Toddlers, Electronic Media, and Language Development

What Researchers Know So Far

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Abstract

Electronic media—whether child-oriented videos and games or background television—is increasingly embedded in young children's lives, raising questions of its impact on children's language skills. New research presents a multitextured picture of how different types of e-media—depending on content, context, and a child's age—can help and hurt. Research is mixed on whether children can learn words from video demonstrations alone before they are 2 years old. Between 2 and 3 years, more evidence emerges of the positive impact of video and interactive games designed for young children. Meanwhile, background television and adult-directed TV are associated with reduced language development starting from infancy.

More than 10 years ago, *Child Development* published a study on young children and media that contained a surprising finding. The study tracked what children watched on TV and how their language skills grew over 3 years, looking at differences in children's learning from educational programs designed for children versus TV made for adults. Known as the Early Window Study, its conclusions probably would not surprise those who have read studies on *Sesame Street*: Yes, the researchers found, educational content helps children learn and noneducational content does not. But one tidbit was especially noteworthy. The children who started watching at the youngest ages—2 and 3 years old, not 4 and 5—were the ones who benefited the most. Frequent watchers performed better on tests of early literacy than those who hardly watched at all (Wright et al., 2001).

While that research was underway, a separate group of researchers, in the United States and New Zealand, were completing experiments with children of slightly younger ages. Is it possible to test, they wondered, how much infants and toddlers remember and use information they see on video or TV? How does their learning compare to face-to-face interactions? The results showed that very young children learn more from in-person demonstrations than from the very same demonstrations shown on video, paving the way for coinage of a new term: the *video deficit*. (Anderson & Pempek, 2005; Barr & Hayne, 1999; see box, Explaining the Video Deficit). Something about watching on screen, they concluded, is not as powerful for young children as watching in real life.

Explaining the Video Deficit

Exploration of the real world is crucial for young children's learning. But mothers and fathers who have seen their babies imitate them—whether it's the movement of putting a cell phone to one's ear or sweeping the floor—know that young children learn by simply watching, too. Which begs the question: Do babies and toddlers have to watch those actions live and in person to learn them? Or could they learn to imitate—or speak a word, or follow directions—just as easily if they watched those actions on TV or through a touch-screen tablet's video screen?

Studies so far show that learning from a screen is certainly possible under certain conditions—with differences showing up depending on a child's age and what task or word the child is asked to learn—but that very young children learn best from in-person demonstrations.

One early example of this research comes from a study by Rachel Barr and Harlene Hayne of 276 children who were 12 months, 15 months, and 18 months old. Barr and Hayne designed a couple of "imitation tasks" that they performed in front of the children face-to-face and via video. The tasks involved simple but unusual actions that would be novel to infants and toddlers (to eliminate the chance the children had seen them before). One, for example, involved a puppet with a paw covered by a tiny mitten, with a bell stitched inside the mitten. The experimenters would position the puppet at the child's eye level, remove the mitten from the puppet's paw, and shake the mitten three times to ring the bell inside. When 12-month-olds and 15-month-olds were shown this task in real life, most of them imitated it immediately after viewing. But when they saw exactly the same thing on video, only one of them did so. The 18-month-olds were a different lot. They appeared to retain something from the video performance and could imitate the task (Barr & Hayne, 1999).

Since then (and before then as well, in a few studies from the 1970s), scientists have tested this phenomenon with different ages of children and different tasks. They have labeled the phenomenon the video deficit—a situation in which modeling or teaching something via the screen is not as conducive to learning compared to showing children something in person. As Marina Krcmar of Wake Forest University wrote in a recent report, "the television image seems less real and vital compared to real experience" (Krcmar, 2011).

But researchers also stress that the existence of this deficit does not mean that children at 1, 2, and 3 years old cannot learn from a screen at all. Success is possible with repeated viewings as well as if the video features characteristics that give toddlers a sense of having a "social partner" in the person or character they see on screen. Those findings are launching new questions about what very young children learn from interactive and two-way media.

Making Choices About E-Media: The Three C's

Taken together, research shows that parents and caregivers should focus on three interrelated factors when choosing whether to use electronic media with their children: content, context, and the individual child.

Content: Choose engaging content designed to be comprehended by toddlers and preschoolers. Try to find out if your children can follow the story by watching with them and asking questions about what they think might happen next. Don't leave the TV on as background noise. Avoid any media that displays violence or aggression.

