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Babies, television and videos: How did we get here?

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ABSTRACT

Baby media have exploded in the past decade, and children younger than 2 are showing increased use of these baby media. This paper examines the historical evidence of babies' use of television since the 1950s as well as the various factors that have given rise to the current increase in screen media for babies. We also consider the ubiquitous role of television in American families, the impact of evidence regarding the educational benefits of educational television on preschoolers, and positive parental beliefs about the usefulness of such educational media in preparing young children for schooling. Finally, we examine the theoretical issues of importance for guiding research into the interactions between media exposure and cognitive development, including the role of media in changing the context of children's development and constraints on the kinds of things babies can learn from screen media. Lastly, we suggest that screen media may indeed be changing the nature of children's development.

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Introduction

Babies did not start watching television for the first time in 1997, but that is the year the first Baby Einstein video, called *Baby Einstein*, was released. This video and its successors gave rise to an explosion of screen media targeted at infants, including television shows like *Teletubbies* and *Classical Baby*, an array of video/DVD products (*Brainy Baby*, *Baby Mozart*), the cable channel Baby First TV, and computer software for laptops as well as portable devices like cell phones. As noted in some of the earliest research into young children's attention to and imitation of screen models, children younger than 2

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likely do not attend to (and by implication learn from) screen models when the material is inappropriate or of low interest (McCall, Parke, & Kavanaugh, 1977). The intent of the initial Baby Einstein video was to create “a line of instructional videos designed to expose [children] to the humanities in a fun, interactive way” (Walt Disney Company, 2006, Episode 2). The products “were created from a baby’s perspective” (Walt Disney Company, 2006, Episode 2) and were explicitly “not designed to make babies smarter” (Walt Disney Company, 2006, Episode 6). The Baby Einstein Company (2009) has recently clarified this intention, indicating the videos are designed to promote parent–child interaction by providing a “‘digital board book’ allowing a parent to have two free hands while enjoying and experiencing the video with their little one – leaving their hands free to clap, point to objects and interact with their baby” (Episode 3). Other programs are more explicit about their education claims. A newer product titled *Your Baby Can Read* (2009) is “designed for children between the ages of 3 months and 5 years” (Episode 1) and claims to be able to “change how and when our children learn to read” (Episode 2).

Across all of these infant media outlets, the program content is intended (either implicitly or explicitly) to provide children with educational or informational programming in an entertaining presentational style that elicits the children’s attention and demonstrates to the parents that their infants are learning. For instance, the Baby Einstein series of DVDs focuses on educational themes such as language, numbers, shapes, colors, seasons, art, classical music, and nature. Media intended for infants has been a growth industry for the past decade, in spite of the fact that the American Academy of Pediatrics (AAP) has advised parents not to have children younger than 2 use screen media since 2001. Concurrently, over the past several years, academic researchers have begun to study various aspects of infants’ media exposure, including whether infants learn from such screen media, how screen media changes parent–child interactions, and the potential effects of media exposure on cognitive development.

There is evidence from two major national studies conducted in the past 6 years by the Kaiser Family Foundation suggesting that screen media are enormously popular with young children. Children between the ages of 0 and 2 watch about an hour and 15 min a day of television and video/DVDs (Kaiser Family Foundation, 2003, 2006; Vandewater et al., 2007), and much of what children watch is produced specifically for them (Garrison & Christakis, 2005; Vandewater, Bickham, & Lee, 2006; Vandewater et al., 2007). There are various estimates of the proliferation of baby videos. According to the New York Times, in 2003, 32% of all new babies born in the United States owned a *Baby Einstein* video (Lewin, 2003). Fenstermacher et al. (2009) estimated that families with children under two own between 5 and 6 baby videos on average. What has given rise to the growth in screen media for infants and what kind of media are available to children today? How has babies’ use of screen media developed historically? In short, what is the context for the current research on babies and screen media over the past several years?

How viewing has changed

The rise of baby media

It is hard to identify the particular historical antecedents of the growth of baby media. Clearly, evidence of babies’ use of television is one potential factor. Is this a new factor? Did babies just start watching television in the past 10 years? This does not seem to be the case.

