understanding the impact of coviewing on language output.

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## LITERATURE REVIEW

Television; America's favorite pastime. With televisions present in nearly all U.S. households, watching television is a popular leisure activity. With an expanding variety of devices, such as tablets and laptops, televisions are not required to watch programs and movies at home. While limited usage of developmentally appropriate media can have positive effects on development, excessive usage of developmentally inappropriate media carries great risks for children (American College of Pediatricians, 2016).

Infants and toddlers are spending, on average, two hours with screen media per day, with television screens accounting for nearly 1.25 hours of that time (Wartella, Rideout, & Vandewater, 2003). The American Academy of Pediatrics (AAP) guidelines (2016) recommend that children under 18 months should avoid the use of all screen media. In addition, children ages 18-24 months should be watching high-quality screen media and a parent should co-view with the child by watching television with them to help them understand what they are viewing. Lastly, the AAP recommends that children ages two to five years should be limited to one hour per day of screen use (AAP, 2016). It is critical to evaluate the developmental impact of this screen time in order to understand the reasoning for the American Academy of Pediatrics' guidelines.

The first years of life are a significant period of development for a child's brain. For example, a typical child acquires 25-50 words by the time they have reached their first birthday (De Temple & Snow, 2003). This information is meaningful because research has shown that the number of words children produce at this age significantly correlates with subsequent language development to words heard in their environment (Lee, 2011). This word learning can be done through direct interactions with the child or

through incidental language learning. A child's word learning is significantly correlated to the words heard in their environment (Hart & Risley, 2006). Television viewing has the potential to limit the number of one on one interactions and language learning opportunities for a child. Currently, there is limited research regarding the impact of television exposure on the language development of infants and toddlers.

### Effects of Media Content on Development

In order to understand how television and screen media influences childrens' language development, it is important to consider that there are various types of media accessible. Anderson and Pempek (2005) classify television programs into two distinct groups: foreground and background television. The researchers define foreground television as "programming to which very young children overtly attend in a sustained manner" (Anderson & Pempek, 2005, p. 506). Essentially, this includes any television program that is designed for young children whose content is partially understandable to them. Background television is defined as television that is not produced for children, consisting of content that would be largely incomprehensible to them (Anderson & Pempek, 2005).

Content appears to be an important piece to understanding the impacts of television on the development of children. When researchers compare the total time children spend with media and the relative importance of media content, it is found that content is more significant. In a study examining young children's attention to Sesame Street, Anderson and Levin (1976) found a linear increase in children watching television from one year through four years old. The researchers recruited 35 females and 37 males for a total of 72 children. Children were divided into seven groups by age; 12, 18, 24, 30,

36, 42, and 48 months, with ten children in each group (5 females and 5 males), and two extra males in the 36- and 42- month age group. Children were placed in a viewing room with a parent and toys, and were observed from an adjacent room. Throughout the 57 minute program, observers recorded the amount of time when children appeared visually fixated on the television and when their attention shifted.

The results of their study indicated that, from one to four years of age, there was a dramatic increase in childrens' attention to television. Children younger than 30 months were observed to not consistently monitor the television, however their attention was captured for short periods of time. This younger group of children appeared to be more interested in playing with toys and interacting with their mothers. In comparison, the older children appeared to more deliberately "watch" the television, and sat oriented toward the television set.

Information gathered from a parent questionnaire, which regarded average daily television watching time, showed an increase in television watching at home in older children, noting a sharp increase that occurred at 30 months of age. It is critical to note that the shift in behavior in both amount of television viewing and attention to television at 30 months of age is likely due to increased comprehensibility as the children matured, and the alignment of their cognitive and language development to the show viewed (Anderson & Levin, 1976). Children selectively attend to aspects that they find understandable and interesting; therefore, they attend to aspects that match their cognitive level. At 30 months of age, Sesame Street and other preschool programs match most childrens' cognitive levels, gaining the child's attention.

In another study conducted by Anderson and Lorch (1981), children's attention to television was found to be highly dependent on content. The researchers once again used Sesame Street to examine 2, 3.5, and 5 year olds' attention to television by randomly rearranging video clips. For example, they made dialogue run backwards or used foreign language. Children at all ages within the study looked at the television more often when they were shown the normal video clips and looked less at the television when the segments were manipulated. The authors argue that this effect would not happen unless the children processed the language at the level of its meaning and were directing their attention to content they could follow. This study clearly depicted that children are attentive to language in the context of a television show, and that language meaning is important to children's enjoyment of the program.

Linebarger and Vaala (2010) provided evidence that supports the notion that a child will learn from material if he or she pays attention to it. Essentially, television can be an effective method of instruction when video materials include tools for learning that are similar to those that support word learning in a natural environment. In order for this to occur, the technology needs to include materials that align with the cognitive level of the child. For example, children who watched programs that included prompting routines after the viewing resulted in a larger vocabulary and were more likely to communicate during play in comparison to infants who did not watch these programs (Linebarger & Vaala, 2010).

Researchers Linebarger and Walker (2005) also found the effect of television to be dependent on content. They investigated whether linguistic input in the form of televised messages had an impact on the communicative ability of infants and toddlers.

The parents of 23 boys and 28 girls six months old were asked to report the number of hours of television their children watched each week until they reached 30 months old. Parents reported the name of all television shows watched, the number of days per week their child watched each show, and the amount of time their child watched each program each day.

The researchers found that children's vocabulary and expressive language output was dependent on the television program the child watched. Regarding vocabulary, when children were assessed at thirty months old, it was found that viewers of Blue's Clues and Dora the Explorer knew 13.30 more vocabulary words than nonviewers, and viewers of Arthur and Clifford resulted in an increase of 8.60 vocabulary words. Barney & Friends and Teletubbies viewing were negatively related to vocabulary acquisition. Specifically, viewing Barney & Friends was associated with 11.68 fewer words at 30 months compared to nonviewers, and viewers of Teletubbies knew 10.18 fewer words in contrast to nonviewers. Finally, there was no relationship found between vocabulary acquisition and the viewing of Dragon Tales, Sesame Street, or Disney movies.

