Screen Media: Parent-Child Discourse and Vocabulary Acquisition

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Abstract

Research on the effects of screen media, specifically infant-directed programming, on children’s language development is lagging behind the times. Children are being increasingly exposed to different forms of screen media so it is important to understand the effects that this media has on children’s learning. The purpose of this study was to learn more about how parent, child, and parent-child interaction behaviors during co-viewing interact with novel word learning performance. 45 toddlers (M = 32.09 months) participated in this study by co-viewing a word learning video with their parents. Sessions were videotaped and coded for certain behavioral measures that were used to cluster parents and children into behavioral groups. A univariate analysis of variance was run to compare parent and child clusters independently and interactionally to performance on a word learning task. Although parent groups and child groups did not differ on word learning performance independently, there was a significant difference on word learning performance when comparing amongst parent-child dyads, in which low-talking children benefitted from having directive parents and children with directive parents generally performed better at the second visit. This research has valuable implications for children’s learning and memory.
Screen Media: Parent-Child Discourse and Vocabulary Acquisition

The advent of technology has drastically changed our world. Screen media are quickly becoming a dominant form in today's society. The realms of business, communication, entertainment, and even education are quickly converting to screen media. Paper books are becoming a treasure of the past as more and more information is being transmitted electronically. Where children once carried around jump ropes they now carry around iPods. Today's youth know how to navigate computers and smart phones vastly better than the older generations. Exposure to screen media, including computers, television, and videos, has become commonplace, even among infants and toddlers, yet there is still relatively little research on how very young children use and learn from screens. The prevalence of screen media also affects how people have adapted to and interacted around an environment full of screen media. In such a technologically savvy world, it is important to investigate the effects of this changing culture on the population, especially the youngest generations.

Research on co-viewing of screen media, specifically infant- and toddler-directed programming, is lagging behind the times. Today, preschool-aged children spend an average of 2.4 hours a day watching television and despite recommendations by the American Academy of Pediatrics (2012) that “children under 2 years not be exposed to television at all, and children over 2 years be exposed to no more than 2 hours daily”, these rates continue to rise (Christakis, Gilkerson, Richards, Zimmerman, & Garrison, 2009). Learning more about the effect of infant-directed programming and the dyadic interactions whilst watching these programs is an important research endeavor.

The current study will focus on this issue of children and an environment of screen media use in the context of cognitive development, especially language development. Looking at how
the interactions that take place between parent and child during co-viewing of screen media contribute to this learning environment. The purpose of this study was to learn more about how parent, child, and parent-child interaction behaviors during co-viewing interacted with novel word learning performance.

**Background Literature**

“The entire history of the child's psychological development shows us that, from the very first days of development, its adaptation to the environment is achieved by social means, through the people surrounding him. The road from object to child and from child to object lies through another person” (Vygotsky and Luria, 1994, p. 116). Vygotsky’s perspective on development is that cognitive development is achieved through social interactions (Fidler, Zack, & Barr, 2010). Language development, which is inextricably intertwined with cognitive development, is the same way. Though language acquisition is often viewed as developing innately, research suggests that there is an interactional aspect to language development as well (Nisbett, Peng, Choi, & Norenzayan, 2001, Snow, 1983). That is, language learning takes place in interactions between children and those around them. This perspective is important when considering how young children develop language. One classic way that interactions have been studied in the realm of language learning is in studies of joint book reading between a child and an adult. More recently, as the availability and normalcy of screen media has increased, this field has expanded to include examinations of co-viewing of screen media. Each of these literatures will be reviewed in turn.

**Co-Reading of Literature**

The vast majority of research on interactional language learning has been done on co-reading of books. Although studies of book reading cannot be directly applied to screen media,
they provide helpful starting points for further research. Joint reading studies have largely focused on parent-child dyads and how social interactions affect literacy and reading skills (Bus, van Ijzendoorn, & Pellegrini, 1995, Evans & Aubin, 2005, Kang, Kim, & Pan, 2009). One study, in particular, demonstrated that children’s book reading and story retelling was largely determined by how talkative and encouraging the parent was (Kang et al., 2009). Book-reading interactions and children’s story retelling were coded for interactional behaviors. Parent behaviors were coded for types of information parents provided to children, types of questions asked, and communicative scaffolding strategies (e.g. vocabulary, labeling, event, evaluation and description, interpretive questions, open-ended prompts, counting, communicative scaffolding strategies, and book talk). Child behaviors were coded for the types of utterances produced, number of main events recounted, narrative structural features, and use of linguistic features. The authors found that mothers who used more extratextual talk tended to have children who did so as well, suggesting that each party was influencing the other transactionally (Kang et al., 2009). This study is similar to the present one as it focuses on how the interaction relates to the outcome variables and it highlights the importance of social interaction during learning. However, this social interaction has mostly been studied in the context of joint book reading and has not been fully extended to co-viewing of screen media.

Studies of book reading have found that the interactional routine between child and caregiver works to establish joint attention and solidify vocabulary (Bus et al., 1995, Evans & Aubin, 2005, Kang et al., 2009). Joint attention is important to early language acquisition in that it provides scaffolding strategies wherein children can reveal knowledge to an adult that is expressed non-verbally and joint attention episodes appear to be correlated with acquiring new language (Goldin-Meadow, 2009, Tomasello & Farrar, 1986).
The current study analyzes the relationship between parent-child co-viewing of screen media and children’s cognitive and language development. As will be reviewed shortly, because most interactional research has been done on parent-child joint book reading, the effects of screen media co-viewing have only begun to be explored and have not really been linked to language and cognitive developmental outcomes (Barr et al., 2008, Fidler et al., 2010). However, much of the same methodology from these book-reading studies can be utilized for my research purposes. The current literature suggests certain properties in joint book reading that are helpful for comparison to vocabulary learning measures. Commonly assessed behaviors include verbalizations (questions, labels and descriptions, expansions, attentional vocatives, confirmations, open-ended prompts), non-verbal communication (child looking time), and interactional behaviors (responsiveness, turn taking) (Barr et al., 2008, Fidler et al., 2010, Kang et al., 2009). All three of these behavior types, verbalizations, non-verbal communication, and interactional behaviors, were utilized for this study. Based on the nature of the task as being a short video presented on screen and the young age of the participants, the behavioral measures of expansions, open-ended prompts, and turn taking were seen as the best fit for the purposes of this study. As screen media has become more commonplace amongst infants and toddlers, research has begun to move away from co-reading of print media and begun to explore co-viewing of screen media.