Television first became a part of American households in the late 1940s, but its presence in homes grew exponentially in the 1950s. In 1950, 7% of American households reported having a television set; by 1957, 83% had televisions and by the late 1960s, television sets were in virtually every household in America (Wartella & Robb, 2008). Video cassette recorders (VCRs) had an equally fast, if not faster, diffusion into American homes. Between 1980 and 1995, the number of households with VCRs went from 1.8 million to 86 million homes, representing 90% of American households by 1995 (Winston, 1998). The 1990s also saw the spread of cable television and computers. As noted in recent reports of children’s media use, at the end of the first decade of the 21st century, screen media, such as broadcast and cable television, DVDs and videos, and computers, are available in nearly all American households

with children (Kaiser Family Foundation, 2006). Furthermore, screen media for children are increasingly mobile (Roberts & Foehr, 2008), with even grade school children having access to cell phones, iPods, MP3 players, and other handheld multimedia devices. What do we know of how babies used screen media since the introduction of television more than 50 years ago?

During the early days of television, many theorists speculated about the “new hearth” around which the American family organized their life, watching television together. According to Spigel (1992), television in the 1950s was very much a part of American family life, in some ways the new American hearth around which family life revolved at home. Some viewed the television optimistically for its role in bringing all family members together to share common experience and as a means of keeping children off the streets and in their homes. Other theorists, however, were fearful that children might imitate television’s violence or that conflict around viewing might actually harm family relationships (Wartella & Robb, 2008). In a very early study of families’ television use, Maccoby (1951) found that although families did watch television together, there was increased togetherness only in that families were in the same room. She did not observe more social interaction among family members in the presence of television. Maccoby did note, however, that all family members, from the youngest to the parents, were in the presence of television. Importantly, this observation included the babies and toddlers in the families.

Since the 1950s, the standard measures of television audiences have been the Nielsen Company data on household viewing. However, the Nielsen Co. does not collect data on children younger than 2. Information on babies’ exposure to television can be found in academic studies of children’s media use. The earliest study of children and television in the United States was the classic Schramm, Lyle, and Parker (1961) monograph *Television in the Lives of Children*. This monograph incorporated several empirical studies of families’ and children’s television use collected in the late 1950s. Schramm et al. painted a picture of the American family and television circa the late 1950s:

Consider a typical child born in the age of television. In his home the view through the picture tube is as much a part of the home setting as the view through the picture Window. The sounds of television and the radio blend into his surroundings like the wallpaper. Even so, television is probably not the first of the mass media with which he makes close contact. His first mass medium is books. ... The first direct experience with television typically comes at age two. Chances are a child will eavesdrop on a program someone else has tuned in. But he soon begins to explore the world of television and to develop tastes and preferences of his own. By the age of 2 he is able to ask for his favorite programs. The chances are these are children’s programs, by which we mean that they are billed as children’s television, typically have animal heroes or animated cartoon figures and all have a high proportion of fantasy and broad action. By the age of three, then, the average child is already making fairly regular use of television (Schramm et al., 1961, pp. 24–25).

This description from 1961 makes it clear that television’s impact on family life included engaging the youngest family members, even when programmers may not have targeted programming to children under 2. In their survey of families in San Francisco, Schramm et al. (1961) reported that 14% of 2-year-olds, 37% of 3-year-olds and 65% of 4-year-olds were watching television. Elsewhere, Schramm et al. (1961) reported that 50% of children were regular viewers of television by 2.8 years of age. Ostensibly, babies were in the living rooms when families were watching television but any concern or even interest in babies and television was not mentioned in the earliest of studies of children and television.

The two earliest studies directly examining babies’ use of television were published in the 1970s. Anderson and Levin (1976) provided a formal description of how very young children, between the ages of from 12 months and 4 years, watched an episode of *Sesame Street*. This study is noteworthy for several reasons. First, it was the first published study of the development of attention to TV from age 1 to 4. Second, it related children’s attention to the presence of different content and production features of the television show. Third, a laboratory setting in which visual attention as measured by eyes on the screen was utilized.