Similar to the effect on vocabulary, the relationship between television shows and the length of the child's utterance was dependent on the type of program viewed. Television shows that were positively related to expressive language output include Blue's Clues and Dora, which were associated with 1.78 more single- and multiple-word utterances at 30 months, as well as Arthur and Clifford, in which viewers were found to use 1.10 more single- and multiple-word utterances compared to nonviewers. In contrast, viewers of Sesame Street and Teletubbies were found to exhibit a negative relationship in regards to expressive language production. Viewing of Sesame Street was associated with

using 1.49 fewer single- and multiple word utterances at 30 months as well as a decrease in the growth rate of 0.13 words per month when compared with nonviewers. Viewers of Teletubbies were found to show a decrease in the growth rate of -0.10 utterances per month.

The findings of Linebarger and Walker's study demonstrated the importance of content in assessing the effects of television viewing on the language and vocabulary development of children at an early age. The researchers concluded programs such as Arthur and Clifford supported vocabulary and language growth due to their storybook-like nature. More specifically, these programs allowed the viewer to hear a vocabulary word and its definition, see a visual representation of the word, and see interactions between characters around the word. The data in this study give evidence that story-book programs may be effective supports for learning vocabulary and producing language.

With the intent of informing parents, educators, and others who work with young children about the impact of television on preschool children, Kirkorian and colleagues (2008) reviewed literature on children and television watching. The authors emphasized the importance of content in mediating the effect of television on cognitive skills and academic achievement. The authors further explained that exposing young children to age appropriate programs with an educational curriculum is associated with cognitive and academic enhancement. On the other hand, the authors concluded that exposure to purely entertainment programs, especially those that contain violence, at a young age is associated with decreased cognitive development and academic achievement.

## Negative Effects of Media on a Child's Development

Despite potential positive benefits of television, research has also shown negative impacts on language, vocabulary, and cognitive developmental skills. A 2008 study conducted by Chonchaiya and Pruksananonda demonstrated a relationship between language delay and viewing television at a young age. The study was comprised of 56 children with language delay, and 110 children with no delay, ranging in age from 15-48 months. Parents provided information related to the child and family, the home environment, at what age their child started watching television, and the amount of television each child watched on average. Chonchaiya and Pruksananonda also observed the child rearing pattern of each family, noting the parent's sensitivity to the child's needs, expectations for self-control, and type of discipline used.

The study found that children who had a language delay tended to start watching television about ten months before they could speak their first meaningful word. On average, they began watching at about seven months of age, and watched television for three or more hours per day. In addition, children who started watching television younger than 12 months old and who watched more than two hours of television each day were approximately six times more likely to develop language delays. Children with normal language development generally started watching television after they could speak their first single word.

Chonchaiya and Pruksananonda concluded that the most significant risk factors that could strongly predict language delay were the onset of television viewing before 12 months of age, television viewing for more than two hours each day, watching adult programs, and the absence of interactive activity during television viewing. This study

demonstrated a strong relationship between early television viewing, high frequency of viewing, lack of coviewing, and delay in language development.

Lin, Cherng, Chen, and Yang (2015) conducted a study to assess the effects of television exposure on the developmental skills of children younger than 36 months of age. The study explored the amount of time children spent watching television and investigated its effects on cognitive, language, and motor developmental skills. Researchers collected 75 children who were frequently exposed to television and 75 children who were not at all or infrequently exposed to television between 15 and 35 months of age. The Bayley Scales of Infant Development-second edition (BSID-II) and Peabody Developmental Motor Scales-second edition (PDMS-2) were used to measure developmental skills. The researchers determined that children who were frequently exposed to television were three times more likely to exhibit a language delay than those who were infrequently exposed, and four times more likely to exhibit a cognitive delay. It was found that children with language delay spent more time viewing screens (117.3 minutes) than those without a delay (53.2 minutes). In conclusion, this study showed that allowing young children to spend too much time watching television could not only delay their language development, but also their cognitive skills.

Another study, conducted by Byeon and Hong (2015), aimed to identify the relationship between television exposure and language delay through the use of a nationwide survey of Korean toddlers. The survey was administered to a total of 1,778 normally-developing children ranging in age from 24 to 30 months. It was composed of questions for parents regarding average daily television watching time, household income and size, level of parental education, employment, level of satisfaction with marriage, and

the communication pattern between both mothers and fathers with their child. The linguistic ability of children was assessed using the K-ASQ (Korean-Age and Stages Questionnaire), a developmental screening tool that examines communication, gross motor, fine motor, problem-solving, and personal-social skills. The Young Children's Development Test was also used to measure the development level of toddlers. The findings of the study revealed that toddlers with more than two hours of television viewing time had a 2.7 times more risk of language delay than those with less than one hour. Children who viewed television for more than three hours a day had three times more risk. Furthermore, the risk of language delay increased proportionately with the increase in television watching time.

The results of another experimental study held consistent with several others that suggest there is a negative relationship between vocabulary development and childhood television exposure. Researchers Krcmar, Grela, and Lin (2007) investigated if young children can learn vocabulary from television programs in a short amount of time. Their study included 48 children ranging from 15-48 months of age. The researchers utilized four different formats to present novel words to children; an adult live presentation when the child was attending (joint reference), an adult live presentation when the child was not attending, an adult speaker on television, and an edited voice-over from the children's program Teletubbies. The study revealed that children were most successful in learning novel words in the joint reference condition, and were significantly less successful identifying words from the Teletubbies segment. Moreover, researchers found a significant interaction between age and condition. All children across the age range (15-24 months) were able to identify the novel words when taught by an adult speaker,

however, only children above the age of 22 months were able to demonstrate word learning when taught from the Teletubbies segment. In conclusion, this study presents the argument that children younger than two years learn better from real-life experiences than from equivalent video presentations.

In a similar experiment that also focused on imitation, Barr and Hayne (1999) investigated infants' ability to learn from television. The study consisted of 12-, 15-, and 18-month old children; 36 children comprised each age group. Children were shown either a live demonstration or a video recording of an experimenter demonstrating a task with a puppet. Some of the tasks were simple one-step operations, such as removing a mitten, and some were more involved, such as removing a mitten, shaking it to demonstrate a bell inside, and then removing the bell. Twenty-four hours after children watched the demonstration, experimenters tested and scored children based on their abilities to mimic the behaviors in the demonstration they received. Researchers found that even after a 24-hour delay, infants' showed little difficulty replicating the behavior they were shown in a live demonstration. However, their ability to imitate the televised demonstrations was poor, showing only some success with the one-step demonstrations. Only when children received six repetitions of the video demonstration did their performance match their ability after watching a single live demonstration. In conclusion, it is clear that all children were more successful in retaining material following a live demonstration rather than a televised model.