Context: Consider how and whether electronic media has a place in the day given a child's other needs that day—from naps to gross-motor exploration and playground romps to quiet playtime. Pay attention to how you interact with your child when the media is on and off. Just as you would with books and music, look for e-media moments that can be jumping off points for joint engagement and joyful interaction with your child.

Child: Be aware of your child's stage of development and what content is meaningful to him at his age. Tune in to what he is interested in and pay attention to the questions he asks about what he is seeing or playing. Avoid media that makes him upset or seem out of control. If your child is not yet 2 years old, make sure that screen time includes social interactions with you or other caring adults.

Adapted from *Screen Time: How Electronic Media—From Baby Videos to Educational Software—Affects Your Young Child* (p. xv-xx), by L. Guernsey, 2012, New York: Basic Books.

Two lines of research; two seemingly contradictory findings that could have—and in some quarters already have had—significant bearing on how parents and teachers think about the impact of media on the very young.

As TV is now accompanied by interactive tablet computers, questions about what very young children learn from these forms of media—or whether they learn anything at all—are as hot as ever. Language development often tops the list of concerns. Parents, teachers, and caregivers want to know whether electronic media will cause their children to learn words less quickly, develop language skills at a slower rate, or be at a disadvantage when it comes time to learn to read. On the flip side, anecdotal evidence makes them wonder whether electronic media might, in fact, play a role in developing their child's vocabulary and other pre-literacy skills. Could media and e-games actually help?

Answers aren't black and white. And contrary to the mainstream media's fixation on the number of hours of "screen time" that children experience per day or per week, the implications of the quantity of children's media consumption are overshadowed by more complicated questions of what, how, when, where, and why children are watching. Science is pointing to the complex interplay between the content on screen, the context surrounding the watching or playing, and the developmental needs of the individual child. (See box *Making Choices About E-Media: The Three C's.*) Furthermore, just as young children go through myriad stages of development, building new abilities as they age and experience new things, researchers are finding that a child's ability to understand the multifaceted aspects of electronic media follows a developmental trajectory, too.

So far, debate has circled around the age of 2 years. This where the American Academy of Pediatrics has drawn a line in the sand. Its recommendation, released in 1999 and reiterated in 2011, is plain: "The AAP discourages media use by children younger than 2 years." (AAP, 2011). Yet, the book isn't closed on the 2-year-old mark.

Inquiring minds around the country are now closely examining what is happening within children's minds during this critical period of toddlerhood—both just before and after 24 months old. While the case for learning from certain types of media at and after 24 months is gaining strength, the evidence from the 6 months just before that second birthday is mixed. A multitextured picture is emerging of how different types of e-media, in different contexts and at different ages, can help and hamper the growth of children's language skills. What's more, the importance of the quality of children's interactions with what is on screen—as well as the impact of their parents' interactions with them prompted by what is on screen—is coming into sharper focus.

Learning New Words

When parents get excited about their toddlers gaining language skills, they often focus on word learning. It can feel extraordinary and almost miraculous to hear a child, who months ago could only gesture or babble in the face of a parent's requests, start to utter recognizable words in return. When my children were babies and toddlers, I remember wondering what sparked some of the new words in their vocabulary. Could they have come from watching something on the video screen? Or did they learn those new words from simply being around me, my husband, and their other caregivers? In truth, I had an even more basic question: When is a baby's brain developmentally prepared to learn this way in the first place? What is the youngest age at which a baby might learn a word by watching video?

Some early answers of word learning via video came from a 2007 study using a version of *Teletubbies*. It showed that it is not until children are about 21 months old that they provide any evidence of being able to learn words via a screen without help from a live person (Krcmar, Grela, & Lin, 2007). But a couple of years ago, the age for that possibility moved down to 18 months. A study led by Elizabeth Vandewater at the University of Texas at Austin showed that 18-month-olds who were introduced to a crescent shape on video (with a voiceover labeling the shape as a "crescent") were later able to point correctly to a crescent when tested using a book with the same image (Vandewater et al., 2010). The study adapted clips from *Brainy Baby*, a commercially produced video aimed at children from 1 year and older, and compared nonviewing babies and toddlers to those who had watched the videos in their homes over 2 weeks.