Co-Viewing of Screen Media

Research on co-reading of literature is much more common than research on co-viewing of screen media, as print media has been around much longer and has historically been commonplace. Current research on co-viewing of screen media primarily focuses on parent behaviors. The vast majority of studies have either completely neglected or barely looked at
child behaviors. Most studies created unique parent clusters by coding for various behaviors of interest from observing parents and children interacting during co-viewing and using statistical clustering techniques to group parents by behavioral characteristics. These parent groupings were then analyzed to see if they associated with different outcome measures. However, these clustering techniques were not done with children (Barr, Zack, Garcia, & Muentener, 2008, Fender, Richert, Robb, & Wartella, 2010, Fidler et al., 2010, Lemish & Rice, 1986). For example, Barr et al. (2008) created three clusters based on parental verbalizations that represented low, medium, and high scaffolding parents. Similarly, Fender et al. (2010) created three clusters based on target words, labels and descriptions, and non-DVD related talk that represented low, moderate, and high teaching focus parents. For both studies, these groupings were associated with differences in child performance but did not look at child behaviors, specifically. Those studies that do look at child behaviors only measures a few behaviors, particularly looking time and turn taking, not nearly enough to cluster child types (Barr et al., 2008, Fidler et al., 2010). Another weakness to current literature on co-viewing of screen media is that much of the focus is on the nature of the social interaction rather than how children learn from screen media (Barr et al., 2008, Fender et al., 2010, Fidler et al., 2010, Richert, Robb, & Smith, 2011). This study helps to fill those gaps in the current literature by focusing equally on parent and child behaviors to investigate interactions between different kinds of parent-child dyads and by utilizing various tests of learning to explore the relationship between parent-child interactions and associated learning outcomes.

Fisch, Schulman, Akerman, and Levin (2002) performed an interesting study that combined aspects of both joint book reading and co-viewing of screen media. In this study, children and their parents read an interactive online storybook. The study is comparable to book
reading because the child was still reading a book rather than watching something, the book just happened to be on a computer screen rather than paper. But it is also comparable to co-viewing because the book was on screen media and like much educational television, was interactive in that it allowed the child to choose which direction the story took. The results of this study suggest that computers have the same potential as books to serve as an educational tool so long as the face-to-face interaction remains (Fisch et al., 2002). Such findings have serious implications for the ability of screen media to serve as an educational tool. The current study further explores the possibility of learning from screen media by having children view an actual word teaching video, rather than simply reading a book in a computer format.

The Present Study

A child being exposed to, and even taught by, visual media is becoming increasingly commonplace. As more educational and non-educational screen media is targeted toward young and developing populations, it is important to understand how their cognitive and language development is affected. The purpose of this study was to learn more about how parent, child, and parent-child interaction behaviors during co-viewing are related to novel word learning performance.

For this study, participants and their parents watched a lab-created word teaching video together. Children were tested on how well they learned the novel words taught in the video and also how well they remembered them after a weeklong delay. Their behaviors and interactions were transcribed and coded to categorize children and parents into various behavioral clusters and dyads. These groupings and pairing were then compared to various outcome measures of vocabulary, word learning, and retention. I hypothesized that the richer the dyadic interaction in parent-child co-viewing of screen media, the better the child’s performance on the word learning
task tended to be. Based on previous research of relevant behavioral measures, richer dyadic interactions are characterized by more verbalizations, non-verbal communication, and responsiveness between parent and child (Barr et al., 2008, Fidler et al., 2010, Fisch et al., 2002, Kang et al., 2009). Methodology, results, implications, and further research will be explored.

**Method**

**Participants**

A convenience sample was used for the collection of data. Participants were young children selected from a database of families in the Boulder County area who have expressed interest in participating in projects in our lab. This database includes information on all past, present, and eligible participants for our projects. Children were signed up by their parents to be a part of our projects so that when we contacted them they had already consented to being contacted. The ultimate sample consisted of 45 participants. Participants included 25 females and 20 males; the mean age of the sample was 32.09 months at Visit 1 (SD = 1.29 mo., range: 30.2-34.5) and 31.35 months at Visit 2 (SD = 1.33 mo., range: 30.7-35.7). Demographic information for race and education level was available for only some participants.\(^1\) Participants were compensated for their participation in this study with $5 given to the parent for travel and a small prize given to the child for participating.

**Research Design**

This study looked at the relationship between parent-child discourse and interaction during co-viewing of screen media on child language learning. The project used quantitative research, specifically quasi-experimental research, on human subjects. Many data collection

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\(^1\) Participant race: 32 unknown or not responded, 1 Asian, 15 white Participant ethnicity: 32 unknown or not responded, 1 Hispanic, 15 not Hispanic or Latino Education level of primary caregiver: 26 unknown or not responded, 2 high school graduate, some college, 20 degree from a four year college or higher
methods were utilized, including experimental word learning tasks, surveys, and standardized tests. The first step of this research was during the time of learning, the actual experimental phase. The second step required coding of the data.

A wide variety of analyses were conducted, including a factor analysis and a K-means cluster analysis, which was used to categorize parents and children into three different groups each. Data were analyzed using the statistics program SPSS to calculate univariate ANOVAs, repeated measures ANOVAs, general linear modes, post-hoc tests, pairwise t-tests, and independent samples t-test.

**Measures and Materials**

*Behavioral Measures*

Several behavioral measures were involved in data collection. First, a 2.50-minute lab-created word teaching video was used to teach participants six novel words for six different novel objects (see Figure 1). The video was shown to participants on a laptop and shows an experimenter holding up and labeling six different objects one at a time. The video was repeated once so that each of the six stimuli were shown twice and labeled six times total. To prevent order effects, one of two videos was randomly selected to be shown to the participant, where each video had a different presentation order of the six objects. To make the experiment more realistic, the experimenter presenting the objects in the video was different from the experimenter testing the participant in person. This was designed to be more realistic to the types of media the participants watch because it would be unusual for a child to know the person on the screen or have ever interacted with them. Participants were tested on this novel word learning through various behavioral tasks involving the novel objects shown in the training video.
The final behavioral measure was the Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4) (Dunn & Dunn, 2007), which was used as a measure of the extent of the participant’s vocabulary. This test of receptive vocabulary “provides a quick estimate of verbal ability and scholastic aptitude” (Dunn & Dunn, 2007). It consists of 228 words that are tested in sets of 12, stopping testing when the participant fails to get more than 8 out of the set of 12 correct. Participants are shown a set of 4 pictures and are asked to point to the picture that corresponds with the word stated by the experimenter. An example of a PPVT-4 testing page can be found in Appendix A. The words become more difficult to identify as the task goes on. The PPVT-4 has been shown to have high reliability and validity for both adults and the age group of interest (> .90) (Dunn & Dunn, 2007).

