The Effect of Narrative Cues on Toddlers’ Imitation from Television and Picture Books

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Abstract

Television viewing and picture book reading are prevalent activities during toddlerhood (Rideout, Vandewater & Wartella, 2003). Parents and teachers assume that toddlers can easily learn from these symbolic media by transferring new information from books or television to the real-world objects they encounter in their daily lives. Recent research has shown that toddlers can imitate novel actions on real-world objects that were originally introduced via television (Barr & Hayne, 1999) or in picture books (Simcock & DeLoache, 2006). However, variations in methodology (e.g., presence or absence of narrative cues) used for television and book studies do not allow for comparisons. Thus the purpose of the present study was to directly compare 24-month-olds’ ability to imitate from books and television and to examine the effect of narrative cues on their performance. Toddlers were either shown a pre-recorded video or were read a picture book depicting an experimenter constructing a novel toy rattle accompanied by either full descriptive narration of the target actions or empty vague narration. Following a ten minute delay, the toddlers were given the depicted objects and were asked to make a rattle. The toddlers were either shown a pre-recorded video or were read a picture book depicting an experimenter constructing a novel toy rattle. The videos and the books were professionally produced and had either full descriptive narration of the target actions or empty vague narration. Following a 10-min delay, the toddlers were given the depicted objects and were asked to make a rattle. Toddlers imitated more actions after exposure to a televised demonstration than a book reading demonstration, but narration only facilitated imitation from the video. Results supported the representational flexibility hypothesis in which Hayne (2004) argues that the degraded perceptual attributes of two-dimensional media make learning from books and television a challenging task for toddlers. In particular, both the audio-visual cues from television and the
narrative cues provided additional retrieval cues to the infants at the time of test. Cognitive flexibility influences the facility with which toddlers can use the information presented in 2D media, which has important theoretical implications for our understanding of toddlers’ emerging representational insight. Further, this data has important practical implications to help inform parents, teachers, and policy makers on the cognitive effects of media on early development.
Introduction

Children under two years of age are one of the fastest growing groups of media consumers, and yet controversy still exists over the merits and potential harm of various types of media. Nowhere is this debate stronger than between television and books. Ninety-six percent of parents rated books as the media with the most educational value, and yet children only spend about 40 minutes a day with books, as opposed to 2 hours with screen media (Rideout et al., 2003). Ninety-nine percent of households have a television and 95% have a VCR or DVD player, helping to make screen media a child’s most frequent daily activity (Rideout et al., 2003). Thirty years ago young children first experienced television around the age of 2.5 years, but current times find children as young as 6 months, if not younger, watching videos and television (Rideout et al., 2003; Zimmerman et al., 2007). Books, as opposed to television, have always been regarded as necessary and highly beneficial to infants’ development. Yet only 45% of parents report reading daily to infants and toddlers, and only 51% of parents report reading even several times per week (Britto, Fuligni, & Brooks-Gunn, 2002; Bradley, Corwyn, McAdoo, & Coll, 2001). These findings are discouraging since the potential benefit of books comes from their complexity and frequency of exposure (Fletcher & Reese, 2005). Most other research with books has focused on children preschool age and older, ignoring the influences book reading can have on younger infants (Fletcher & Reese, 2005).