Anderson and Levin (1976) noted a dramatic increase in children’s attention to television at 2.5 years of age and that a “break” in viewing occurred between 24 and 30 months. Anderson and

Levin found that children younger than 30 months did not “systematically monitor the TV screen but rather had their attention captured for short periods of time” (p. 810). Children under 30 months were more interested in playing with the various toys in the simulated living room viewing situations and in interacting with their mothers than in watching television. The older toddlers’ viewing was characterized by orientation toward the set, sustained looks, and monitoring of the set while playing with toys. The presence of adult women, children, puppets, peculiar voices, animation, movement, lively music, rhyming, repetition, alliteration, and auditory changes all increased young children’s attention to the program.

Also in the 1970s, [Hollenbeck and Slaby \(1979\)](#) studied infants’ visual and vocal responses in the presence of television among a sample of 72 6-month-olds. The experimenters and the babies’ mothers observed the babies watching experimentally-controlled educational television stimuli in four conditions: picture only, picture and sound, sound only, and a control stimulus. The standard television including both picture and sound elicited the most attention and vocalizations by the infants, who spent 49% of the observed time looking at the screen ([Hollenbeck & Slaby, 1979](#)). Hollenbeck and Slaby noted that television had become a standard part of babies’ daily lives; they estimated babies as young as 6–12 months spent between 1 and 2 h daily in the presence of television.

Since the [Kaiser Family Foundation \(2003\)](#) study of media use among children from birth to age 6, there has been well-documented evidence that children under 2 view screen media for significant portions of time. Parents reported that on a typical day, 59% of children under 2 watch television and 42% watch videos or DVDs. The children using screen media spent about 1 h and 15 min per day engaging with screen media.

According to another survey published, children under 1 year old spent on average just under an hour a day (49 min) with screen media (including television, DVDs, computers, or videogames) ([Kaiser Family Foundation, 2006](#)). Children younger than 3 only engage in two activities more frequently than they engage with screen media. The first activity is reading or being read to: parents report that 77% of children 1-year-old or younger and 81% of 2- and 3-year-olds read or are read to on a typical day. The second activity is listening to music: parents report that 88% of children 1-year-old or younger and 84% of 2- and 3-year-olds listen to music on a typical day. Parents report that nearly half of children under 1-year-old watch TV everyday (43%), and almost three-quarters of 2- and 3-year-olds are daily TV viewers (72%).

These young children also spend considerable time watching videos or DVDs ([Kaiser Family Foundation, 2006](#)). Twenty-four percent of children 1-year-old and younger and 41% of 2- and 3-year-old children watch a video or DVD every day. Much smaller percentages of these very young children are reported to use a computer on a typical day: 2% of children younger than 1 and 12% of children ages 2 or 3. In addition, only 1% of children younger than 1 and 8% of 2- and 3-year-old children play videogames on a typical day. When all screen media are combined (TV, videos, DVDs, computers, or videogames), the vast majority of very young children are attending to screen media on a typical day (61% of children 1 and younger and 88% of 2- and 3-year-old children) and for a considerable amount of time (49 min for children 1 and younger and 1 h 51 min for 2- and 3-year-old children).

As [Anderson and Pempek \(2005\)](#) noted, when compared to data from the 1980s and 1990s, the data from the Kaiser Family Foundation studies showed a dramatic increase in the number of very young children attending to TV on an average day. Anderson and Pempek compared the 2003 Kaiser Family Foundation data to data collected from the early to mid-1990s ([Certain & Kahn, 2002](#)) and found that while less than one fifth of babies younger than 1 were reported to watch television in the 1990s, by 2003 57% were reported to view television on an average day. For 1 year olds, about half were reported watching television in the mid-1990s as compared to 60% in 2003. In short, although some babies may have been in the viewing audience for television since the earliest days of television, the past decade has seen a rise in babies watching television, and for longer periods than in previous decades.

This increase in babies watching television has occurred against the backdrop of two other television use characteristics of American families: the development of constant television households and the movement of television sets into children’s bedrooms. Whereas television in the 1950s was characterized as the new American hearth around which family life revolved, a new image of the role of television in American households has developed in the past decade. Television is now in the background of daily life, a constant presence in many families. In constant television households, where

television is on throughout the day, during meal time, and even when people are not watching, babies are exposed to greater amounts of television programs not intended for them. Nearly one-third of children 6 and younger live in households where the TV set is on either all or most of the time regardless of whether anyone is watching (Kaiser Family Foundation, 2006). It is not surprising that children growing up in heavy television households tend to watch more television (an average of 25 minutes more per day—1 h 16 min vs. 51 min), spend less time on average reading (Kaiser Family Foundation, 2006), and are less likely to be able to read (Vandewater et al., 2005).