Still, researchers caution that parents may give videos too much credit for new vocabulary. It's possible that parents see their children learning words from video when what's really happening is that their children are in the throes of the phenomenon known as the "word spurt," uttering an avalanche of new words, seemingly within weeks. "It would be easy for parents to misattribute their children's sudden linguistic advances to recent video experience," Judy S. DeLoache, a developmental scientist at the University of Virginia, and other researchers recently reported (DeLoache et al., 2010, p. 1570).

To find out whether misattribution occurs, DeLoache and her colleagues (2010) designed an experiment with many similarities to that of Vandewater's for testing what level of word learning might come from video watching before children were 2 years old. The experiment included 72 children between 12 and 18 months old. The parents were randomly assigned to participate in one of four groups over a 4-week period. Researchers asked one group to show a baby DVD in their homes and interact with their children while doing so (without any particular instructions on what that interaction should look like). A second group showed the DVD but did not interact with their children while watching. A third group did not use the DVD and instead was asked to teach up to 25 words "in whatever way seems natural to you" (these 25 words were the same words featured in the video). And a fourth group—the control group—was not given any assignment but allowed their children to be tested on which of the 25 words they may have learned in those 4 weeks.

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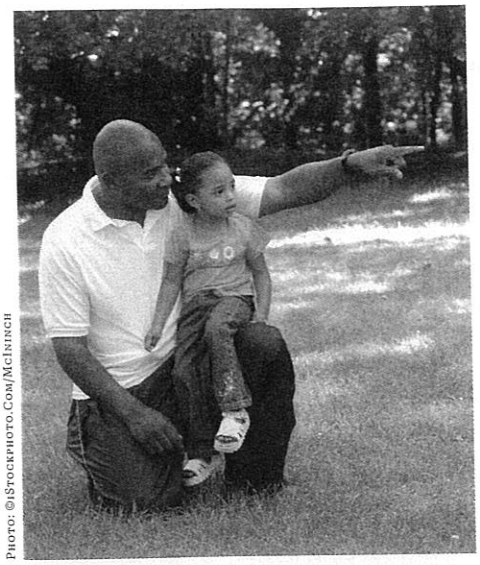
The children in each group took tests of their word knowledge before the experiment began and at the end of the four weeks. The tests were one-on-one assessments by adults who asked children to point at objects that matched the words featured in the videos, such as a clock, table, and tree. (In the case of large objects, like a tree, a representation of the tree was shown to the child.)

The test results showed that children in the group whose parents taught them the words answered nearly 50% of the questions correctly, while all the other groups answered fewer than 40% correctly. The performance of the two DVD groups was not statistically different from that of the control group. In short, children learned more words from their parents teaching them directly without aid of the DVD (though evidently, with only 50% of their answers correct, even the parents weren't perfect teachers or perhaps the children weren't ready to be taught). The viewing of the DVD—which totaled 10 or more hours a week in 20 or more video episodes—had essentially no effect, good or bad, on children's word learning.

Diary entries from the parents who had used the DVDs, however, showed that the parents thought their children had learned a substantial amount by watching, just as DeLoache had predicted. Parents took their cues from how engaged their children seemed to be: "She was practically glued to the screen today," wrote one. "She was very quiet today—stared intently at the screen and ignored me when I asked her to talk," wrote another (DeLoache et al., 2010).

Similar results came from studies conducted by Michael Robb and Rebekah Richert that examined the impact of the *Baby Wordsworth* video from the Baby Einstein series on children from 12 to 25 months old (Richert, Robb, Fender, & Wartella, 2010; Robb, Richert, & Wartella, 2009). The children made some "general gains in word knowledge attributable to time and age." (Richert et al, 2010, p. E4). But, they concluded, "children who viewed the DVD at home over 6 weeks did not demonstrate new knowledge of the DVD-highlighted words." (Richert et al., 2010, p. E4).

To recap, evidence from two experimental studies showed toddlers learning words via video around 18 and 21 months old, and two others showed no evidence of children learning words via video at about the same ages.



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Parents can point to and label fixed objects to help their children learn nouns.