Television vs. Books
Television and books are used quite differently. Whereas books are given an integral role in classroom curriculum and home education, television is regarded as a time-filler, creating a pattern of books for deliberate learning and television as a placeholder in the day (Jordan, 2005). Salomon (1979, 1981, 1983) has argued that children have expectations about how “easy” or “hard” media are and so they learn more from books because they believe books require more mental effort and they are taught that television is an entertainment tool with little take-away value. Television has consistently possessed a negative reputation, only more enhanced by the American Academy of Pediatrics’ (AAP) recommendation of no television for children under the age of two (American Academy of Pediatrics, 1999). After this guideline was released, research documented links between television viewing under age two and poor school performance, aggression, impairment of creative play, displacement of face-to-face time with parents, and attentional problems, including ADHD (Zimmerman, Christakis & Meltzoff, 2006; Zimmerman, Christakis, & Meltzoff, 2007; Barr, Lally, Hilliard, Andolina, & Ruskis, submitted; Christakis, Zimmerman, DiGiuseppe, & McCarty et al, 2005). Thakker, Garrison, and Christakis (2006), however, engaged the idea that television may have positive impacts on children’s development, depending on the type of content. They analyzed twelve controlled studies and found that television viewing can aid in acquiring general knowledge and improving overall cognition. They reported that other studies showed that educational television can change racial attitudes by integrating diversity and can facilitate imaginative play when content is low action and low violence. Thakker, Garrison, and Christakis and colleagues emphasized the critical role of content, writing that content is more important than viewing time for young children and suggesting that programs with age-specific curricula, coupled with adult-mediated viewing, could allow children to learn more efficiently and effectively.
Other studies have directly examined the impact of television on vocabulary and language acquisition. Linebarger and Walker (2005) found that the quality and impact of television should be judged conditionally by specific program. When looking at children’s educational programming, results showed that some programs were related to an increase in vocabulary, vocabulary growth rate per month, and expressive language, while other programs were negatively associated with vocabulary acquisition and expressive language. Linebarger and Walker suggested that positive results come from having onscreen characters speak directly to the child and having a story-book like nature with a strong narrative and vocabulary words with visual representation. The negative impact of other programs could be due to loose narrative and use of immature language. Similar studies have shown that children’s attention to television is guided by formal features, such as animation and child voices, that aid in cognitive processing of content and thus understanding of content messages (Huston & Wright, 1983). Books also have the potential to significantly affect language. Raikes et al (2006) conducted a study to assess patterns of maternal book reading in low-income families. They found that reading daily or several times a week at 14 months was significantly related to vocabulary and comprehension, and a pattern of daily reading over the three ages studied was significantly related to language and cognitive outcomes at 36 months. Findings revealed paths from early reading to later reading and early vocabulary to later language. These studies suggest that perhaps early exposure to specific positive educational television and books with strong narrative would result in later positive developmental outcomes.

*Role of Narration*

Narrative in book reading has been shown to play an important role in children’s language acquisition and verbal ability (for review see Fletcher & Reese, 2005). Rapid language
learning occurs between 8 and 36 months, and picture book reading during this time, particularly with parents engaged in the narrative, increases exposure to vocabulary as well as concepts rarely used in conversation (DeTemple & Snow, 2003). For children older than 18 months, parents reading books tend to ask questions and extend conversations about pictures and story lines (Goodsitt, Raitan, & Perlmutter, 1988; Martin, 1998; Murphy, 1978; Ninio, 1983; Senechal, Cornell, & Broda, 1995; Snow & Goldfield, 1982, 1983; Wheeler, 1983). As opposed to younger children who are told about the story by the parent, children in this older age group are more likely to be asked a question about the content (DeLoache & DeMendoza, 1987). This behavior is most effective when parents are sensitive to their child’s developmental level and structure the book reading to maximize potential for language learning (Vygotsky, 1978). Enhancing the quality of book reading can lead to increased interest on the child’s part, an important factor since engagement in reading at 24 months significantly predicts language ability at 30 and 54 months and reading achievement at 6 years (Crain-Thoreson & Dale, 1992; Dale, Crain-Thoreson, & Robinson, 1995). One way to enhance the experience is through repeated readings. Children talk more frequently and engage in discussions about the story more often with familiar books than with unfamiliar books (Goodsitt et al., 1988). A history of supportive and quality book reading creates a pattern of frequent reading interactions, which in turn facilitates vocabulary skills that will increase the child’s interest and participation and further their language learning (Fletcher & Reese, 2005). Book reading can also help the child learn about the world around them, and many parents try to draw a parallel between the representational material in the book and the child’s real-world experience (DeLoache & DeMendoza, 1987). These same principles may also apply to television, with the implication that television that employs helpful narrative, particularly when viewed with an engaged adult who tries to create real-world
connections, can enhance the child’s viewing experience and help the child take advantage of the potential learning benefits of the media.