#### Positive Effects of Media Viewing

While the previous discussion was centered around the negative impacts television can have on the development of children, there is considerable evidence that

suggests television can be a sufficient tool for learning. For example, researchers found that viewing Sesame Street, specifically, resulted in children being more likely to be able to recognize letters of the alphabet and tell connected stories when trying to read. These effects were found to be strongest in children from low-income families. In addition, researchers found a positive correlation between children who had viewed Sesame Street as preschoolers and their reading abilities as they entered first and second grade (Zill, Davies, & Daly, 1994). Another study examined the effects of viewing Sesame Street on school readiness of children ages two to seven years old from a low socioeconomic background (Wright & Huston, 1995). Over the course of the three years, children were tested at regular intervals with standardized tests, including the Peabody Picture Vocabulary Test and the Woodcock-Johnson Letter-Word Recognition Test. The study also took note of childrens' viewing of all television, not just Sesame Street, in addition to non-television activities, such as reading, music, and video games. Wright and Huston found that preschool children who watched educational programs, Sesame Street in particular, performed significantly better than their peers on standardized tests in the areas of vocabulary size, letter-word knowledge, mathematics skills, and school readiness. Furthermore, these children spent more time reading and engaged in educational activities. Viewing child-audience educational programs between ages two and three predicted high performance on all four measures of academic skills.

The positive impact of Sesame Street extends beyond early learning, as shown in a study that examined high school academic success. The study looked at 570 high school students who either had or had not watched Sesame Street as preschoolers. The findings of the study indicated that the students who viewed Sesame Street as preschoolers had

higher grades in English, math and science. In addition, the Sesame Street viewers also used books more often, showed higher academic self-confidence, and valued their academic performance more than their peers who did not watch the show as preschoolers (Anderson, Huston, Wright, & Collins, 1998).

**Environment.** In addition to the positive impacts television was found to have on school readiness and academic success, television exposure was also found to be beneficial to specific populations. For example, television can provide an alternative way to teach early language to infants in impoverished environments (Linebarger & Vaala, 2010). Infants, toddlers, and preschoolers from low-income families who had televisions in their bedrooms scored equally on language as their more advantaged peers who had more books, educational toys and higher quality parent-child interactions (Linebarger & Vaala, 2010). Impoverished homes may lead to less parent-child interaction, thus diminishing the language learning input provided by parents. In this case, television provides another way for children to gather language input and promote language learning.

A literature review that supports this notion was written by Schmidt and Vandewater in 2008. The authors investigated research on the links between various types of electronic media and the cognitive skills of school-aged children. Schmidt and Vandewater (2008) found that the amount of time spent viewing television appears to have different effects on children from different socioeconomic backgrounds. For example, heavily viewing television is negatively associated with achievement for children from higher economic backgrounds. However, viewing television is positively linked with achievement for children from low-income families or those with limited

proficiency in English. (Schmidt & Vandewater, 2008). In conclusion, television viewing and academic achievement are negatively associated when television displaces cognitively enriching moments, but positively associated when it supplies those experiences (Comstock & Paik, 1991).

**Co-Viewing.** The positive influence of television on language is also found to be increased by co-viewing. Co-viewing refers to the act of more experienced language users interacting with the child while watching television together. Co-viewing results in an increase in parent-child interactions and gives opportunities for the adult to enhance the media content. In order to help increase language and communication skills, it is recommended that a parent interacts with their child during television viewing to expose them to more language, highlight novel vocabulary, and make personal connections to what they are seeing (American Academy of Pediatrics, 2016).

In an article reviewing the clinical and psychological effects of excessive screen time on children, Domingues-Montanari (2017) stated that the cognitive developmental benefits of television have been shown to increase when television programs are co-viewed with an adult. For example, when preschool-aged children viewed *Barney & Friends* with an adult, they acquired 3.5 words. When the children viewed the television program alone, they acquired an average of just one word.

In a study that focused on the effects of prosocial television on young children, Friedrich and Stein (1975) pointed out that coviewing is just as important as television program content when determining the effects of television. Friedrich explained how parents can increase the effectiveness of television viewing by co-viewing with their child. The educational value can be enhanced when parents draw attention to the most

important aspects of the program and extend lessons presented in the program. There is limited research on the impact of co-viewing, however the studies that are available suggest that it is an important tool that can be used to increase a child's learning and vocabulary development from television.

### The Present Study

The purpose of this study is to describe parent and sibling interactions throughout a child's television program watching. The following will be investigated: 1) The quality of television programming being watched by the children; 2) An overall description of the children's television viewing (total time viewing and co-viewing); 3) An examination of the number of utterances heard (from sibling or parent) that were relevant vs irrelevant to the television program; 4) An examination of the amount of relevant utterances that were indirectly related to the television program (e.g. responses to child utterances) compared to the number that were directly related to the television program.

## METHODS

### Participants

Four local families agreed to participate in the current study, two from the Old Town YMCA and two from the Children's Center. However, out of these four, one child did not watch television while being recorded, and one family left the recorder on for only 30 minutes, thereby not capturing enough data. The data on the LENA recorder from these children were unable to be analyzed because segments with television watching were not recorded. These children were removed from the final analysis. In addition to the four local families, four previously recorded LENA samples from Edinboro University were included in the current analysis.

Data from six children, between the ages of three and five, were used for analysis of this study. All participants spoke English as a first language. None of the participants had parent identified developmental or communication disabilities. The participants included one preschooler from the YMCA in Old Town, Maine, one from the Children’s Center in Orono, Maine, and four from Edinboro, Pennsylvania. Out of the six children, there were four males and two females ( $x = 3$  years 9.5 months; Range = 2 years 2 months). Parents’ employment was self reported and consisted of a university professor, physician, lecturer, insurance sales agent, CDL driver, logistics officer in the U.S. Army, sales manager, and a childcare center director. Refer to Table 1 for more information regarding participant demographics.