Another relatively new characteristic of the use of television is the increasing tendency for children—including babies—to have television sets in their bedrooms. Parents reported that nearly one in five (19%) of children 1 year and younger and 29% of 2- and 3-year-olds have working television sets in their bedrooms (Kaiser Family Foundation, 2006). Children with screen media in their bedrooms have been found to spend more time using those screen media, watching television, playing videos, and playing videogames more than children without bedroom screen media.

In a reanalysis of these data, Vandewater et al. (2007) found that screen media have become ubiquitous in the homes of very young children. Most children lived with at least two television sets in the home and nearly one-quarter of children lived with four or more televisions in the home. In addition, 4 out of 5 young children were in homes with either cable or satellite access. Approximately half of households had a video game console, and between one-fifth (for the 0- to 2-year-olds) and one-third (for the 5- to 6-year-olds) had access to a handheld video game. Even more households (78%) reported having a computer, and nearly 7 in 10 of all households (69%) had Internet access (Vandewater et al., 2007).

Since the 1950s, evidence has suggested that television is a unique media form in the way that it “colonizes” leisure time, occupying time normally spent with other media or leisure activities (Sahin & Robinson, 1981). In their review of children’s use of leisure time, Wartella and Mazzarella (1990) noted the early research evidence pointing to a reorganization of children’s time. Rather than simply displacing other leisure-time activities, such as outdoor sports, playing musical instruments, going to the movies, or listening to the radio, researchers documented an increase in the overall amount of time devoted to mass media use. This reorganization of time may very well be the case for babies as well. Screen media use by babies, while not a new phenomenon since the advent of television, seems to be occupying more of babies’ waking time.

Educational claims about baby media

One factor that might account for the rise in baby media is marketing claims about the educational benefits of media for preparing very young children for schooling. Research has documented a range of benefits to preschoolers who use educational media, in areas including literacy, mathematics, science, prosocial behaviors, and problem solving (see reviews in Comstock and Scharrer (2007), Fisch (2004), and Schmidt and Anderson (2007)). Marketers may be capitalizing on the effectiveness of preschool programming, by making similar claims about baby media. Fenstermacher and Barr (2009) noted that over the past 10 years, marketers have consistently marketed baby media to parents with strong educational claims. A survey of the screen media market for children under 2 found that educational claims were nearly ubiquitous on baby products, and that marketers may be capitalizing on parental anxieties about normal child development and a presumed deficit when it comes to teaching their children the skills they need to be ready for school (Garrison & Christakis, 2005). More recently, Fenstermacher and Barr (2009) described marketing claims on the boxes of DVDs and baby videos. For example, products (a) are described as “thoughtfully created to nurture cognitive, sensory and emotional development throughout your baby’s first years,” (b) claim to “[inspire] early language development, from simple gestures to first spoken words,” and (c) and suggest that they can “[teach] your child whole language and phonics using a combination of sight, sound and interaction”.

Fenstermacher and Barr (2009) conducted a content analysis for actual educational content in 56 baby videos. The researchers coded each interaction on the videos for educational content (i.e., general knowledge, language communication, socio-emotional development, physical and motor skills development, general cognitive development) and for the presence of active on-screen interactions

between caregivers and babies or among children. They found that most of the educational content focused on general knowledge and language development and they found only about one-third of the scenes contained any interaction between a parent or caregiver and a child, the sort of interaction they argued is best for the babies learning outcomes. They concluded that these videos presented a narrow range of educational content for babies in a manner less than ideal for developmental growth.

Regardless of actual content, baby videos have been marketed to parents with claims of educational content. This began to change in 2006, when the Federal Trade Commission required all baby videos to limit the educational claims present on their video boxes. In 2009, after threats of an investigation, the Walt Disney Company, maker of the Baby Einstein video series, offered to reimburse parents unhappy with the videos and their educational claims. The company offered to refund the current retail value per video/DVD (about \$16 each) for up to four videos in tacit acknowledgement that they could not dispute critics of the educational claims of these baby videos. How this might influence parental attitudes toward baby videos is not at all clear.