**Cognitive Load of 2D Media**

The question remains, however, of why television and books are such difficult sources of learning for young children. Previous research has shown that young children learn faster and more easily from a live 3D demonstration as opposed to a video 2D demonstration (see Anderson & Pempek, 2005 for review), but little investigation has been done into the comparison of books and television, which share a 2D nature. Studies examining looking patterns of 2- to 24-month-olds have revealed very similar results for all age groups, suggesting that an attentional mechanism for processing 2D stimuli emerges at a very young age (Alwitt, Anderson, Lorch, & Levin, 1980; Crawley et al., 1999; Richards & Gibson, 1997; Richards & Cronise, 2000), which allows for the assumption that infants should be able to glean information with the same level of ease and depth from both television and books.

The 2D nature of television, videos, and books has been shown to be a great obstacle in children’s ability to use the medium as a source of information because of the heavy cognitive load required to successfully make the transfer. Troseth (2003) has attributed this difficulty to dual representation, the idea that, in order to successfully use information from 2D sources, children must recognize the relation between the symbol seen on the screen or page and the reality it stands for while simultaneously using this knowledge to guide their behavior in a real event they have not directly experienced. Young children have a very hard time with the cognitive load that holding two symbols involves, and training to help the children recognize the connection between television and reality does not seem to influence their behavior (Troseth, 2003). There are differences in age, however, with improved use of dual representation even
within a span of six months, suggesting that there may be sudden advances in children’s ability to recognize the symbolic nature of television and apply it to reality (Troseth & DeLoache, 1998).

Alternative theories have been put forth to explain the cause of the heavy cognitive load associated with processing and utilizing the information in television and books. The cognitive load may be heavy because there are not enough retrieval cues that correspond with the high degree of specificity and consistency in contextual characteristics that infants use to encode information. Thus flexibility is required to encode this information in a variety of contexts and take advantage of a wide range of retrieval cues (Hayne et al, 2000, 1997; Herbert & Hayne, 2000). The cognitive load lightens with age, as older children encode information faster, retain information longer, and, most importantly, are more flexible about the contexts in which the information can be retrieved (Barr et al., 1996; Hayne et al., 2000; Barr & Hayne, 2000; Herbert & Hayne, 2000).

Previous Research

There are other factors besides age which decrease the cognitive load and help children use television and books as sources of information. While direct experience still yields better results than screen media, children will perform better if they are shown a video but are led to believe that they are experiencing the demonstration directly (Troseth & DeLoache, 1998). Similarly, with books, young children have a difficult time transferring what they see to the real world, but they improve with age and with highly iconic pictures that ease the transfer process (Simcock & DeLoache, 2006). Past research has focused on comparing children’s learning and memory from video versus live demonstrations. Studies have consistently shown that imitation is easier from a live model than a screen unless the video demonstration is repeated twice as many
times as the live demonstration, a phenomenon called the “video deficit effect” (Barr et al., 2007). The fact that doubling exposure increases performance for the video condition suggests that 2D media yields impoverished encoding, and repetition works to improve encoding and provide more retrieval cues at test (Barr et al., Muentener, Garcia, Chavez, & Fujimoto, 2007). Accordingly, Hayne, Herbert, and Simcock (2003) hypothesize that the poorer imitation from television seen in past studies is not due to rapid forgetting, but more likely from a failure to extract and encode information from a 2D source.

The Present Study

The present study will examine other factors that may ameliorate the video deficit effect by introducing narration as a mechanism that could potentially enhance encoding and create strong retrieval cues. The present study looks at the impact that narration has on lowering cognitive load by providing more cues for encoding and retrieval and making the television and book more similar to the real world situation. Previous research with narration has shown that children who receive full, labeled narration imitate more actions than children who receive empty, general narration (Hayne & Herbert, 2004). These findings provide evidence that verbal cues during demonstration and at test facilitate long-term retention, despite the limited verbal skills of the children involved. As a result, the present study hypothesizes that children who receive demonstrations with full narration will imitate more target actions than children who receive demonstrations with empty narration.