Table 1  
*Participant Demographics*

| <b>Variable</b>                   | <b>n=6</b> | <b>Percent</b> |
|-----------------------------------|------------|----------------|
| <b>Gender</b>                     |            |                |
| Female                            | 2          |                |
| Male                              | 4          |                |
| <b>Family</b>                     |            |                |
| No siblings                       | 1          | 16.7           |
| 1 sibling                         | 4          | 66.6           |
| 2 siblings                        | 2          | 33.3           |
| <b>Mother’s Educational Level</b> |            |                |
| Bachelor’s Degree                 | 2          | 33.3           |
| Master’s Degree                   | 2          | 33.3           |
| Doctoral Degree                   | 2          | 33.3           |

|                            |   |      |
|----------------------------|---|------|
| Father's Educational Level |   |      |
| High School/GED            | 1 | 16.7 |
| Some College               | 2 | 33.3 |
| Bachelor's Degree          | 2 | 33.3 |
| Master's Degree            | 1 | 16.7 |
| Race                       |   |      |
| Caucasian                  | 4 | 66.6 |
| African American           | 1 | 16.7 |
| Asian                      | 1 | 16.7 |

---

### Recruitment

**Local.** Introduction letters (Appendix A), a parent questionnaire (Appendix B), consent forms (Appendix C), and assent directions (Appendix D) were dropped off at the Old Town YMCA and Children's Center in Orono. The packets were asked to be sent home with children between the ages of three and five years old. Interested parents returned the consent form and questionnaire.

Consenting families were notified, via phone or email, of a recording day/time. The LENA recording packet was then dropped off at the YMCA and Children's Center in Orono on a scheduled Friday and the child was recorded on either Saturday or Sunday. The LENA packet included: a copy of the consent form, the LENA recording device, a specialized t-shirt to hold the LENA, daily schedule (Appendix E), and directions.

**Previously collected data.** Children and adult utterances while watching TV were utilized from previously transcribed families recruited from Edinboro, Pennsylvania. The principal investigator narrowed the transcripts down to four children,

because the original goal was to recruit six participants for the study. The transcripts were selected based on the highest number of minutes spent watching television, the highest number of minutes spent coviewing, and transcriptions with children who co-viewed with a sibling in addition to a parent.

### Materials

The LENA device, Language Environment Analysis Systems (LENA), is a language monitoring and feedback system that has the capability to record a full-day of language used by a child and his/her communication partners. LENA software processes the audio recording on a digital language processor and provides computer-generated reports and graphs for analysis of children's vocalization counts (CVC), adult word counts (AWC), conversational turns, and the routines/times in which they occurred. The LENA software facilitates the examination of data elements in children's language use aggregated by a desired time interval (15 minute intervals) across the day. Unlike a clinical observation or parent interview, the LENA provides information regarding adult-child interactions throughout an entire day. The LENA also helps to reduce the Hawthorne effect, which can be described as a time in a study when subjects change their behavior due to awareness that they are being observed.

### Procedures

The parent was instructed to place a LENA recording device in the pocket of a provided shirt. The child wore the shirt for a day to capture all audio and conversations experienced throughout the day. The LENA, T-shirt, and schedule were returned with the child to school the following Monday, and then picked up by the primary investigator. Local parents provided a schedule of the child's day which was used to identify times the

child was watching television. Using this schedule, the principal investigator extracted all audio segments from the indicated time the child spent watching television. Also found on the schedule, and on the previously collected transcripts, was the name of each television program viewed. The television programs were then coded into three groups: interactive, educational, and entertainment. Interactive television shows were determined based on whether social interactions were promoted between the child and the television character. For example, the character looked directly at the camera, asked the child questions, and paused to allow the child the opportunity to respond. Educational television shows were classified as programs that put an emphasis on promoting learning, for example counting and shape recognition, while not giving a chance for children to engage in any language response opportunities. Programs in the entertainment category may send messages important for development, for example teamwork and problem solving, however they did not overtly teach concepts like mathematics or science to benefit the academic success of children.

Research assistants and the PI used Systematic Analysis of Language Transcripts (SALT) guidelines to transcribe all audio segments within television viewing segments. All coviewer (parent or sibling) utterances during television viewing were coded based on the speaker and the relevance of the utterance. Utterances spoken were labeled as “*relevant*” if they were related to the television show the child was watching. Relevant utterances were further divided into “*directly related*” to the television program or “*indirectly related*”. “*Directly related*” utterances were defined as utterances that were either asking the child specifically about the program or were statements related to the program. An example of a “*directly related*” utterance was when Child 4’s mother asked

him, “Are you listening to what the tv is saying? Which senses are you using right now?” and prompted her child to determine which senses he was using (eyesight, hearing). “*Indirectly related*” utterances were classified as a response to what the child was saying about the program but did not add new information or prompt dialogue related to the show. An example of an “*indirectly related*” utterance was when Child 1 told his father “I like that train!” his father replied with “mhm” which was a response to what the child said regarding the television show, but does not prompt the child to reply and engage in speaking. The average number of “*irrelevant*”, “*directly related*”, “*indirectly related*” utterances were totaled and the average and standard deviation were calculated. Comparisons were made across the coviewer (mother, father, sibling) for all utterance types.

## RESULTS

### Quality of television programming

Three children (50%) in the study watched only educational television programs, two children (33%) watched only entertainment television, and one child (17%) watched a combination of interactive, educational, and entertainment television programs. The names and classifications of the television programs that were watched by the children in the study can be found in Table 2.

Table 2

#### *Types of television programs watched*

---

| <b>Child</b> | <b>Name of Television Program(s)</b> | <b>Classification</b> |
|--------------|--------------------------------------|-----------------------|
| Child 1      | Massive Freight Trains               | Educational           |
|              | Blippi                               | Educational           |

|         |   |   |
|---------|---|---|
| Child 2 | Mr. Mike TV   | Educational   |
| Child 3 | Blaze and the Monster Machines  | Educational   |
| Child 4 | Curious George<br>Rescue Bots   | Entertainment<br>Entertainment  |
| Child 5 | Mickey Mouse Clubhouse<br>Goldie and Bear<br>Miles from Tomorrowland<br>Power Rangers<br>Paw Patrol | Interactive<br>Entertainment<br>Entertainment<br>Entertainment<br>Educational |
| Child 6 | Sofia the First   | Entertainment   |

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### Frequency of television viewing and coviewing

The amount of time each individual child spent watching television during the total LENA recording is shown in Table 3. The average total time spent watching television was 138.5 minutes, or 2 hours 18.5 minutes (Range= 238 minutes; SD= 84.56 minutes). Out of this time, the average time each child spent coviewing with a parent or sibling totaled 90 minutes, or 1 hour 30 minutes (Range= 175 minutes; SD= 68.3 minutes).