Parental attitudes about baby media

There have been very few studies of parental attitudes about infant media. The [Kaiser Family Foundation \(2003, 2006\)](#) has found that parents generally believed in the positive role infant media could play in their children's development. In the 2003 Kaiser Family Foundation report, parents of children 0–6 were asked their opinions about the potential of television in learning. Forty-two percent of parents believed that television mostly helped children's learning, compared to 27% who felt it mostly hurt learning and 21% who felt it did not affect learning either way. The same study found that 58% of parents believed that educational television was very important for children's intellectual development, with 49% feeling the same about educational videos and DVDs. It should be noted that this survey did not ask specifically about infant DVDs and included older children.

In a nationally representative survey of 1051 parents of children ages 6 months to 6 years old, 42% of parents believed that television was “a lot” or “somewhat” helpful in teaching young children to get along with others ([Kaiser Family Foundation, 2006](#)). Another 52% of parents felt that television was “a lot” or “somewhat” important in helping their children to be ready to learn in school. When asked specifically about baby videos, 48% of parents believed that baby videos had a positive effect on early childhood development. Of these parents, 41% based their impressions on their own experiences.

[Vandewater et al. \(2005\)](#) reanalyzed the [Kaiser Family Foundation's \(2003\)](#) data to examine parental attitudes toward screen media by parents in heavy television use households. For children under the age of 2, parents in constant television households were twice as likely as other parents to view educational television as a very important contributor to healthy development ([Vandewater et al., 2005](#)). These data suggest that some parents may feel that baby videos are an acceptable way to occupy their children, because they are presumed safe and potentially educational.

In a recent study of parental attitudes towards baby videos, [Robb, Wartella, and Richert \(submitted for publication\)](#) queried 76 parents of children 12 months to 2 years on their attitudes toward baby videos. Overall, parents had very high expectations of educational videos/DVDs. Nearly nine out of ten parents (89.2%) said that viewing these kinds of videos/DVDs was “very” (45.8%) or “somewhat important” (43.4%) for children's intellectual development. In follow-up questions, parents were asked how important it was for children to learn specific content from baby videos. Results revealed high expectations for learning across a variety of domains. More than 80% of parents believed that viewing was “very” or “somewhat important” for learning colors, shapes, reading skills, numbers, music, and science and nature. The only area in which parents were slightly less enthusiastic was with regard to learning a foreign language, however a solid majority (63%) of parents still believed that baby videos/DVDs could be useful for teaching a foreign language ([Robb et al., submitted for publication](#)).

These parental attitudes most likely are rooted in evidence that educational media can be beneficial to older, preschool-age children in preparing them for schooling. Research on *Sesame Street*, *Blues Clues*, and other educationally-oriented preschool programs has demonstrated educational benefits of such television shows (see summary in [Kirkorian, Wartella, and Anderson \(2008\)](#)). Indeed, the

widespread publication of *Sesame Street's* success in preparing children for grade school has become an accepted part of our understanding of how out-of-school educational programming can help children make the transition to schooling. Most recently, the 40th anniversary of *Sesame Street* reinforced its role in demonstrating the positive impact of specially designed educational television for preschool children (Stanley, 2009).

Although there had been educational shows before 1969, such as *Ding Dong School*, *Kukla Fran and Ollie*, and *Mister Rogers' Neighborhood*, it was the advent of *Sesame Street* in 1969 that changed the face of children's educational television. *Sesame Street* demonstrated that preschool children could learn their letters, numbers, and other planned educational content from television and contribute to success in school. The Early Window Project (Wright & Huston, 1995) and the Recontact Study (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001) assessed the long-term impact of educational TV. The original Early Window Project tracked the effects of educational television viewing for three years on two cohorts of children, initially ages 2–5 and 4–7, from relatively low-income homes. In addition to finding positive relationships between watching educational television and school achievement, the researchers also found that viewing planned educational TV shows at ages 2 and 3 predicted higher scores at age 5 on measures of language, math, and school readiness (Wright & Huston, 1995).