The present study also examines learning from television as compared to picture book reading and posits cognitive flexibility as the cause of any differences in imitation. Studies have found that 30-month-olds can successfully complete object-retrieval tasks from both television and pictures (DeLoache, 1991; Troseth & DeLoache, 1998) so that if the difficulty in transfer is
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due to dual representation, then the results of children’s performance in the present study should be the same for television and books. Yet we predict that television will yield better performance because it contains motion and sound cues that books do not have and that should enhance retrieval, thus suggesting that cognitive flexibility better explains the cognitive load created by these media.

Experiment 1

Since both television and books in the present study are 2D media, the need for repetition was eliminated and each demonstration was presented the same amount of times. Studies have shown that children’s imitation performance is improved when they are tested with an enabling sequence task as opposed to an arbitrary sequence task (Barr & Hayne, 1996). Perhaps because each step in the enabling sequence provides a retrieval cue for the next step, or perhaps because of the demand for a particular order, children imitate enabling tasks earlier and easier. Similarly, the high iconicity and realistic nature of color photographs eases learning, aids imitation, and generates greater performance scores than demonstrations with less iconic illustrations (Simcock & DeLoache, 2006). Thus the present study employed an enabling, sequential rattle task and a picture book with color photographs so that the difficulty of the task would not be a factor in the children’s memory and performance.

Methods

Participants

Seventy-nine 24-months-olds ($M = 24.53$ months, $SD = 18.9$ days; 45 boys and 34 girls) and their caregivers were recruited through commercial mailing lists and by word-of-mouth.
Participants were African-American \( (n = 1) \), Latino \( (n = 1) \), Asian, \( (n = 3) \), Caucasian \( (n = 51) \), and of mixed descent \( (n = 13) \). The majority of toddlers were from middle- to upper-class, highly educated families. Their parents’ mean educational attainment was 17.3 years \( (SD = 1.5) \) based on 86% of the sample reporting, and their mean rank of socioeconomic status (Nakao & Treas, 1992) was 80.9 \( (SD = 11.2) \) based on 46% of the sample reporting. Toddlers \( (n = 14/group; n = 23/group \) for baseline) were randomly assigned to five conditions: television full, television empty, book full, book empty, and baseline. Five additional toddlers were excluded from the final sample due to equipment failure or experimenter error \( (n = 2) \) or previous exposure to the rattle stimuli \( (n = 3) \).

**Apparatus**

The apparatus used in the present experiment were sets of stimuli to assemble a toy rattle, professionally produced DVDs of an experimenter demonstrating how to make a rattle, and a book illustrated with color photographs depicting how to make the same rattle. There were two versions of the novel three-step rattle sequence (red and green) each of which has the same target actions: 1) push the ball into the jar, 2) attach the stick to the jar, 3) shake the stick to make a noise. The red rattle consisted of a red wooden stick (14.5 cm long) with a plug on the end which fitted into a blue plastic ball with a hole in the top (4.5 cm in diameter) and a red wooden ball (2 cm in diameter). The green rattle consisted of a green stick (12.5 cm long) attached to a white plastic lid (9.5 cm in diameter) with velcro attached to the underside of the lid, a green octagonal bead (3 cm in diameter x 2.5 cm in height), and a clear plastic cup with velcro around the top (5.5 cm in diameter x 8 cm in height).

**Procedure**
Demonstration Session

At the beginning of the visit, the purpose of the study and details of the procedure were explained to the caregiver, and consent was obtained. All toddlers were tested in their homes at a day and time that the caregiver had identified as a period when the toddler would be alert and playful. At the beginning of each session, the experimenter interacted with the toddler for approximately 5 to 10 minutes in order for the child to become comfortable with her.

For both the video and the book conditions, three specific actions with a rattle were demonstrated for the toddler. The demonstration was repeated twice for all conditions. Caregivers were asked to refrain from making revealing comments or trying to coach the child. If the toddler looked away during the demonstration, either the caregiver or the experimenter would attempt to redirect the toddler’s attention by pointing and saying the toddler’s name or the word “look”. In order to later measure looking time and attention, the toddler was videotaped during the demonstration.