When the total number of utterances was compared between mothers ( $x=139.33$ ,  $SD= 144.42$ ) and fathers ( $x=133.83$ ,  $SD=237.68$ ), no significant difference was found  $t(10)=.48$ ,  $p=.56$ . On average, mothers were interacting more with the child during co-viewing ( $x=139.33$ ,  $SD= 144.42$ ), compared to the siblings ( $x=63.17$ ,  $SD=65.37$ ). There was a significant difference found in the number of total utterances spoken by the mother to the child compared with the sibling to the child,  $t(10)=1.57$ ,  $p=.03$ . There was not a significant difference when the total number of utterances was compared between the father ( $x=133.83$ ,  $SD=237.68$ ) and the sibling ( $x=63.17$ ,  $SD=65.37$ ),  $t(10)=.94$ ,  $p=0.11$ .

Table 3

*Frequency of Television Viewing and Coviewing*

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| <u>Child</u> | <u>Time Spent Watching Television</u> | <u>Coviewing</u>                 |
|--------------|---------------------------------------|----------------------------------|
| Child 1      | 135 minutes (2 hours 15 minutes)      | 30 minutes                       |
| Child 2      | 50 minutes                            | 20 minutes                       |
| Child 3      | 65 minutes (1 hour 5 minutes)         | 55 minutes                       |
| Child 4      | 150 minutes (2 hours 30 minutes)      | 100 minutes (1 hour 40 minutes)  |
| Child 5      | 290 minutes (4 hours 50 minutes)      | 195 minutes (3 hours 15 minutes) |
| Child 6      | 145 minutes (2 hours 25 minutes)      | 140 minutes (2 hours 20 minutes) |

---

Relevant vs. irrelevant utterances heard

When examining coviewing patterns across children, there was a total of four families (66.7%) that spoke to their child about the television program being watched. Two families (33.3%) did not discuss any topics related to the content of television program with their child.

Table 4 shows the total number of utterances parents and siblings spoke to their child while coviewing, and, out of these, the utterances that were relevant versus irrelevant to the television program. Overall, the children heard significantly more irrelevant utterances ( $x=105.5$ ,  $SD= 140.80$ ) than relevant utterances ( $x=7.05$ ,  $SD=14.75$ ),  $t(17)=2.74$ ,  $p=.01$ .

When the types of utterances (relevant compared to irrelevant utterances during coviewing) across mothers and fathers were compared, there was not a significant difference in the average number of irrelevant utterances,  $t(10)=.01$ ,  $p=.52$  or relevant

utterances,  $t(10) = .46, p = .33$  spoken. However, mothers were using significantly more relevant utterances ( $x = 12.33, SD = 22.54$ ) than siblings ( $x = 1.33, SD = 2.16$ ),  $t(10) = 1.28, p = .04$  during coviewing. In contrast, fathers were not using significantly more relevant utterances ( $x = 7.50, SD = 12.42$ ) than siblings ( $x = 1.33, SD = 2.16$ ),  $t(10) = 1.37, p = .07$ . However, this is approaching significance. Mothers, however, were using significantly more irrelevant utterances ( $x = 127, SD = 130.03$ ) than siblings ( $x = 61.83, SD = 64.56$ ),  $t(10) = 1.52, p = .04$ . Furthermore, there was no significant difference found between the amount of irrelevant utterances spoken by fathers ( $x = 126.33, SD = 225.49$ ) compared to siblings ( $x = 61.83, SD = 64.56$ ),  $t(10) = .97, p = .38$ .

Table 4

*Relevant vs. Irrelevant Utterances Heard*

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|                         | Total utterances | Total relevant utterances (%) | Total irrelevant utterances (%) |
|-------------------------|------------------|-------------------------------|---------------------------------|
| <b>All participants</b> |                  |                               |                                 |
| Average                 | 112.11           | 7.05 (6%)                     | 105.05 (94%)                    |
| Standard deviation      | 159              | 14.75                         | 148.80                          |
| Range                   | 613              | 57                            | 581                             |
| <b>Mother</b>           |                  |                               |                                 |
| Average                 | 139.33           | 12.33 (9%)                    | 127 (91%)                       |
| Standard deviation      | 144.42           | 22.54                         | 130.03                          |
| Range                   | 342              | 57                            | 289                             |
| <b>Father</b>           |                  |                               |                                 |

|                    |        |           |              |
|--------------------|--------|-----------|--------------|
| Average            | 133.83 | 7.50 (6%) | 126.33 (94%) |
| Standard deviation | 237.68 | 12.42     | 225.49       |
| Range              | 601    | 32        | 569          |

**Sibling**

|                    |       |           |             |
|--------------------|-------|-----------|-------------|
| Average            | 63.17 | 1.33 (2%) | 61.83 (98%) |
| Standard deviation | 65.37 | 2.16      | 64.56       |
| Range              | 143   | 5         | 139         |

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Indirectly related vs. directly related relevant utterances

To further examine relevant utterances, these utterances were further subdivided into “indirectly related” and “directly related”. Out of the six children whose data were analyzed, four heard relevant utterances while watching television shows. Of these four children, it was found that three children heard more directly relevant utterances than indirectly relevant. Only one child heard more indirectly relevant utterances than directly relevant. Table 5 displays the amount of directly relevant and indirectly relevant utterances heard across each child.

When the total average number of directly related relevant comments ( $x=4.33$ ,  $SD=10$ ) spoken, either by the parent or sibling, was compared to the total average number of indirectly related comments ( $x=2.44$ ,  $SD=5.11$ ), there was not a significant difference in the number heard,  $t(17)=1.84$ ,  $p=.08$ . However, this is approaching significance.

Furthermore, when the number of directly related utterances was compared between mothers ( $x=8.33$ ,  $SD=15.31$ ) and fathers ( $x=4.66$ ,  $SD=7.99$ ), there was no

significant difference found,  $t(10)=.52, p=.25$ . Similarly, when the number of indirectly related utterances was compared between mothers ( $x=4, SD=6.81$ ) and fathers ( $x=2.83, SD=4.92$ ), there was also no significant difference found,  $t(10)=.32, p=.61$ .