In a follow-up study in the 1990s when these children were teenagers (between 15 and 19 years old), researchers found long-term positive cognitive effects for those who viewed more educational TV programs early in life, especially for boys (Anderson et al., 2001). In addition, both boys and girls who viewed educational television programs early in development were more creative and held more positive attitudes toward learning. These findings suggested that viewing educational television programs during the preschool years helps put children on a trajectory for educational success that persists beyond the learning of letters and numbers in the preschool years. Research on prosocial content in television (e.g., teaching children to help, share and cooperate) also emerged during the 1970s as scholars realized that children could learn constructive behaviors from viewing television (see Friedrich & Stein, 1973; Mares, Palmer, & Sullivan, 2008).

Trade books on young children and media, such as Guernsey's (2007) *Into the Minds of Babes*, have provided popular evidence of these claims. When parents purchase baby video products, it is likely they do so with expectations about the products' capabilities. Even if the primary reason that parents use baby videos is to occupy a baby's time so that the parent has time to complete other tasks around the house, parents may feel that baby videos are an acceptable way to occupy their children because they are perceived to have similar educational benefits as effective educational preschool programming. Guernsey's (2007) interviews with parents led her to speculate that parents' personal experiences with educational media may also play a factor in parental attitudes:

The interviews taught me how much our generation's reliance upon and desire for media shapes what we want for our children. . .nearly all of them grew up watching *Sesame Street*; nearly all harbored the belief that TV shows can do good (Guernsey, 2007, p. 235).

Guernsey (2007) found that parents reported it easier to follow AAP recommendations that children over 2 be limited to 2 h of screen media a day than the recommendation of no screen time for children under 2. These data are similar to the data reported in Vandewater et al. (2007), who found that among 0- to 2-year-old children, parents reported that only 32% of the children had no television use and therefore fell within the AAP media guidelines, while 68% of children fell outside the guidelines. Moreover, 56% of 3- to 4-year-olds watched television for 2 h or less, as recommended by the AAP; and 70% of the 5- to 6-year-olds watched no more than the recommended 2 h per day. Further, while she found no consistency in television time rules across families, she did note that families control what content their children do watch. "Several parents said they made a point of avoiding programs with characters that acted aggressively and used adult language. They avoided the nightly news, soap operas, game shows, sitcoms or crime-scene dramas. They relied on children's shows only" (Guernsey, 2007, p. 240). Other parents, who objected to the commercials on broadcast and cable television, limited their young children's viewing to videos and DVDs so that ads could be avoided.

Lastly, Guernsey (2007) noted that the parents she interviewed were very conscious of the wide range of screen media and the growth of digital media available for children: they were careful about

where they located the television, conscientiously let other caregivers and babysitters know about their media rules, and tried to engage their children in a variety of media. This tacit acceptance of screen media is captured by Guernsey's (2007) description of her own family's use of media:

Today, as long as my girls are watching age-appropriate content, as long as I am within earshot to hear how they are responding to it, as long as they get plenty of time in the day to run around and escape into fantasy worlds of their own making, I figure they are going to be just fine. I know not to rely on media as a superior stimulator for their brains or a foreign-language instructor. But I do believe that the world my kids inherit is going to be increasingly rich in audiovisual information, so I see a value in exposing them to media tools that foster new kinds of expression (pp. 251–252).

Implications for early cognitive development: constraints and contexts

Given the influx of media targeted at children in the earliest developing years, researchers have considered the effects that media exposure has on cognitive development. As noted in any introductory-level textbook on cognitive development, infancy is a remarkable period for cognitive development evidenced in the disproportionate growth of the brain in these early years, relative to physical development in general. At birth, the brain weighs approximately 25% of its eventual adult weight. By the age of 2, a child's brain is approximately 50% of its adult weight; and the brain is approximately 90% of its adult weight by the age of 5 (Tanner, 1978). In contrast, a newborn's full body only weighs approximately 5% of her or his eventual adult weight and only about 20% of eventual adult weight at age 2. Thus, the brain is developing rapidly and disproportionately compared to the rest of the body in the early years.