In the video condition, toddlers were seated on their caregiver’s lap, approximately 80 cm from the family’s most used television set such that the screen was at eye level, but out of reach. The experimenter remained in the room, and the toddler saw a different female experimenter standing at a table with the three pieces of the rattle. The video began with a narrating voice saying “Linda makes a rattle” or “Linda is going to make something”. As the voice described the actions necessary to make a rattle, the experimenter on the video performed the actions. The narration and accompanying photographs from the picture book conditions can be seen in Table 1. The video images were the same as those from the picture book. Close-ups were used to show the target actions (push the ball into the jar, attach the stick to the jar, shake the stick to make a noise) so that the video alternated between the head and torso of the female experimenter at a
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table and close-ups of the target actions. For toddlers in the video full narration group, labels were used for the target actions and intended goal, such as “Linda makes a rattle” and “Linda has found a ball, and jar, and a stick” and “Linda pushes the ball into the jar”. For infants in the video empty narration group, general non-label terms were used such as “Linda is going to make something” and “Look at that” and “Wow! What is she doing?” (see Table 1). The set of actions was demonstrated twice and the demonstration lasted for about 60 seconds (mean = 59.11, SD = 2.5).

In the book condition, the caregiver held the toddler on his/her lap and the experimenter sat next to them. She read the book at the same pace as the narrator in the video condition in order to equate the two conditions. The book contained color photographs and narration identical to that in the video. As in the video, close-ups were used during the target actions so that the book alternated between photographs of a female experimenter’s head and torso at a table and close-ups of the target actions. For toddlers in the book full narration group, identical labels were used for the target actions and intended goal as in the corresponding video condition. For infants in the book empty narration group, identical general non-label terms were used as in the corresponding video condition (chart below; see Table 1). The book describing the set of actions was read twice and the demonstration lasted for about 60 seconds (mean = 63.05, SD = 8.4).

Test Session

The test session occurred ten minutes after the demonstration and was identical for all conditions. During the test, the toddler and the experimenter were seated facing each other on the floor; the caregiver was typically seated directly behind the child. Each toddler was tested with the same stimuli, either the red or green rattle, which he or she had seen during the demonstration. The experimenter who conducted the demonstration always conducted the test.
Caregivers were asked not to instruct the toddler. During the test, the experimenter placed the three parts of the rattle (ball, jar, stick) within the toddler’s reach and asked the toddler to show her how to make either “a rattle” or “something”. The toddler’s behavior was videotaped and coded for 60 seconds after he/she first touched the stimuli. They were allowed to play with the stimuli for an additional 30 seconds to see if this extra time would help their imitation scores. A baseline control group, who was not shown any demonstration and encountered the stimuli for the first time during the test session, was used to assess the probability of spontaneous production of the target actions. These toddlers were tested in a manner identical to that of the experimental groups.

Results

Descriptive statistics

Language development in this sample was typical, but unfortunately not enough language measurements were collected to use the scores as a covariate; on average the percentile rank on the MCDI was 56.71 ($SD = 27.9$), and most children were within one standard deviation of the mean. Based on reports by 56% of parents who completed a 24 hour household media diary, toddlers were exposed to television on average for 47.7 min per day ($SD = 5.44$ mins) and were exposed to books an average of 49.2 min per day ($SD = 4.14$ mins).

Demonstration session

<table>
<thead>
<tr>
<th>Number of Points</th>
<th>Number of Vocalizations</th>
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</table>
For the experimental conditions, looking time during the demonstration was coded. A one way analysis of variance (ANOVA) was calculated on percent looking during target actions. There was a significant main effect for percent looking during target actions, $F(3,41) = 6.54, p < .001$, partial $\eta^2 = .324$. Post-hoc Student Newman Kuhls tests (SNK, $p < .05$) indicated that the book full condition had significantly lower looking time at the screen during the presentation of the target actions than the book empty, television full, and television empty conditions, which did not differ significantly from one another (see Figure 1). We also measured the number of times children pointed and vocalized during the demonstration sessions. As can be seen in Table 2, these behaviors were most frequent in the book empty condition, while no points or vocalizations were recorded in either television condition.