![Six novel training objects used in the word learning video.](image)

_Figure 1. Six novel training objects used in the word learning video._

**Other Measures**

Parents were also asked to fill out two different surveys as a means to get more information about the child’s language development and at-home screen media use. The MacArthur-Bates Communicative Development Inventory (CDI-III) is a vocabulary form that parents filled out regarding their child's expressive vocabulary that is used to identify language delays and track the course of language development for 30- to 37-month-olds (OPRE, 2007). It was used for the purposes of the current study to measure the size of the child’s current vocabulary, and thus only the 100-item vocabulary checklist portion of the otherwise three-tiered inventory was used. A copy of the vocabulary checklist can be found in Appendix B. The CDI-
III has been shown to have high reliability (>0.90) and medium to high validity (0.59-.83) (OPRE, 2007). Parents also filled out a lab-created Screen Media survey that was used to learn more about the child’s learning environment, particularly in terms of screen media (see Appendix C). Questions were asked regarding the amount of time the child spent watching TV, videos, DVD, playing video games, computer games, and using handheld devices, for example, “About how much time does your child spend watching TV in a typical day?”

Coded Behaviors

Once the experimental tasks and measures were completed, data from parent-child co-viewing of the lab-created videos were coded. The dyadic interactions between parent and child during co-viewing of the video were the topic of interest so a set of coding classifications was compiled to code video data. Coding classifications were chosen based on similar research of parent-child co-viewing of screen media as well as parent-child co-reading of books (Bus, van Ijzendoorn, & Pellegrini, 1995, Evans & Saint-Aubin, 2005, Fidler, Zack, & Barr, 2010, Kang, Kim, & Pan, 2009). Using this literature, behavioral measures that seemed particularly relevant to the study at hand were selectively chosen, going in line with co-viewing of screen media and the age group of the sample. Codes were subdivided into three types of behaviors: parent behaviors, child behaviors, and interactional behaviors.

For parent behaviors, open-ended prompts, repetition, expansion, non-verbal gestures, parent word count, and total lines were looked at. Open-ended prompts are directives that trail off so as to encourage a response from the child. For example, a parent may say: “a…”, “then…”, “and…”. Ultimately, open-ended prompts proved to be an unhelpful observation as none of the parents in the study utilized them. Repetition involved the parent repeating after the child, including anything from stimuli labels to entire phrases. For example, child: “That’s a
nork”; parent: “Yes, that’s a nork”. Expansion involved the parent expanding on a verbalization either from the child or the screen, including new descriptors such as location or color. For example, child: “A gub”; parent: “There is a gub on the screen, right”. Non-verbal gestures refer to unspoken gestures. For this study, pointing to the screen and eye contact between parent and child were the sole focus. For example, parent: “Look at that (while pointing at the screen)”.

Parent word count was a count of the total words said by the parent during the course of the entire video. Total lines was a similar count of the sentences said by the parent during the course of the video. For data analysis, total lines was chosen over word count as a representation of parent utterances.

For child behaviors, repetition, self vs. social verbalizations, initiating vs. responding verbalizations, stimuli count, child word count, and total lines were looked at. Repetition involved the child repeating after the parent, including anything from stimuli labels to entire phrases. For example, parent: “A zeb”, child: “Zeb”. Self versus social verbalizations refer to whether verbalizations are made for oneself or for others to hear. For example, a self verbalization could be a child repeating a label for the purpose of understanding that label while a social verbalization could be a child saying a label to get feedback from the parent. Self versus social verbalizations proved to be insignificant as the overwhelming majority of verbalizations were social rather than self (97.32%). Initiating versus responding verbalizations refer to whether verbalizations were unsolicited and initiatory or responsive. For example, an initiating verbalization could be a question by the child to the parent about video content while a responding verbalization could be answering a question posed by the parent. Stimuli count was a count of the target novel words produced, both the overall total and broken down by each of the six different words (i.e. ife, nork, gub, zeb, elg, lug). Word count was a count of the total words
said by the child during the course of the video. Total lines was a count of the total sentences said by the child over the course of the video. As with parent behaviors, total lines was chosen over word count as a representation of child utterances for data analysis.

For interactional behaviors, total word count and turn taking were looked at. Total word count was a totaling of the words said by both parent and child. Turn taking was measured as a variable of the story-like interaction between child and parent, how they act and react with one another to create a dialogue. Turn taking was intended to capture the responsiveness of the child to the parent so it was measured by dividing the total lines produced by the child from the total lines produced by the parent, resulting in the percentage of the time the child responded to the parent.

Procedure

Participants were recruited from a database of families in the Boulder County area who have expressed interest in participating in projects in our lab. Parents with children in the desired age group were contacted via phone or email with an invitation to participate in the study. Parents were given a brief summary of the project and directions to the research site. Upon agreeing, participants were scheduled for two appointments approximately one week apart.

Parents and children were brought to a greeting room upon arriving at the lab where the parent read over and signed an Institutional Review Board-approved consent form for the project (CU Boulder IRB Protocol #1108.20), that included consenting to being videotaped. The greeting room provided an opportunity to make a smooth adjustment for the participant if they were feeling shy or nervous as it is a comfortable and colorful space with many toys in which the researcher can get to know the child before the actual experiment begins. Families were also
provided a babysitter should they have needed one to watch a sibling of the participant. Once the parent and participant were both ready to begin, they were brought into the experiment room.

The parent and child were seated across the table from the experimenter. A video camera was set up in the room before the start of the experiment to record both the parent-child interactions while watching the lab-created word teaching video, as well as record the participant’s answers to behavioral measures should the researcher make a mistake on their forms during the time of the experiment. Children had the option of sitting in their own chair or on their parent’s lap. A practice trial was given to ensure the participant understood the logistics of the tasks and was not just picking objects randomly. The practice involved six familiar objects: a tennis ball, a golf ball, a bouncy ball, a plastic spoon, a tinker toy, and a toy clip. The child was shown a short video in which an experimenter held up one of the three balls and said to the child, “This is a ball. See the ball? This is a ball.” The child was then asked in person if they could find any more balls. If the participant correctly picked out both of the balls, then they had successfully passed the training task and moved on to the actual experimental task. Participants who did not pick a ball were corrected until they found the other two balls themselves or the experimenter pointed them out to the participant, then they also moved on to the experimental task.

A laptop, with the video already pulled up, was set in front of the participant and their parent. The participant and parent were told they would be watching a short word teaching video and the parent was encouraged to interact with their child as they would at home. The parent was then instructed to press the “space” bar when they were ready to watch the video and the researcher left the room. Once the video was over, the experimenter re-entered the room and proceeded with the behavioral tasks.
A forced choice target identification task was performed in which the participant was presented with two of the trained target objects and was asked to identify one of the objects by its trained name. For example, two of the target objects were placed together in front of the participant and the experimenter asked, “Which one is the elg?”, at which point the child choose which of the two objects they believed to be the elg (see Figure 2). This target identification task tests if children accurately learned and remembered the names of the objects taught in the video. Children were also tested on other word learning measures as part of a larger study, however, only this target identification task was utilized for the purpose of the present study.

Once the participant completed the behavioral tasks, the PPVT-4 (Dunn and Dunn 2007) was administered. Afterwards, they were given the choice of one of two small books to take home as a prize. The parent was given $5 to compensate for travel expenses and signed for the money on a tracking form. The second appointment was confirmed or scheduled, and the parent and participant were free to leave.