All of the sibling coviewers in the study who spoke relevant utterances to the child used indirectly related utterances. None of the siblings in the study used directly related relevant utterances. When the number of directly related utterances was compared between mothers ( $x=8.33, SD=15.31$ ) and siblings ( $x=0, SD=0$ ), mothers used significantly more directly related utterances than siblings,  $t(10)=1.33, p=.02$ . However, there was no significant difference found in the amount of indirectly related utterances used by mothers ( $x=4, SD=6.81$ ) compared to siblings ( $x=1.33, SD=2.16$ ),  $t(10)=1.14, p=.07$ . However, this is approaching significance. The number of directly related and indirectly related utterances spoken across fathers and siblings was not tested for significance, because there was no significant difference found in the amount of relevant utterances spoken.

Table 5

*Indirectly Related vs. Directly Related Relevant Utterances*

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|                | Total Utterances | Relevant Utterances   |                         |                           |
|----------------|------------------|-----------------------|-------------------------|---------------------------|
|                |                  | Irrelevant Utterances | Relevant Utterances     |                           |
|                |                  |                       | <u>Directly Related</u> | <u>Indirectly Related</u> |
| <b>Child 1</b> |                  |                       |                         |                           |
| Mother         | 34               | 31                    | 0                       | 3                         |
| Father         | 21               | 15                    | 1                       | 5                         |
| Sibling        | 22               | 19                    | 0                       | 3                         |

**Child 2**

|         |    |    |   |   |
|---------|----|----|---|---|
| Mother  | 0  | 0  | 0 | 0 |
| Father  | 12 | 12 | 0 | 0 |
| Sibling | 0  | 0  | 0 | 0 |

**Child 3**

|         |     |     |    |   |
|---------|-----|-----|----|---|
| Mother  | 133 | 119 | 12 | 2 |
| Father  | 26  | 26  | 0  | 0 |
| Sibling | 4   | 4   | 0  | 0 |

**Child 4**

|         |     |     |    |    |
|---------|-----|-----|----|----|
| Mother  | 342 | 285 | 38 | 19 |
| Father  | 112 | 105 | 7  | 0  |
| Sibling | 143 | 138 | 0  | 5  |

**Child 5**

|                     |     |     |     |     |
|---------------------|-----|-----|-----|-----|
| Mother              | 38  | 38  | 0   | 0   |
| Father              | 613 | 581 | 20  | 12  |
| Sibling             | N/A | N/A | N/A | N/A |
| *no sibling present |     |     |     |     |

**Child 6**

|           |     |     |   |   |
|-----------|-----|-----|---|---|
| Mother    | 289 | 289 | 0 | 0 |
| Father    | 19  | 19  | 0 | 0 |
| Sibling 1 | 139 | 139 | 0 | 0 |
| Sibling 2 | 71  | 71  | 0 | 0 |

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## DISCUSSION

A majority of the children in the study spent more time watching television than recommended by the American Academy of Pediatrics, which suggests that children ages two to five years should be limited to one hour per day of screen use (AAP, 2016). Although children surpassed the AAP recommendations, most children watched high-quality television programs that taught useful academic lessons and were not primarily entertainment-based. However, only one child in the study watched an interactive television program that was actively engaging in language learning opportunities. This finding demonstrates why it is crucial for parents to coview with their children and help elicit language while television viewing.

All children spent time coviewing with a parent or sibling, which prompted the child to utilize language, even if they were not talking about the television program. Nonetheless, a majority of the children had at least one coviewer (mother, father, or sibling) that talked with them about the television program using questions and comments that created opportunities for the child to think and respond about the television show. Future studies should investigate child language specifically to examine if differences exist based on how the parents interacted with them during coviewing.

During the act of coviewing, it is important that parents or siblings use utterances that are related to the television show in order to help children understand the content being viewed, to help make connections with what children are learning, and to increase language and communication skills (Friedrich & Stein, 1975). Although a majority of the children in the study had at least one coviewer who used relevant utterances regarding the television program during coviewing, there was a higher total number of irrelevant

utterances spoken across all coviewers to children during coviewing. Discussing unrelated information during coviewing may not create easily accessible language opportunities for children. This may be because the child experiences competing language inputs, where they receive language from both the television and the coviewer at the same time, making it difficult to process and acquire new language.

While parents may be talking to their child about the television program during coviewing, not all utterances are useful in improving language skills. Directly related utterances were found to be more supportive of children's language and more useful in teaching the child to apply what they see on television to their own life. Although more parents and siblings were found speaking irrelevant utterances during coviewing, when relevant utterances were further analyzed, it was found that a majority of children heard directly related compared to indirectly related utterances. This may be due to awareness of the importance of coviewing; if parents know it is critical to use relevant utterances, then they may be more apt to use directly related utterances to benefit their child.

Mothers were found to be speaking to their child during coviewing more than sibling coviewers overall. In addition, mothers were found to use a higher amount of relevant utterances than siblings, while only two sibling coviewers were found to use relevant utterances when speaking during coviewing. These findings may be due to the age of the siblings; all children had siblings whose age deviated three years or less from their own age. Since siblings were so close in age to the children in the study, it can be argued that they do not understand the need to support their sibling's language development.

Previous literature that specifically focuses on the effect that coviewing can have on the language development of children while watching television is scarce. Much of the previous literature on the impacts of television focuses on the content of the media (Anderson & Lorch, 1981). Additionally, in the present study, there was no presence of meaningful coviewing in two of the families who were recorded. Studies such as the present one that demonstrate the lack of meaningful coviewing encourage the involvement of parents in their child's television program to help foster more language opportunities and promote vocabulary development.

Additionally, results of the present study show that although four out of six families may be engaging with their child about the television program during the act of coviewing, only three families are asking questions directly related to the program that engage their child in opportunities for building their language skills. This information is important for service providers to know in order to educate parents on the importance of coviewing, especially during the early years when children are developing language skills. If parents are aware of the types of speech acts during co-viewing that have been shown to correlate with high language development, then they can incorporate these when they are watching television with their child.

#### Limitations and Future Directions

Findings from this study cannot be generalized to a larger population due to a small sample size. In addition, the children in the study were extracted from a limited geographic area: northwest Pennsylvania and Orono, Maine. Future studies should utilize a larger sample size, and recruit participants from a diverse range of areas in the United States.

Also, children's language skills were not tested, so it is impossible to make the claim that the presence or absence of coviewing impacts language development. A longitudinal study that investigates the presence and quality of coviewing in relation to children's language would be helpful in the future. Another notable limitation is that not all variables were controlled for across the children. For example, children were different ages, had a different amount of siblings, and siblings ranged in age. The difference in age of siblings could account for a different amount of utterances during coviewing. Furthermore, there was high variability in the amount of total and irrelevant utterances spoken by mothers, fathers, and siblings, as shown by high standard deviations. This suggests that not all participants were interacting with the child in the study the same amount, which could alter results.