<table>
<thead>
<tr>
<th></th>
<th>Television Full</th>
<th>Television Empty</th>
<th>Book Full</th>
<th>Book Empty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Looking Time</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 2

Test session
A preliminary analysis was conducted as a function of stimuli and gender, and there were no main effects or interactions found. The data was therefore collapsed across these variables for further analysis. A one-way ANOVA yielded a significant main effect of condition on the average number of behaviors reproduced during the test session, $F(4, 74) = 10.89, p < .001$, partial $\eta^2 = .371$. The post-hoc analysis of this effect addressed three main questions. First, did the experimental conditions perform above baseline? Second, did imitation differ between video and book conditions? Third, did imitation differ between full and empty narration conditions? As can be seen in Figure 2, post-hoc SNK t-tests ($p < .05$) indicated that all of the experimental groups performed significantly above baseline. However, only the video full group differed significantly from the other experimental groups. The video empty, book full, and book empty groups did not differ significantly from each other. Thus there was no difference in imitation between television and book groups and, while narration facilitated imitation in the television conditions, it had no effect in the book conditions.

**Figure 2**

![Figure 2](image-url)

**Discussion**
The results of this study show that all toddlers imitated from television and picture book demonstrations. Although imitation from television was slightly higher than that from books, there was no significant difference between imitation from the two media. Only the television full condition yielded significantly higher imitation than the other three groups. This finding is consistent with Hayne’s theory of cognitive flexibility (Hayne et al., 2000, 1997; Herbert & Hayne, 2000). This theory attempts to explain the difficulty children have in learning from 2D media by suggesting that they need to develop the ability to encode information in a variety of contexts and thus take advantage of a wide range of retrieval cues. The superiority of television in improving cognitive flexibility could be attributed to motion and sounds, features that picture books lack. Acting as additional retrieval cues, these features ease the transfer process by providing a demonstration that is more similar to the real world. Through this media, children can see the movement required during each target action and hear the sound of the rattle shake at the end of the demonstration, motions and sounds that they are then able to recreate when given the opportunity to play with the rattle pieces. Picture books, on the other hand, provide only stagnant images of the desired behaviors.

The results of this study also demonstrate a facilitating impact of narration on television, but not on books. Toddlers imitated more after viewing a television demonstration with full specific narration than when viewing one with empty vague narration. The results replicate those of Hayne and Herbert (2004), who also found greater imitation after full narration. This finding is also consistent with studies that have shown increased vocabulary and language when television programs have a strong structure and narrative and characters that speak directly to the child viewers, as well as when parents directly engage their children in the story (Linebarger & Walker, 2005; Fletcher & Reese, 2005).
The most surprising result was the finding that narration had no effect on facilitating imitation from books. Surprisingly, toddlers imitated more after a picture book demonstration with empty narration that one with full narration, but this finding was not significant. This unexpected outcome could be explained by the contingency that children expect from picture books – an expectation that they do not have of television. Past experience with picture books involves parents asking questions and responding to children’s verbalizations, since parents of toddlers 18 months and older are more likely to ask questions and extend conversations about the books’ story lines (Goodsitt, Raitan, & Perlmutter, 1988; Martin, 1998; Murphy, 1978; Ninio, 1983; Senechal, Cornell, & Broda, 1995; Snow & Goldfield, 1982, 1983; Wheeler, 1983). Parents, unlike television programs, are able to structure their presentations to the specific child’s age and verbal ability, maximizing the potential for learning (Vygotsky, 1978). Perhaps since children have come to expect this contingent relationship during picture book reading, they were more engaged with the several questions that characterize the empty narration, and thus they learned more from the interaction. This explanation is strengthened by the fact that toddlers in this study pointed and vocalized more during the empty picture book demonstration than during any other condition.

Despite the interesting and revealing findings of this study, there are several potential limitations. Participants were drawn solely from Queensland, Australia and the Washington, DC area, and toddlers were primarily Caucasian with highly-educated parents of high SES. The homogenous nature of the sample limits the ability to generalize the results to a greater population. Generalizing the results is also inhibited by the three-step rattle task, which is an accurate measure of motor skills learning, but may not represent children’s capacity for imitating other kinds of behaviors, such as proper manners or social interactions. Finally, the fact that most
results were not significant calls into question whether or not the rattle task was too easy and if a more challenging task may yield stronger results.