What accounts for the discrepancy? Maybe it was the way the children were tested. Or perhaps there were subtle differences in how images were displayed and words were expressed on screen. Another possibility lies in the difference between teaching shapes and teaching objects—could one be easier than another? Scientists have uncovered evidence, for example, that some words—such as verbs—are more difficult to learn than others, on screen and off (Roseberry, Hirsh-Pasek, Parish-Morris, & Golinkoff, 2009). Parents can point to and label fixed objects to help their children learn nouns, but helping children learn the words for various actions requires children to see a full range of similar actions in different contexts before their brains can match verb to action. Studies from Temple University showed that children around 30 months old can only learn verbs from video if their watching is followed by a live demonstration whereas older children can learn verbs from video alone.

The bottom line for parents and teachers of 18- to 24-month-olds looking for clear answers on word learning from video alone: The possibility exists if the person or character on the screen is very direct in its teaching approach, but it certainly is not guaranteed.

What about even younger children? If it's unlikely that videos, on their own, are much benefit to babies, could it be that they might, in fact, do some harm? There is still much researchers don't know. Outside of the realm of experimental research, one study based on parental reports and survey data is often cited as evidence that baby videos are not simply benign but could actually reduce language development when watched heavily by children in the range of 8 months to 16 months old. Conducted by Frederick Zimmerman, Dimitri Christakis, and Andrew Meltzoff (2007), the study was based on a telephone survey of approximately 1,000 parents on what kind of videos or television, if any, their babies and toddlers watched. The survey also asked parents to respond yes or no to an inventory of 90 common words that babies may know, such as *cup* or *fast*. Results revealed that 17% of parents said their babies watched 1 hour or more of baby videos a day—and that those babies appeared to know significantly fewer words than the other children in the study.

But educators and parents should be careful not to assume that this means that video viewing caused children to have smaller vocabularies, only that there is a link between these two characteristics. One possibility is that the parents who played the videos for an hour or more at these very young ages were less likely to talk to their babies than those who played them for less time or didn't use them at all. It's certainly plausible that less talk from parents could cause less word learning in their babies. But be aware that the study was based not on vetted tests of word knowledge but on parents' reports of the words they thought their children already knew, and some parents may be less in tune with what their children know—or, conversely, more apt to exaggerate. And no such word gap was found among parents who reported on children from 17 months to 24 months old. Given these caveats and the limitations of survey data, Zimmerman and his colleagues (2007) have argued for more experiments and more studies that track children over time.

When the Media Is Interactive

Until a few years ago, screen media for infants and toddlers meant television and DVDs. The passive nature of the technology—all the babies can do is watch—triggers worry among child development experts. Two big factors in children's healthy growth and development—active exploration and social interaction—are missing. It was these concerns that drove the AAP to put out its recommendation to avoid screen media for children less than 2 years old.

But what happens when a child under 2 years old uses screen media that do enable her to explore and interact socially? That's the question hastened by the emergence of interactive apps on devices like tablet computers and video-phone or videochat technology. Scientists are keen to learn which features of interactive technologies could be helpful to children and which ones are a waste of their time. This is inspiring a new round of experiments on video deficit, the tendency of young children to learn more or more quickly from a live in-person demonstration than a demonstration on video.

In a study at Vanderbilt University, researchers wondered whether 24-month-olds might be able to overcome the video deficit if they felt they had a personal connection with or engaged in conversation with a person or character on the screen. They set up an experiment in which children used information presented via video to find a toy hidden in a nearby room. Which would be most helpful, they wondered: interactive video (in which children were seeing a person give hints on video in real-time, as if via a webcam), participatory but noninteractive video (in which the person on video faced outward and acted as if she was talking to the children), or a live demonstration? The results showed that the interactive webcam video and the live demonstration promoted the most learning. The participatory video was not helpful, except in the cases of the few children who were most engaged and responded to the character on the screen, a discovery that delighted makers of TV shows like *Blues Clues* that try to elicit those kind of reactions. (Guernsey, 2006; Troseth, Saylor, & Archer, 2006).

Marina Krcmar of Wake Forest University took the questions a step further by testing whether a child seeing his own mother on video would be more likely to learn from the video. She and her research team shot video of mothers showing actions (e.g., clapping hands) and teaching new words as if they were talking directly to their babies. They also recorded similar videos with strangers acting out the parts. The researchers then played the videos for the babies and toddlers assigned to age groups (6–12 months, 13–20 months, and 21–24 months old). The children in the middle age group responded by imitating actions they saw on the videos of their mothers but not of the strangers. But the learning of new words was difficult for them even with their mothers on screen. Only children in the oldest age group showed signs of knowing the words that their mothers had taught on video (Krcmar, 2011). In short, even when the person on screen is as familiar and meaningful as a parent, younger toddlers appeared to have difficulty recalling words taught via video. But the results do suggest a window of opportunity for older toddlers to benefit from real-time video conversations.