At the second visit, the training task and word learning video were not performed so the child began right away with the behavioral tests. Once the behavioral tasks were complete, the parent and participant were led back to the greeting room where the parent was asked to fill out a lab-created screen media survey and the CDI-III (Fenson, Marchman, Dale, Reznick, Thal, and Bates, 2007) vocabulary checklist.

Once a participant had completed the project, the video was ready to be transcribed. For the purpose of the present study, the interaction between parent and child whilst watching the lab-created word teaching video was the sole interest, so only that segment of the entire video was transcribed. The video program, ELAN (Max Planck Institute for Psycholinguistics, 2009) was used to transcribe and annotate parent and child speech and behaviors in the videos.
Once a video was transcribed, the transcription was used to code for the various parent and child behaviors of interest. The great majority of the behaviors could be identified by simply reading over the transcription and categorizing verbalizations properly. Pointing and eye contact, the only nonverbal gestures being coded, required watching the videotapes and counting the number of times either of these gestures was used. Once all 45 transcriptions were coded for the behavioral measures, the data was transferred to one spreadsheet to allow for ease of analysis.

![Figure 2. Example of the forced choice target identification task.](image)

**Results**

The results are outlined in six sections. The first section presents descriptive statistics of parent and child behavioral measures during co-viewing. The second section provides a brief synopsis of preliminary analyses results. The third section details how a cluster analysis was done to group parent and child types. The last three sections examine word learning performance differences among child groupings, parent groupings, and as an interaction between the two groups.

**Descriptive Statistics**

Table 1 presents descriptive statistics for parents’ and children’s utterances and nonverbal communication during co-viewing of the lab-created novel word teaching video. Parents most commonly utilized the non-verbal gesture of pointing during co-viewing (M=5.62, SD=7.62), closely followed by repetition utterances (M=5.58, SD=5.55). Children’s main
utterances were producing the novel words (M=9.78, SD=7.76).

Table 1. Range, Mean, Standard Error, and Standard Deviation for Adult, Child, and Interactional Behaviors

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SE</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent Behaviors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Open-Ended Prompts</td>
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<td>Repetition</td>
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<td>• Pointing</td>
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<td>7.62</td>
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<td>• Eye Contact</td>
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<td></td>
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<tr>
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<td>.6380</td>
<td>4.28</td>
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<td>19</td>
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<tr>
<td>Self vs. Social Verbalizations</td>
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<td>.0655, 2.393</td>
<td>.1038, .1038</td>
<td>0, 50</td>
<td>50, 100</td>
</tr>
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<td>Initiating vs. Responding Verbalizations</td>
<td>4.22, 12.29</td>
<td>.6291, 1.828</td>
<td>.2334, .2337</td>
<td>0, 0</td>
<td>100, 100</td>
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<td>Stimuli Word Count</td>
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<td>7.76</td>
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<td>1.76</td>
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<tr>
<td>Word Count</td>
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<td></td>
<td></td>
</tr>
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<td>8.768, 3.510</td>
<td>58.81, 23.44</td>
<td>4, 0</td>
<td>273, 94</td>
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<tr>
<td>• Parent vs. Child (%)</td>
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<td>.0239, .0239</td>
<td>.1606, .1607</td>
<td>2.87, 0</td>
<td>100, 71.21</td>
</tr>
<tr>
<td>• Total</td>
<td>126.78</td>
<td>10.354</td>
<td>69.46</td>
<td>4</td>
<td>332</td>
</tr>
<tr>
<td>Turn Taking (%)</td>
<td>45.67</td>
<td>.0429</td>
<td>.288</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

**Preliminary Analyses**

Preliminary analyses indicated that the parental behavioral measure of open-ended prompts and the child behavioral measure of self vs. social verbalizations were not significant predictors of outcome measures and were thus excluded from later analyses.

**Cluster Analyses**

The first step was to organize coded behaviors into more concise groupings. An exploratory factor analysis was performed using coded behaviors across parent, child, and
interactional behaviors. However, behaviors did not appear to group in any clear and significant way. Next, A K-means cluster analysis was done using coded behaviors across parent, child, and interactional behaviors. This too, however, was not a good representation of the groups, despite attempting to cluster with 3, 4, and 5 clusters.

A K-means cluster analysis was used to discover how children and parents, respectively, tended to cluster into groupings based on co-viewing behavior. The clusters were not random, but rather were separated based on statistically significant differences in behavior between clusters. Cluster groupings of two, three, and four were all attempted but the three-cluster grouping proved the most useful for both parents and children. The two-cluster grouping for parents had disproportionate and nonsensical groups while the four-cluster grouping had one cluster that was disproportionate and illogical. The two-cluster grouping for children had disproportionate groups while the four-cluster grouping had disproportionate and nonsensical groups. Parents were grouped into one of three clusters based on the behavioral measures of repetition, expansion, pointing, eye contact, and total lines. The first cluster was the parent-directive group, which was characterized by high values of expansion, pointing, and total lines. Next was the child-oriented group, which was characterized by high values of repetition. Finally, the non-verbal communication group was characterized by high values of eye contact and pointing. Child demographics organized by parent cluster can be seen in Table 2.

Table 2. Parent cluster demographics.

<table>
<thead>
<tr>
<th>Parent Clusters Demographics Means</th>
<th>Subjects n</th>
<th>Age V1</th>
<th>Age V2</th>
<th>CDI Score</th>
<th>CDI %</th>
<th>PPVT Score</th>
<th>PPVT %</th>
<th>Total Screen Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1: Parent-Directive</td>
<td>13; 7f, 5m</td>
<td>31.57</td>
<td>31.81</td>
<td>63.82</td>
<td>49.55</td>
<td>120.1</td>
<td>84.8</td>
<td>80.38</td>
</tr>
<tr>
<td>Cluster 2:</td>
<td>17; 8f, 9m</td>
<td>32.13</td>
<td>32.39</td>
<td>61.64</td>
<td>46.79</td>
<td>122.87</td>
<td>88.57</td>
<td>72.50</td>
</tr>
</tbody>
</table>
Children were grouped into one of three clusters based on the behavioral measures of repetition, initiating versus responding verbalizations, stimuli count, total lines, and turn taking. Low talkers, medium talkers, and high talkers were characterized by the increasing use of stimuli count, total lines, and turn taking, respectively. Interestingly, children were not grouped based on different types of behavioral patterns, but rather on how much they tended to talk across all coding categories. Child cluster demographics can be seen in Table 3.

Table 3. Child cluster demographics.