An additional limitation of the present study is the Hawthorne effect; the alteration of behavior by the subjects in a study due to their awareness of being observed. Although the LENA recording device was utilized to eliminate this effect, there is still a chance that parents, siblings, or subjects acted differently because they were aware they were being recorded.

Lastly, children were only recorded over the course of one day. This may not accurately represent the regular television watching or coviewing habits of the family. It is also important to note that children were recorded on a weekend day, which could also alter results if children have different television watching habits on the weekdays.

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## APPENDIX A: INTRODUCTION LETTER

Dear parent (s)/caregiver(s),

Have you ever wondered if exposure to children's television shows affects your child's language development? As part of my honors thesis project, at the University of Maine, I would like to know if you and your child (between 3-5 years old) are interested in helping me answer this important question. The study asks two things: that you complete a schedule of your child's day and that you use a recording device (provided) to record your child's speech for a whole day (either Saturday or Sunday). This recording will be done using a new technology, called the LENA (short for Language Environmental Analysis). Your child will receive the recording device and t-shirt in an envelope at his/her daycare/school with a form to indicate your child's recorded-day schedule. The next morning, turn on the recorder (directions provided) and place it in the pocket of the specially made shirt (provided). Your child will wear the device all day and you will leave the device on even after he/she goes to bed. The LENA device will record for 16 hours. The following week day, place the recorder and t-shirt back in the envelope with the completed schedule form and I will pick it up at your child's school/daycare. (Don't worry about cleaning the shirt, I will do that!) If you feel that any personal/private information may have been recorded by the LENA that you do not want others to hear, please notify me or my thesis advisor, Jane Puhlman, and we will automatically delete the recording.

After the recording is done, a small portion of your child's day will be transcribed and analyzed. The recording will also be entered into a computer analysis program that allows me to see the number of words that was said to your child, the number of words he/she said, and the number of conversational turns they had throughout the day. This information is important when studying how your child develops vocabulary and learns how to use language. I am happy to share this with you! Please provide an email address on the consent form.

If you would like to participate in my project, please fill out the attached consent form with the questionnaire and return it to your child's school/daycare. In the event that a large number of families express interest in my project, it is possible that not all families will be able to participate due to the amount of time I have to gather all information. Families will be chosen on a first-come first-serve basis. All participating families will be notified initially, and again one day before your child is given the LENA/recorder. You will also be receiving further directions and a questionnaire if you agree to participate.

Thank you for your support on this project. Please contact me or Dr. Puhlman with any questions or concerns you may have.

Sincerely,

Courtney Daly  
University of Maine Honors College  
Professor

Jane Puhlman, Ph.D., CCC-SLP  
Thesis Advisor, Assistant

Communication Sciences & Disorders Major  
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Communication Sciences and  
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[jane.puhlman@maine.edu](mailto:jane.puhlman@maine.edu)

**APPENDIX B: PARENT QUESTIONNAIRE**

Best way to contact you: Phone: \_\_\_\_\_ or Email: \_\_\_\_\_  
Your name \_\_\_\_\_

Child's Date of Birth: \_\_\_\_\_ Child's Gender: *Male Female*

Child's Race/Ethnicity: \_\_\_\_\_

Your relationship to the child (e.g. mother, father, step-parent, grandparent etc): \_\_\_\_\_

1) What is the primary language spoken in your home? \_\_\_\_\_

Is your child fluent in any other language(s)? \_\_\_\_\_

2) Has your child ever been diagnosed with a disability/had an IFSP or IEP? \_\_\_\_  
If so, what is his/her diagnosis? \_\_\_\_\_

3) Circle the highest level of education you and your spouse have completed

**YOU**

High School  
Some college, no degree  
Associate's degree  
Bachelor's degree  
Master's degree  
Doctoral

**SPOUSE**

High School  
Some college, no degree  
Associate's degree  
Bachelor's degree  
Master's degree  
Doctoral

4) What kind of work do you and your spouse do? YOU \_\_\_\_\_  
SPOUSE \_\_\_\_\_

5) What is your zip code where you live? \_\_\_\_\_

6) Do you feel like your child watches more television with certain family members? **Yes NO**  
If yes, please explain:

7) What are your child's favorite television shows? \_\_\_\_\_

8) On average, how much television (in minutes) do you estimate your child watches a day? \_\_\_\_\_

9) Is television watching part of your child's daily routine? For example does he/she always watch tv before bedtime? \_\_\_\_\_ If yes, please explain:

## APPENDIX C: CONSENT FORM

### UNIVERSITY OF MAINE Orono, Maine CONSENT TO PARTICIPATE IN A RESEARCH STUDY

You are invited to participate in a research project being conducted by Courtney Daly, a student in the Honors College at the University of Maine, and Jane Puhlman, the faculty advisor, a professor in the Communication Sciences & Disorders department at the University of Maine. The purpose of this research is to study language interactions that occur in your child's daily routines within the home, and to analyze these samples to determine whether exposure to children's television programs has any effect on communication skills and language development.

This study is seeking children between the ages of three and five years old that use English as their primary language at home and do not have diagnosed developmental or language delay.

**What Will You and Your Child Be Asked to Do:** If consent is provided, the LENA recorder will be used to record an entire day of interactions that occur within your home. Your child will wear a specialized t-shirt (provided on the day of recording) that will house a small recorder (the DLP). On either Saturday or Sunday, your child will wear the DLP for the entire day.

To identify times during the day your child was exposed to television shows, you will provide a completed schedule of your child's day. If you do not want the researchers to hear the recording, you can notify the primary investigator, Courtney Daly ([courtney.daly@maine.edu](mailto:courtney.daly@maine.edu)) or the faculty supervisor, Jane Puhlman ([jane.puhlman@maine.edu](mailto:jane.puhlman@maine.edu)) via email or on the daily schedule and the entire recording will be deleted. In addition, you can notify us that you would like the recording deleted any time after the DLP is returned. Finally, you can request that all transcripts be destroyed.

**Benefits:** Upon your request, you will receive summarized information displaying your child's language usage during the recorded day. This information will show you how many words were spoken to or near the child, how many child vocalizations were said and how many conversational turns there were across the day.