Then there's interactivity of a different kind: interactions stimulated by games on touch screen tablets and other child-friendly computers. Babies and toddlers are being regularly exposed to interactive games and apps, as any search online for pictures or videos of "babies and iPads" can attest. A new generation of researchers—not to mention parents—want to know the impact of these interactive games on cognitive development. No independent, published,

and peer-reviewed research has provided answers yet for the very young, but one study from Georgetown University does raise the possibility of 2½-year-olds gaining something from these games. In an experiment with 30- to 36-months-olds using a touch-based interface and a computer, researchers showed that an interactive computer game could rival face-to-face learning and was more useful in helping children learn than passive video (Lauricella, Pempek, Barr, & Calvert, 2010). "When faced with a cognitively challenging task, both developmental factors and interactivity are important for children's success" (p. 367) wrote Alexis Lauricella, the lead author. But experts agree that much more research is necessary to assess the educational value of different types of touch screens and apps, especially when unaccompanied by parental input or guidance.

Developing Language Skills of All Kinds

The focus of most research so far might leave you mistakenly thinking that word learning is the end-all, be-all of language development. Not at all. It merely happens to be one of the easiest factors to measure. Multiple factors within a child's environment, building upon each other over time in the first few years of a child's life, have enormous bearing on how well children learn to understand language, express themselves, and ultimately learn to read and write. (National Research Council & Institute of Medicine, 2000). There is a huge amount of research to do to unpack what video and interactive media means to language development from the earliest months of life, as babies start to recognize different sounds in speech and segment into words, to the preschool years, when children are putting thoughts together in complex sentences.

Take storytelling, for example. Being able to comprehend the content of a book and follow a narrative is crucial to understanding what that book is about and being able to talk about it. Studies of preschool TV indicate that the same is true for video. Video programs that contain flashbacks, dream sequences, or quick cuts between scenes are difficult for a young child to follow, while video stories that follow a linear sequence—taking a character from point A to point B—may be more comprehensible and therefore more potent as learning tools. One longitudinal study led by Deborah Linebarger of the University of Pennsylvania, who is known for her work evaluating the reading show *Between the Lions*, showed that some children gained early literacy skills from watching certain educational TV shows from when they were 12 months to 30 months old. The Nick Jr. show *Dora the Explorer*, whose simple plot lines were designed to enable 2-year-olds to follow them, was among them (Linebarger & Walker, 2005).

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Studies of book-reading with preschoolers have shown that children are more likely to gain early literacy skills if adults not only read the books but also ask questions about characters, images, and what might happen next in the story. Such back-and-forth interactions are key to fostering language development. Yet preliminary findings from studies of children's e-books are troubling. By observing how parents interact with their children when using e-books, researchers have discovered that instead of talking about the story, parents issue directives (e.g., "Click here. Don't click there. Touch this!"). Early tests of children's comprehension show them less likely to recall elements of the story than children whose parents read the same books in print form (Chiong, Ree, & Takeuchi, 2012; Parish-Morris, Hirsh-Pasek, Golinkoff, & Collins, 2011; Robb, 2010).

Language learning may be most hampered by a more nefarious kind of screen time: TVs that are on when children aren't watching or that show adult-oriented programs children aren't paying any attention to. This background television—dubbed in a USA TODAY article as "second-hand TV" (Toppo, 2011, p. A1)—is ubiquitous in many households, with 39% of parents with children up to 4 years old reporting that they left the TV on most or all of the time (Vandewater et al., 2005). A recent study showed that infants are exposed to much more of it than preschoolers (Barr, Lauricella,

Learn More

Books

Reading With Babies, Toddlers & Twos: A Guide to Laughing, Learning, & Growing Together Through Books
S. Straub & K. J. Dell'Antonia (2013)
Naperville, IL: Sourcebooks

Pioneering Literacy in the Digital Wild West: Empowering Parents and Educators
The Campaign for Grade-Level Reading, (2012)
http://gradelevelreading.net/resources/technology-for-successful-parenting

Screen Time: How Electronic Media—From Baby Videos to Educational Software—Affects Your Young Child
L. Guernsey (2012)
New York, NY: Basic Books