<table>
<thead>
<tr>
<th>Child Clusters Demographics</th>
<th>Subjects n</th>
<th>Age V1</th>
<th>Age V2</th>
<th>CDI Score</th>
<th>CDI %</th>
<th>PPVT Score</th>
<th>PPVT %</th>
<th>Total Screen Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1: Low Talkers</td>
<td>23; 14f, 9m</td>
<td>32.10</td>
<td>32.36</td>
<td>58.00</td>
<td>38.24</td>
<td>116.18</td>
<td>78.17</td>
<td>43.86</td>
</tr>
<tr>
<td>Cluster 2: Medium Talkers</td>
<td>15; 6f, 9m</td>
<td>31.59</td>
<td>31.84</td>
<td>60.06</td>
<td>45.71</td>
<td>113.5</td>
<td>74.42</td>
<td>81.33</td>
</tr>
<tr>
<td>Cluster 3: High Talkers</td>
<td>7; 4f, 3m</td>
<td>33.11</td>
<td>33.39</td>
<td>60.85</td>
<td>39.39</td>
<td>125.67</td>
<td>92.15</td>
<td>95.71</td>
</tr>
<tr>
<td>Average</td>
<td>45; 25f, 20m</td>
<td>32.1</td>
<td>32.35</td>
<td>59.64</td>
<td>41.67</td>
<td>116.45</td>
<td>78.35</td>
<td>65.23</td>
</tr>
</tbody>
</table>

Does performance differ by child group?

The key question of this study was how parent, child, and parent-child interaction behaviors during co-viewing impacted novel word learning performance. Tests were performed
to see if there were any differences between child groups on demographic measures and their actual word learning performance.

The first question was if any of the dependent measures differed by child clusters. To assess this, a univariate analysis of variance (ANOVA) was performed to check for differences between child groups (low, medium, and high talkers) on various dependent measures. Analyses were done on the dependent measures of age, CDI-III percentiles, PPVT-4 percentiles, and total screen time (see Table 4). Of these measures, age and total screen time were significant. Age was significantly different amongst the child groups (F(2, 36) = 3.77, p = .031). The results of a post hoc test showed that this main effect was driven by a significant difference in age between medium talkers and high talkers in which high talkers were generally older than medium talkers (F(2, 44) = 2.879, p = .027). Total screen time was marginally significant amongst the child groups, with total screen time increasing from the low to medium to high clusters (F(2, 43) = 3.014, p = .060).

Analyses were also done on the word learning performance measures of target identification accuracy at visit 1, target identification accuracy at visit 2, and target identification accuracy across visits, but none were statistically significant (See Table 4). The same analyses for target identification were also done using age and screen time as covariates since they statistically differed by child group. However, even controlling for age and screen time, there was no difference in child groups for target identification at visit 1 (F(3, 45) = .693, p = .562), visit 2 (F(3, 45) = 1.130, p = .348), or across visits (F(1, 40) = .093, p = .964).

Table 4. Univariate analysis of variance: Child group x behavioral measures.

<table>
<thead>
<tr>
<th>Child Group x ...</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average age across visits</td>
<td>3.765</td>
<td>.031*</td>
</tr>
</tbody>
</table>
A general linear model analysis was performed to model the relationship between child group and performance over time in the target identification task. The relationship was not significant \((F(2, 39) = .032, p = .969)\). Overall, performance on the novel word learning task did not differ by child group.

**Does performance differ by parent group?**

Then, analyses were run to see if children’s demographics and performance on behavioral measures differed by parent clusters. The dependent measures are solely related to the child, this section simply looks to evaluate any possible relationships between parent groups and their children’s demographics and performance. To assess this, a series of univariate ANOVAs were run to check for differences between parent groups on various measures. Analyses were done with the dependent measures of age, CDI-III percentiles, PPVT-4 percentiles, and total screen time (see Table 5). None of these measures proved significant. That is, children of parents in the three parent type clusters did not differ significantly from each other in any of these measures.

Analyses were also done on the word learning performance measures of target identification accuracy at visit 1, target identification accuracy at visit 2, and target identification accuracy across visits, but none were statistically significant (See Table 5).
Table 5. Univariate analysis of variance: Parent group x behavioral measures.

<table>
<thead>
<tr>
<th>Parent Group x ...</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average age across visits</td>
<td>1.857</td>
<td>.169</td>
</tr>
<tr>
<td>CDI-III Percentile</td>
<td>1.019</td>
<td>.370</td>
</tr>
<tr>
<td>PPVT-4 Percentile</td>
<td>.713</td>
<td>.496</td>
</tr>
<tr>
<td>Total Screen Time</td>
<td>1.037</td>
<td>.386</td>
</tr>
<tr>
<td>Performance Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target Identification Accuracy (Visit 1)</td>
<td>.225</td>
<td>.800</td>
</tr>
<tr>
<td>Target Identification Accuracy (Visit 2)</td>
<td>2.255</td>
<td>.117</td>
</tr>
<tr>
<td>Target Identification Accuracy (Across Visits)</td>
<td>2.366</td>
<td>.106</td>
</tr>
</tbody>
</table>

Note: *p < .05, **p < .01, ***p < .001.

A general linear model analysis was performed to model the relationship between parent group and performance over time in the target identification task. The relationship was not significant ($F(2, 42) = 2.366, p = .106$). Overall, children’s performance did not differ by parent group.

**Do parent and child groupings interact to influence word-learning performance?**

Individually, the parent and child groups did not significantly differ in novel word learning performance. However, looking at parent and child groupings separately did not tell the whole story. The larger question was how co-viewing interactions impact learning; so next the interactions between the parent and child clusters on word learning performance were analyzed.

Combining the parent and child clusters created nine unique combinations of groupings. However, two of the groupings, parent-directive/high talkers and non-verbal communication/high talkers, had too few children and were removed from further analyses to avoid misrepresentation of the data by outliers, thus leaving seven parent-child groupings (see Table 6).
Children’s word learning accuracy (averaged across visits) was submitted to a 3 (parent group) x 3 (child group) x 2 (visit) ANOVA test of between-subjects contrast using the significant measures of age and screen time as covariates. These analyses controlled for the demographic dependent measures of age and screen time, which were significantly different across child groups, to ensure they were not acting as confounding variables. Three main effects were found from this analysis, a marginal child group difference on performance, a marginal interaction between parent and child groups on performance, and a significant difference between parent groups on performance over time. Each of these will be discussed in turn.

Like before, parent groupings individually were not significant (F(2, 33) = .886, p = .422). There was a marginal child group difference (F(1, 15) = 2.879, p = .070) in which performance increased from low to medium to high talkers. The interaction between parent group and child group on performance across visits was also marginally significant (F(2,36) = 2.968, p = .065). Figure 3 represents this performance difference among parent-child pairs.

Follow-up ANOVA analyses were performed across various groupings to find possibly significant differences between and within groups. First, analyses of parent group differences were run within the child groups of low talkers and medium talkers but neither was significant (F(2, 21) = 2.442, p = .117; F(2, 14) = .850, p = .456 respectively). In addition, a post hoc test was run on the low talker group to see if there were any significant differences between pairs of parent groupings. However, no significant differences were found for child-oriented/parent-directive dyads, child-oriented/non-verbal communication, or non-verbal communication/parent-directive (p = .12, p = 1.00, p = .34 respectively). Though not statistically significant, there was a trend amongst the low talker group in which children in the low-talking group performed better when they were paired with directive parents. The child-oriented and non-verbal communication
groups’ performance was essentially at chance while the parent-directive group was performing better than the other two, although just not significantly.