The results from this study may help us learn more about the impacts technology may have on the development of young children. In addition, this study may help early interventionists better serve families within the home setting.

**Risks:** Except for your time and inconvenience, there are no risks to you from participating in this study. Your child can take a break or discontinue at any time and this consent may be withdrawn at any time without penalty.

In the event that a conversation is recorded that you do not want the investigators to hear, the entire recording will be deleted.

**Confidentiality:** Your child's participation and responses will be kept confidential. The faculty advisor, Dr. Jane Puhlman, is a mandatory reporter, and is required by law to report any abusive activity. The name of your child or family members will not appear on any of the results. Individual responses will not be reported with any identifying information. Any interactions that occur with your child or in his/her vicinity may be recorded with the LENA device, and these recordings will be stored indefinitely on a password protected computer. Both child and adult conversations will be transcribed.

You also reserve the right to have this audio file deleted before that time. These recordings will be kept in a secured server in the Communication Sciences and Disorders Department at the University of Maine. All paperwork identifying your child, yourself, or your family will be kept in a locked filing cabinet.

**Voluntary:** Your child's participation is completely voluntary. If your child chooses to take part in this study, he/she may take a break or request to end the recording session at any time.

**Contact Information:** If you have any questions about this study, please contact me at (207)-730-1957, [courtney.daly@maine.edu](mailto:courtney.daly@maine.edu). You may also contact the faculty advisor on this study, Dr. Jane Puhlman, at (401)-374-2469, [jane.puhlman@maine.edu](mailto:jane.puhlman@maine.edu). If you have any questions about your rights as a research participant, or if you feel your child has been placed at risk, please contact the Office of Research Compliance, University of Maine, 207/581-2657 (or e-mail [umric@maine.edu](mailto:umric@maine.edu)).

Parent signature: \_\_\_\_\_ Date: \_\_\_\_\_

Phone number/Email: \_\_\_\_\_

Child's name \_\_\_\_\_ Child's date of birth \_\_\_\_\_

Would you like a copy of the LENA output summary? Y/N

If yes, please provide your email address (if not provided above)

\_\_\_\_\_

My child's recordings may be used for teacher training (e.g., classroom instruction, conference presentations) Circle one: **Yes** **No**

**\*Please return signed consent form to child's daycare**

## APPENDIX D: ASSENT DIRECTIONS

Dear parent or caregiver,

We appreciate your participation in this investigation of language development. In your LENA packet, you will find:

- the LENA recording device
- a special t-shirt that holds the LENA safely in place
- a schedule for you to complete
- directions for turning on/off the LENA (on the back of this sheet)
- a consent form for you to keep.

Please be sure each item, with exception to the directions and copy of consent form, is returned to your child's daycare. Please do not worry about washing the t-shirt!

The LENA device will record your child's communication throughout the day and provide us with invaluable information about how your child's language develops in a very naturalistic setting such as your home. We ask for one full day of participation, and therefore ask that you encourage your child to continue wearing the device through the evening. When your child is ready to go to bed tonight, you may then remove the LENA device and turn it off by pressing and holding the power button.

If you have any questions please call or email Jane Puhlman at 401-374-2469 or [jane.puhlman@maine.edu](mailto:jane.puhlman@maine.edu)

Sincerely,

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## Directions for using the LENA

Thank you for your participation in our study using the LENA! This is a new technology that we are excited to begin using at University of Maine. Below is information you will need to successfully begin using the LENA.

\*\* To capture your child's entire day, be sure to turn your child's LENA on at the start of the day and turn it off before they go to sleep. \*\*

- Dr. Jane Puhlman & Emma Peterson

### Getting familiar with the DLP (Digital Language Processor)



**Step 1:** Press and hold the power button for 3 seconds. This will turn the DLP on. The display screen will read "Sleeping"

**Step 2:** When you are ready to record, have the provided shirt nearby. Press and hold the "REC" button until the display screen reads "RECORDING". This marks the beginning of your recording.

**Step 3:** Immediately place the DLP in the front pocket of the provided shirt. The microphone should be facing outward to ensure high quality recording. Please also make sure that the snap on the shirt is secure. This will prevent your child from removing the DLP during the day.

#### Need to know:

- Be sure to remove the LENA from your child's clothing while they are in a car seat or any other safety harness. It is appropriate to keep the DLP within four feet of your child while traveling.
- Remove the DLP while your child is napping, however, please leave the DLP in "recording" mode near your child while he/she is sleeping.
- The DLP is NOT water resistant. Please be sure to remove the device if your child will be interacting with water. Keep it in "Recording mode" within 4 feet of your child until he/she finishes the activity.
- You may pause the recording by pressing the "Rec" button. Press "REC" again to resume recording. The DLP will shut off for a pause exceeding 15 minutes. Power DLP back on and press "REC" to resume recording.

### APPENDIX E: DAILY SCHEDULE

Once again, thank you for agreeing to participate in our research study. Your information is instrumental in our study of child language development. By completing this schedule, we will have a general idea of your child's recorded day.

Child's name: \_\_\_\_\_

| Date recorded:<br>_____     | What event was happening at this time? (e.g., dropped off at school, mealtime, playing) | Who did your child talk to? (e.g., classmates, parents, siblings etc) | Where was your child? (e.g., car, school, home etc.) | Is this typical behavior for your child? Explain    |
|-----------------------------|---|---|--|---|
| <b>EXAMPLE:<br/>6am-8am</b> | Breakfast, playing in living room   | Brother & sister<br>Mother  | home   | No, Johnny has a cold and is usually more talkative |
| <b>6am</b>                  |   |   |  |   |
| <b>7am</b>                  |   |   |  |   |
| <b>8am</b>                  |   |   |  |   |
| <b>9am</b>                  |   |   |  |   |
| <b>10am</b>                 |   |   |  |   |
| <b>11am</b>                 |   |   |  |   |
| <b>12pm</b>                 |   |   |  |   |
| <b>1pm</b>                  |   |   |  |   |
| <b>2pm</b>                  |   |   |  |   |
| <b>3pm</b>                  |   |   |  |   |
| <b>4pm</b>                  |   |   |  |   |
| <b>5pm</b>                  |   |   |  |   |
| <b>6pm</b>                  |   |   |  |   |
| <b>7pm</b>                  |   |   |  |   |
| <b>8pm</b>                  |   |   |  |   |
| <b>9pm</b>                  |   |   |  |   |