The Elephant in the Living Room: Make Television Work for Your Kids
D. A. Christakis & F. J. Zimmerman (2006)
Emmaus, PA: Rodale

Web Sites

ELE, Early Learning Environment, Fred Rogers Center for Children's Media and Early Learning
http://ele.fredrogerscenter.org/

Common Sense Media
www.commonsensemedia.org/

Joan Ganz Cooney Center at Sesame Workshop
www.joanganzcooneycenter.org/

Wonderopolis, from the National Center For Family Literacy
http://Wonderopolis.org

Zack, & Calvert, 2010). There's evidence that background TV may have a significant impact on the parent–child interactions that are so critical to language development. Researchers at the University of Massachusetts have made careful observations of how children and parents interact in a room with the TV on, and they have found a significant decrease in the quantity and quality of the conversation between parent and child compared to cases in which the TV is off (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009).

Other researchers have found ill effects of adult-directed TV programs—including the nightly news, sitcoms, police dramas, and other programs that likely qualify as background television for the very young—on early language development. One longitudinal study of 60 children found a link between heavy exposure to adult-directed TV at 1 year old and poor cognitive outcomes at 4 years old, including lower vocabulary scores, compared to children without such exposure (Barr et al., 2010). Similar bad news arrived with a study of 259 children starting even earlier—at 6 months old. In that study, Suzy Tomopoulos and her team (2010) found that by 14 months old, children exposed to adult-oriented programs tested lower on measures of cognitive development and received lower language scores than children with less exposure. Here the sheer amount of time watching TV did matter; the more total TV time, the worse the scores. The lowest performance showed in babies who were "watching" more than 6 hours of TV a day. But content mattered, too: Aside from quantity issues, no significant adverse effects were found for infants exposed to educational programming designed for young children.

With background television, researchers continue to search for the culprit of lower language development. Is it the way an always-on TV lessens parents' interactions with their children, the noise from the television, the content or pace of what is on screen, or all of the above? Alan Mendelsohn, a pediatrician who researches the effect of TV on very young children, has found that encouraging parents to communicate with their infants and toddlers about what they see on TV can lessen the negative effects (Mendelsohn et al., 2010).

All told, the best advice gleaned from electronic media studies so far is that which encourages parents to communicate with their young children in general—whether it is during watching or playing, after watching or playing, or not connected to media use at all. As parents come under pressure from marketers and hear claims about new interactive games and electronic toys for their children, and as TV and interactive games continue to become ubiquitous in young families' households, they may need reminders of the positive power they can have on their children's development by being careful about content and simply talking and interacting with their kids. And most of America could use a nudge on background TV as well: If the tots aren't watching, turn it off.

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References

AMERICAN ACADEMY OF PEDIATRICS, COUNCIL ON COMMUNICATIONS AND MEDIA. (2011). Media use by children under 2 years, *Pediatrics, 128,* 1040–1046.

ANDERSON, D. A., & PEMPEK, T. A. (2005). Television and very young vhildren. In E. Wartella, E. A. Vandewater & V. J. Rideout, (Eds.), *Electronic media use in the lives of infants, toddlers, and preschoolers,* a special issue of *American Behavioral Scientist, 48*(5), 505–522.

BARR, R., & HAYNE, H. (1999). Developmental changes in imitation from television during infancy. *Child Development, 70*(5), 1067–1081.

BARR, R., LAURICELLA, A., ZACK, E., & CALVERT, S. (2010). Infant and early childhood exposure to adult-directed and child-directed programming. *Merrill Palmer Quarterly, 56*(1), 21–48.

CHIONG, C., REE, J., & TAKEUCHI, L. (2012). *Print vs. e-books quick study.* New York, NY: The Joan Ganz Cooney Center. Available at www.joanganzcooneycenter.org/upload_kits/jgcc_ebooks_quickreport.pdf

DELOACHE, J. S., CHIONG, C., SHERMAN, K., ISLAM, N., VANDERBORGHT, M., TROSETH, G. L., STROUSE, G., & O'DOHERTY, K. (2010). Do babies learn from baby media? *Psychological Science, 21*(11), 1570–1574.

GUERNSEY, L. (2006, September 15). When toddlers turn on the TV and actually learn. *New York Times,* Science Times section. .