Next, analyses of child group differences were run within the three parent groups of child-oriented, non-verbal communication, and parent-directive. The child-oriented group had marginally significant child group differences (F(2, 15) = 3.828, p = .055). The non-verbal communication group had significant child group differences (F(1, 21) = 5.317, p = .044). The parent-directive group did not have statistically significant child group differences (F(1, 11) = 2.231, p = .174). Much like the analyses done within child groups, it can only be speculated that there was a trend in which children with child-oriented parents performed worse when they were low talkers and better when they were medium or high talkers. However, it can be stated with strong support that children with non-verbal communication parents performed worse when they were low talkers and better when they were medium talkers. Trends across groups could not be drawn for high talkers as there was no data to support it.

Table 6. Demographic info for various parent-child cluster groupings.

<table>
<thead>
<tr>
<th>Various Parent-Child Grouping</th>
<th>Demographics Means</th>
<th>Subjects</th>
<th>Age V1</th>
<th>Age V2</th>
<th>CDI Score</th>
<th>CDI %</th>
<th>PPVT Score</th>
<th>PPVT %</th>
<th>Total Screen Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent-Directive/</td>
<td></td>
<td>Low Talkers</td>
<td>4; 3f, 1m</td>
<td>31.47</td>
<td>31.67</td>
<td>38.5</td>
<td>30</td>
<td>112.33</td>
<td>67</td>
</tr>
<tr>
<td>Child-Oriented/</td>
<td></td>
<td>Low Talkers</td>
<td>8; 4f, 4m</td>
<td>31.53</td>
<td>31.79</td>
<td>67.57</td>
<td>54.29</td>
<td>122.2</td>
<td>91</td>
</tr>
<tr>
<td>Child-Oriented/</td>
<td></td>
<td>Medium Talkers</td>
<td>8; 5f, 3m</td>
<td>32.03</td>
<td>32.29</td>
<td>75.8</td>
<td>59</td>
<td>125</td>
<td>91.96</td>
</tr>
<tr>
<td>Child-Oriented/</td>
<td></td>
<td>High Talkers</td>
<td>4; 0f, 4m</td>
<td>31.28</td>
<td>31.48</td>
<td>51.25</td>
<td>43.75</td>
<td>117.5</td>
<td>81.5</td>
</tr>
<tr>
<td>Non-Verbal Communication/</td>
<td></td>
<td>Low Talkers</td>
<td>5; 3f, 2m</td>
<td>33.00</td>
<td>33.30</td>
<td>55.8</td>
<td>37</td>
<td>124.5</td>
<td>89.73</td>
</tr>
<tr>
<td>Non-Verbal Communication/</td>
<td></td>
<td>Medium Talkers</td>
<td>11; 6f, 5m</td>
<td>32.38</td>
<td>32.66</td>
<td>53.44</td>
<td>32.22</td>
<td>112</td>
<td>71.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium Talkers</td>
<td>3; 3f, 0m</td>
<td>32.17</td>
<td>32.47</td>
<td>54.33</td>
<td>28.33</td>
<td>93.67</td>
<td>37.33</td>
</tr>
</tbody>
</table>
Figure 3. Parent group and child group interaction on target ID accuracy (averaged over visits).

Finally, a test of within-subjects contrast resulted in statistically significant differences between parent groups in performance across visit 1 and visit 2 (F(2, 36) = 3.675, p = .035). Figure 4 represents this performance difference between parent groups and performance over time. Child-oriented parents and non-verbal communication parents dropped in performance from visit 1 to visit 2. Parent-directive parents increased in performance from visit 1 to visit 2. These performance differences were not reliant on child group; parent group was the only significant variable. There was no difference on performance at visit 1 across all three parent groups, the parent-directive, child-oriented, and non-verbal communication groups learned equivalently (F(2, 27) = 2.307, p = .423; F(2, 24) = 3.883, p = .374; F(2, 29) = .028, p = .992, respectively). However, by visit 2 children who had more directive parents retained information better overall (F(1, 21) = .073, p = .040). This significantly greater performance for children of
directive-parents at visit 2 drove the interaction. Children who had directive parents when they were learning tended to show better retention. A breakdown of these results can be seen in Table 7.

![Graph showing performance over time for different parent groupings.]

**Figure 4.** Parent group differences on performance over time.

**Table 7.** Performance by visit across various parent groupings.

<table>
<thead>
<tr>
<th>Various Parent Grouping Performance By Visit</th>
<th>Visit 1</th>
<th></th>
<th></th>
<th>Visit 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent-Directive/Child-Oriented</td>
<td>-.0801</td>
<td>.0885</td>
<td>.374</td>
<td>-.1373</td>
<td>.0842</td>
<td>.115</td>
</tr>
<tr>
<td>Parent-Directive/Non-Verbal Communication</td>
<td>-.0794</td>
<td>.0973</td>
<td>.423</td>
<td>-.1191</td>
<td>.0550</td>
<td>.040*</td>
</tr>
<tr>
<td>Child-Oriented/Non-Verbal Communication</td>
<td>.0007</td>
<td>.0733</td>
<td>.992</td>
<td>-.0182</td>
<td>.0752</td>
<td>.810</td>
</tr>
<tr>
<td>Average</td>
<td>.0534</td>
<td>.0864</td>
<td>.5963</td>
<td>.0915</td>
<td>.0715</td>
<td>.3217</td>
</tr>
</tbody>
</table>

*Note: *p < .05, **p < .01, ***p < .001.
Discussion

The current research question focused on how parent, child, and parent-child interaction behaviors during co-viewing related to novel word learning performance. I hypothesized that the richer the dyadic interaction between parent and child during co-viewing of screen media, the better the child’s performance on the word learning task would be. Specifically, the more verbalizations, non-verbal communication, and responsiveness between parent and child, the better the child would perform on the target identification task. Parent and child behaviors during co-viewing of the word learning task were coded, parents and children were categorized into different groups based on their behaviors, and the interactions between groups were analyzed, as will be discussed in turn here.