Based on these limitations, there are several possibilities for future research and adaptations of the present study. Other age groups could be used to compare the imitative behavior of younger and older children to that of 24-month-olds and potentially reveal how cognitive flexibility develops over time. Perhaps the lack of significant results in this study is partially due to the level of flexibility at 24 months. Future research could also employ a different task, such as a more challenging sequence task or a more socially applicable task. To examine the impact of narration more deeply, a study could be run in which the rattle pieces and target behaviors are covered up during the demonstration, leaving narration as the children’s only source for learning. Versions of the video and book could also be used in which the entire demonstration is enacted from one viewpoint, removing the cuts that call the child’s attention to the target actions.

The results of this study have great implications for every level of children’s media. The findings suggest the way in which parents should engage their children during exposure to 2D media, asking questions and discussing story lines to maximize the potential for encoding and retrieval cues. There are also implications for the amount and kind of media used by parents and teachers. Television should have strong, descriptive narratives, and books should engage the child with questions. Neither media, however, should be used too often since the greatest learning still comes from real-life demonstrations (Barr & Hayne, 1999; Simcock & DeLoache, 2006). Similarly, these results have the potential to influence the production of media by demonstrating which techniques should be focused on in each type of media to enhance children’s learning. Finally, at the highest level, this study has implications for policies regarding
media production in an attempt to create the most beneficial and educational media possible for young children.
Table 1. Comparison of the narration used in the full and empty demonstrations. Images from the picture book are shown beside the phrases corresponding with those pages. Identical narration and images were used for the video conditions.

<table>
<thead>
<tr>
<th>Narration</th>
<th>Red Rattle Photos (Book Condition)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empty</strong></td>
<td><strong>Full</strong></td>
</tr>
<tr>
<td>Linda is going to make something.</td>
<td>Linda makes a rattle.</td>
</tr>
<tr>
<td>Linda has found some things on the table.</td>
<td>Linda has found some things on the table.</td>
</tr>
<tr>
<td>Look at that.</td>
<td>Linda has found a ball, a jar and a stick. She can use these things to make a rattle.</td>
</tr>
<tr>
<td>Wow! What is she doing?</td>
<td>Linda pushes the ball into the jar.</td>
</tr>
<tr>
<td>Did you see that?</td>
<td>Linda picks the stick up and puts it on the jar.</td>
</tr>
<tr>
<td>Isn’t this fun?</td>
<td>Linda shakes the stick to make a noise: shake shake.</td>
</tr>
<tr>
<td>Wow! Good job Linda!</td>
<td>Wow! Linda made a rattle! Good job Linda!</td>
</tr>
</tbody>
</table>
Table 2. The number of points and vocalizations performed by children during the demonstration of each condition. More points and vocalizations were recorded during the book conditions, with the largest number being performed during the book empty condition. None of these behaviors were recorded during the television conditions.

<table>
<thead>
<tr>
<th></th>
<th>Number of Points</th>
<th>Number of Vocalizations</th>
</tr>
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<tbody>
<tr>
<td>Television Full</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Television Empty</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Book Full</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Book Empty</td>
<td>10</td>
<td>15</td>
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</tbody>
</table>
Figure captions

Figure 1. The mean percent looking time (+/- 1 SE) as a function of experimental group. The book full condition had a significantly lower percent looking time than the other three conditions, which did not differ significantly from each other.

Figure 2. The mean imitation score (+/- 1 SE) as a function of experimental group. The baseline control group performance is indicated by a dashed line. Group performance that was significantly above baseline is indicated by an asterisk. All four experimental groups performed significantly above baseline, but only the video full condition differed significantly from the other conditions.
Figure 1

![Bar chart showing percent looking time for Full Narration and Empty Narration across Video and Book media types.](chart.png)
Figure 2

Comparison of imitation scores between full narration and empty narration for video and book media types. The baseline is indicated by the dotted line. Asterisks indicate significant differences.
References