GUERNSEY, L. (2012). *Screen time: How electronic media—from baby videos to educational software—affects your young child.* New York: Basic Books.

KIRKORIAN, H. L, PEMPEK, T. A., MURPHY, L. A., SCHMIDT, M. E., & ANDERSON, D. R. (2009). The impact of background television on parent-child interaction. *Child Development, 80*(5), 1350–1359.

KRCMAR, M. (2011). Can past experience with television help U.S. infants learn from it? *Journal of Children and Media, 5*(3), 235–247.

KRCMAR, M., GRELA, B., & LIN, K. (2007). Can toddlers learn vocabulary from television? An experimental approach. *Media Psychology, 10,* 41–63.

LAURICELLA, A. R., PEMPEK, T. A., BARR, R., & CALVERT, S. (2010). Contingent computer interactions for young children's object retrieval success. *Journal of Applied Developmental Psychology, 31*(5) 362–369.

LINEBARGER, D., & WALKER, D. (2005). Infants' and Toddlers' Television Viewing and Language Outcomes, *American Behavioral Scientist, 48* (5), 624–645.

MENDELSOHN, A., BROCKMEYER, C., DREYER, B. P, FIERMAN, A. H., BERKULE-SILBERMANN, S., & TOMOPOULOUS, S. (2010). Do verbal interactions with infants during electronic media exposure mitigate adverse impacts on their language development as toddlers? *Infant and Child Development, 19,* 577–593.

NATIONAL RESEARCH COUNCIL & INSTITUTE OF MEDICINE. (2000). *From neurons to neighborhoods: The science of early childhood development.* J. P. Shonkoff & D. A. Phillips, (Eds), Board on Children, Youth, and Families; Commission on Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

PARISH-MORRIS, J., HIRSH-PASEK, K., GOLINKOFF, R.M., & COLLINS, M. F. (2011). *Once upon a time: Preschoolers and storybook reading in the electronic era.* Unpublished manuscript.

RICHERT, R. A., ROBB, M. B., FENDER, J. G., & WARTELLA, E. (2010). Word learning from baby videos. *Archives of Pediatric and Adolescent Medicine, 164*(5), E1–E6.

Robb, M. B. (2010). New ways of reading: The impact of an interactive book on young children's story comprehension and parent-child dialogic reading behaviors. (Doctoral dissertation for University of California at Riverside.) Abstract available: www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED520241&ERICExtSearch_SearchType_0=no&accno=ED520241

Robb, M. B., Richert, R., Wartella, E. A. (2009). Just a talking book? Word learning from watching baby videos. *British Journal of Developmental Psychology, 27*(pt 1), 27–45.

Roseberry, S., Hirsh-Pasek, K., Parish-Morris, J., & Golinkoff, R. (2009). Live action: Can children learn verbs from video? *Child Development, 80*(5), 1360–1375.

Tomopoulous, S., Dreyer, B. P., Berkule, S., Fierman, A. H, Brockmeyer, C., & Mendelsohn, A. (2010). Infant media exposure and toddler development. *Archives of Pediatric and Adolescent Medicine, 164*(12), 1105–1111.

Toppo, G. (2011, October 23) Experts warn of harm to kids from secondhand TV viewing. *USA TODAY*, p. A1.

Troseth, G. L., Saylor, M. M., & Archer, A. H. (2006). Young children's use of video as a source of socially relevant information. *Child Development, 77*(3), 786–799.

Vandewater, E. A., Barr, R. F., Park, S. E., & Lee, S. (2010). A U.S. study of transfer of learning video to books in toddlers: Matching words across context change. *Journal of Children and Media, 4*(4), 451–467.

Vandewater, E. A., Bickham, D. S., Lee, J., Cummings, H., Wartella, E., & Rideout, V. (2005). When the television is always on: Heavy television exposure and young children's development. *American Behavioral Scientist, 48*(5), 562–577.

Wright, J. C., Huston, A. C., Murphy, K. C., St. Peters, M., Pinon, M., Scantlin, R., & Kotler, J. (2001). The relations of early television viewing to school readiness and vocabulary of children from low-income families: The Early Window Project. *Child Development, 72*(5), 1347–1366.

Zimmerman, F. J., Christakis, D. A., & Meltzoff, A. N. (2007). Associations between media viewing and language development in children under age 2 years. *Journal of Pediatrics, 151*(4), 364–368.