There was no significant difference in word learning performance across child groupings. Though the lack of performance difference between child groupings was initially unexpected, there may be other factors at play. Perhaps the amount of language a child actually verbalizes is not representative of how well they are learning and retaining information. Instead, child verbalizations may be better representative of how outgoing or outwardly-thinking the child is, rather than on their ability to learn. After all, this often appears to be the case in older children, adolescents, and even adults- one does not have to be loud to be “smart”. Previous research shows that there are no correlations between extroversion or introversion and intelligence (Dorner & Gerdes 2012). Whatever the case, child verbalizations were just one side of co-viewing. Child groupings alone did not predict learning differences, rather, child and parent co-viewing styles may instead interact to associate with different extents of learning, as will be discussed shortly. There were, however, differences in age between medium and high talkers in which high talkers were generally older than medium talkers, as well as differences in total
screen time in which total screen time increased from the low to medium to high talking clusters. It makes sense that there is a difference of age between low and medium to high talkers as older children will tend to talk more than younger children since they are further along in their language development. And although no significant differences in standardized vocabulary measures were apparent in this study, children did increase in PPVT-4 scores from low to medium to high talkers. It is also intuitive that total screen time would show a trend of increasing from low to medium to high talkers since children are more likely to spend more time in front of a screen as they get older, especially if their parents are adhering to the American Academy of Pediatrics guidelines (2012).

There was also no significant difference in children’s word learning performance across parent groupings, as well as no differences in demographic dependent measures. What was curious about the parent groups was that they were clustered based on more complex characteristics than the child groups. Children were clustered based solely on amount of verbalizations but parents had more qualitative differences. For parents, it was not about how much they were talking, but the quality of the interaction. To recall, parents were grouped into one of three clusters based on the behavioral measures of repetition, expansion, pointing, eye contact, and total lines. The first cluster was the parent-directive group, which was characterized by high values of expansion, pointing, and total lines. Next, was the child-oriented group, which was characterized by high values of repetition. Finally, the non-verbal communication group was characterized by high values of eye contact and pointing. Each group contains a unique composition of behavioral measures. Interestingly, when comparing to similar studies of co-viewing, parents were neatly grouped by amount of various behavioral measures, much as this study’s child groupings were by amount of verbalizations. Barr, Garcia, Muentener (2008) found
clusters of low scaffold, medium scaffold, and high scaffold based off the corresponding proportion of different question types, labels and descriptions, and proportion of verbalizations unrelated to media content. Fender, Richert, Robb, & Wartella (2010) found clusters of low teaching focus, medium teaching focus, and high teaching focus based off the amounts of target word-specific talk, general DVD talk, and proportion of talk unrelated to the DVD. The parent groupings in this study did not cluster in segments of low, medium, and high for specific behavioral measures, but rather each cluster had a unique combination of behavioral measures of which they were representative. The lack of differences amongst parent and child groupings alone on demographic dependent measures and word learning performance are in line with previous research on co-reading of literature and the few studies on co-viewing of screen media that are suggestive of the importance of social interaction in the learning process (Barr et al., 2008, Bus et al., 1995, Evans & Aubin, 2005, Fender et al., 2010, Fidler et al., 2010, Fisch et al., 2002, Kang et al., 2009, Richert, Robb, & Wartella, 2010). Since child groupings and parent groupings alone lacked any differences in child performance, the interaction between the two groups must be considered.

The most interesting results came from looking at interactions between various parent and child groupings. When analyzed together, parent groupings individually were not significant, but there was a child group difference in which performance increased from low to medium to high talkers. Also, there was a difference on performance across visits with the interaction between parent group and child group. There was a trend amongst the low talker group in which children in this group performed better when they were paired with direct parents. Low talker children who interacted with child-oriented and non-verbal communication parents performed essentially at chance while those with parent-directive parents performed better than the other
two. Amongst medium talkers, there were no differences between parent-directive and non-verbal communicating parents, but there was a trend in which children with child-oriented parents performed worse if they were low talkers and better if they were medium or high talkers. Trends across groups cannot be drawn for high talkers, as there is no data to support it.

Why did low talkers benefit so greatly from having directive parents rather than child-oriented or non-verbal communicating parents? The explanation is rather intuitive in that children who talk the least amount would benefit the most from the parent compensating for that. It seems that a directive parent could lead and help their child more so than child-oriented parents who center interaction around the child and non-verbal communicators who are not as likely to use verbal communication and indicators. Why do medium and high talkers perform better than low talkers if they have child oriented parents? A reciprocal argument to that stated above can be made. Just as low talking children benefit more from the leading behavior of directive parents, medium and high talkers appear to do better when they are more in control of the learning process. It makes sense that children who talk more would have the personality or learning mechanisms that make it so these verbalizations help them the most to learn. Research on the personality traits of introversion and extraversion in terms of learning has largely focused on arousal. It is well accepted that introverts are more chronically aroused than extroverts, thus introverts learn better when there is less stimulation since they are more aroused on average and extroverts learn better when there is more stimulation since they are less aroused on average (Eysenck, 1976, Cambell & Hawley, 1982, Dobbs, Furnham, McClelland, 2011). Because extraversion has been associated with more social talk and preferred higher levels of stimulation, it is possible that medium and high talkers do better when there is more stimulation, which they create by talking more. These children may not be as reliant on their parents to provide structure
or stimulation to the task. While high talkers could not be compared across groups due to a lack of data, those who had child-oriented parents also fall under this explanation.

Another large finding of parent-child interactions was that there were significant differences between parent groups in word learning performance across visit 1 and visit 2. Children of child-oriented parents and non-verbal communication parents tended to drop slightly in performance from visit 1 to visit 2 while children of parent-directive parents increased in performance from visit 1 to visit 2. There was no difference on performance at visit 1 across all three parent groups, the groups learned equivalently. However, by visit 2 children who had more directive parents retained recently learned novel words better overall, demonstrating better retention. This significantly greater performance for children of directive-parents at visit 2 drove the interaction. This finding is comparable to previous research on co-reading of literature that found that the more talkative and encouraging the parent was, or in terms of this study, the more directive, the more involved the child was (Kang et al., 2009). So why does performance increase for the parent-directive group but remain stable for the child-oriented and non-verbal communication groups? It is logical that performance would decrease over time as a general function of memory. One possibility is that some behavior of the directive parent themselves in the moment of the task helps the child remember and improve at a later date. Another possibility is that directive parents are prepping their children for the second visit, a practice hypothesis of sorts. Maybe directive parents are directive all of the time, not just in the context of the experiment, and thus practice with and talk to their children about the information outside of the task itself. Whether it is solely during the actual lab task or an ongoing characteristic of directive parents, child performance increased significantly over time. It is strange, though, that directive
parents would have such low performance at visit 1 compared to the other two groups. However, significance bars show that this is only a trend and not statistically significant.

Limitations and Future Directions

There were several limitations to this study involving research design, the sample, and the survey data. This was a quasi-experimental study in which the independent variable of parent-child co-viewing behavior was not manipulated and random assignment was not a possibility. The greatest disadvantage of quasi-experimental research is that it does not have high internal validity, the extent to which one can conclude that the independent variable affected the dependent variable. Because of this, confounding variables are especially important to note. A confounding variable is a variable not focused on in the study that is related to the independent variable. Because the confounding variable and independent variable change together, one could falsely conclude that the independent variable caused the difference in performance when, in reality, it is some unknown confounding variable. Although there are limitations to the quasi-experimental method, there are also strengths that are particularly relevant to this study. This method is much more naturalistic and captures valuable insight into how parent-child dyads interact and learn. So while a quasi-experimental study cannot make absolute conclusions as a true experiment can, what is gained is a natural interaction between parent and child as they are not forced into assigned treatment and control groups.

Another limitation involving the research design revolved around the extent of the naturalistic interaction between parent and child. It is very possible that the behaviors of parents during the word teaching video were not indicative of their general at-home behavior and interactions with their children. More likely than not, they were making a much greater effort to be involved with and help their children learn the words on the screen, knowing that they were
taking part in an experiment in which the researcher inevitably would be comparing them to many other parents, for better or worse, as a necessary part of the process. While naturalistic observation would have resulted in greater ecological validity, the extent to which the lab-created situation generalizes to real-life circumstances, the ability to state a causal relationship would be even weaker. Ultimately, though the quasi-experimental research method had its limitations, it allowed for a balance between naturalistic observation and more controlled measures of learning.

There were two limitations to the sample of this study. First, the sample size of \( n = 45 \) \((n = 43\) in some of the analyses\) may have lowered the power of the statistical tests. This can be seen in the fact that there was no data for the parent-child combinations of non-verbal communicators/high talkers and parent-directive/high talkers because the two points in those groups were outliers. More participants would have allowed for a larger and more telling data set. Second, the sample composition was a nonrandom convenience sample made up of children who were listed in a database of families in the Boulder County area. This very select group of children from the Boulder County area, most of whom were middle to upper class socioeconomic status and white in race was not well-representative of the general population. The solution would be to obtain a more random sample that will make the results more generalizable to the population of interest.

Finally, there may have been reliability problems with the surveys used in this study. The two surveys that were utilized, the lab-created screen media survey and the CDI-III, have various disadvantages related to them, as all survey methodology does. The main issues related to these two surveys involved respondent’s answers. Parents may not have been motivated to give accurate answers if they were in a rush or uninterested, they may also have been dishonest in the representation of how much screen media their child watches and how many words their child
knows so to present themselves favorably, and there may have been simple memory issues in which the parent was unsure or could not remember all of their child’s behavior and vocabulary. Although there are problems with survey methodology, overall, they proved useful in the larger scheme of data collection.

Future directions for this study would involve coding for more behavioral measures and utilizing more measures of various dependent variables. Future research should code for even more behavioral measures during parent-child co-viewing of screen media, possibilities include questions and more non-verbal gestures. Future research could also include utilizing more measures for various dependent variables. For example, more tests of screen time since it proved significant or a measure of parenting personality or behavior to help evaluate why it made a difference in performance. Further research on different kinds of parent teaching styles and child learning styles and the various combinations of them would prove valuable for more individualized teaching programs.

**Conclusions**

This study demonstrated that the interactions between various parent-child groupings were related to word learning performance. There was a difference on performance across visits with the interaction between parent group and child group wherein low talking children performed better when they were paired with direct parents as opposed to child-oriented or non-verbal communicating parents. Amongst medium talkers, there were no differences between parent-directive and non-verbal communicating parents, but there was a trend in which children with child-oriented parents performed worse if they were low talkers and better if they were medium or high talkers. Trends across groups could not be drawn for high talkers, as there was no data to support it. In addition, there were significant differences between parent groups in
child word learning performance across visit 1 and visit 2. Child-oriented parents and non-verbal communication parents dropped in performance from visit 1 to visit 2, while parent-directive parents increased in performance from visit 1 to visit 2. There was no difference on performance at visit 1 across all three parent groups. However, by visit 2 children who had more directive parents retained recently learned novel words better overall.

The results of this study provide valuable information for parents and educators looking to improve and maximize children’s learning from screen media. First, children who do not speak much appear to benefit from directive and structured learning whereas children who talk more benefit most from self-direction and observation. Second, children who had directive parents saw increased performance from visit 1 to visit 2 while children who had child-oriented or non-verbal communicating parents saw no performance improvement. Because all three groups performed evenly at the first visit and only children with directive parents improved at the second visit, the difference may be attributed to the teaching style. This has implications for the power of practice in learning and remembering new words and the role of adults in helping children learn, but should be further researched. From this study, parents and educators should take away that different children benefit from different learning styles and that being directive and proactive in a child’s learning can be of great benefit. As society becomes increasingly technological, it is important to learn for ourselves just how screen media relates to children’s learning so that they, in turn, can learn as well.
References


Appendix A
Appendix B

Vocabulary Checklist

Children understand many more words than they say. We are particularly interested in the words your child SAYS. Please mark the words you have heard your child use. If your child uses a different pronunciation of a word, mark it anyway. This is only a sample of words; your child may know many other words not on this list.

- Dinosaur
- Donkey
- Reindeer
- Castle
- Drum
- Football
- Microscope
- Tricycle
- Kite
- Wagon
- Lemon
- Peanut
- Cracker
- Salt
- Sauce
- Vanilla
- Vegetable
- Bead
- Jeans
- Elbow
- (Finger)nail
- Bandaid/ bandage
- Blade
- Computer
- Glass
- Jar
- Ladder
- Material
- Tamp
- Tire
- Furniture
- Kitchen
- Sofa/Couch
- Cloud
- Fence
- Hose
- Sidewalk
- Zoo
- Child
- Cowboy
- Family
- Farmer
- Nobody
- Nurse
- Accident
- Circle
- Front
- Idea
- Camping
- Catch
- Drop
- Fasten
- Forget/Forgot
- Hate
- Hurry
- Leave
- Measure
- Peel
- Promise
- Skate
- Sneeze
- Somersault
- Think
- Black
- Bored
- Deep
- Different
- Empty
- Expensive
- Fine
- Half
- Long
- Lost
- Angry
- Peculiar
- Yourself
- Why
- About
- Above
- Away
- Between
- On top of
- Each
- Every
- None
- Might
- Need to
- Were
- Although
- Because
- However
- Then
- Today
- Week
- Yesterday
- Their
- They
- Those
- Yourself
- Why
- About
- Above
- Away
- Between
- On top of
- Each
- Every
- None
- Might
- Need to
- Were
- Although
- Because
- However
### Appendix C

2. About how much times does your child spend on those activities in a typical day?

<table>
<thead>
<tr>
<th>Activity</th>
<th>NA</th>
<th>5</th>
<th>15</th>
<th>30</th>
<th>45</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
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<tr>
<td>Watching TV</td>
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<td>Watching a video or DVD</td>
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<td>Listening to music (including while riding in the car)</td>
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<td>Playing outside</td>
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<td>Reading or being read to</td>
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<td>Playing video games like X-Box, Playstation, or Wii</td>
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<td>Playing inside with toys</td>
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<td>Playing computer games</td>
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<td>Using a computer for something other than games</td>
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<td>Playing with hand-held electronic devices like iPhone, iPad, Leapfrog Platform, Gameboy, etc.</td>
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