Current research has focused on: (a) the potential influence of media exposure on synapse formation and pruning in early neuronal development (e.g., studies on ADHD and phonemic discrimination), (b) the factors involved in babies' attention to and understanding of the screen (e.g., attention to the screen, symbolic understanding), and (c) children's learning of on-screen content (e.g., word learning, imitation). Each of these lines of research is outlined by other contributors to this special issue. Here we outline the theoretical issues that we see as important for guiding research into the interactions between media exposure and cognitive development:

Media exposure changes the social and physical context of babies' cognitive development

Certainly quality parent–child interaction is important for cognitive development, and some researchers have emphasized the negative effects that background television can have on parent–child interaction. Two recent studies have suggested that parents alter both the quantity and quality of their interactions with their children when the television is on the background (Christakis et al., 2009; Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009). In addition, televised models provide new social partners in the context of development, but young children's relationship with televised social partners is not well understood (Richert, Robb, & Smith, submitted for publication). Given theoretical approaches suggesting cognitive development occurs through the internalization of external, social interactions (e.g., Vygotsky, 1978), researchers should be considering how fundamental changes in the social context resulting from children's interactions with television screens may fundamentally change the underlying cognitive architecture.

In addition to internalizing social interactions, other theorists have highlighted the embodied and action-based nature of cognitive development, again suggesting cognition is the internalization of externalized actions in the environment (e.g., Piaget, 1952). As Smith and Gasser (2005) have argued, although social partners and language certainly alter the nature of children's cognition, children do not passively receive their environment; children are active participants in their own development. Children learn through seemingly random physical exploration in which they are exposed to new problems and must derive inventive solutions (Smith & Gasser, 2005). If having background television on for the majority of the day changes the way in which children are engaging with cultural tools, this

may fundamentally change the structure of young children's cognition. For example, what does the structure of children's problem-solving look like if they learn about problem-solving from characters on television rather than by coming up with the solutions on their own or in the context of a guided interaction with a parent or sibling? Embodied learning also occurs through play (Smith & Gasser, 2005), and research should consider how background television influences both the content as well as the quality of toddlers' play. It is conceivable that when the television is on, children may be less physically exploratory or less likely to explore certain cultural tools.

There are constraints on the kinds of things babies can learn from television screens

Models of cognitive development often begin with the assumption that there are certain constraints on learning that influence what can be learned and when (Johnson & Munakata, 2005; Keil, 1981), and researchers should examine how constraints on infants' cognitive development constrain their learning from screen media. Some researchers have suggested infants' early learning about objects is constrained by assumptions about continuity and solidity (Spelke, Breinlinger, Macomber, & Jacobson, 1992) and that early word learning is constrained by assumptions that words refer to whole objects rather than parts of objects (Markman, 1990). Although agreement on the nature of the constraints on cognitive development remains elusive, arguments for certain constraints on cognitive development note that learning is not "infinitely flexible or general during development" (Johnson & Munakata, 2005, p. 153). As many baby videos aim to teach infants about words and objects, the expectations of researchers about the kinds of learning babies can demonstrate from screen media should be informed by the kinds of constraints already demonstrated by research into infants' learning in those domains.

Babies' learning from television screens is likely also constrained by their understanding of symbolic representation. Research with very young children has focused on children's symbolic understanding of the television screen and typically involves object retrieval tasks in which children try to find a hidden toy after watching it being hidden live or on a television screen (e.g., Schmitt & Anderson, 2002; Troseth & DeLoache, 1998). Interestingly, children's performance in video conditions increases if the televised model first engages in a contingent interaction with the child (Troseth, 2003; Troseth, Saylor, & Archer, 2006). We have suggested that the kinds of studies that demonstrate young children treating the television screen symbolically may have actually interfered with children's understanding of the symbolic nature of the television screen (Richert et al., submitted for publication).

Another constraint that young children bring to their learning from television screens is skepticism (Gelman, 2009). Some evidence has suggested that young children begin to discriminate between true and false statements as early as 16 months and will learn words from speakers who provide relevant intentional cues (Koenig & Harris, 2005), for example when a person labeling a novel object is looking at that object rather than attending elsewhere. It may be that encouraging young children to "learn" from screen models before they have the cognitive abilities to discriminate different kinds of sources of information may disrupt this developing ability, and may have long-term consequences for how children view the information presented to them from different kinds of media sources.

Exposure to screen media may fundamentally change the nature of babies' brain development

As the brain develops through dramatic synapse formation and pruning during the early years, many researchers have been concerned about the influence of experience on the physical development of the brain (e.g., Greenough, Black, & Wallace, 1987). One way in which the influence of media exposure on brain development has been examined has been to study infants' auditory perception. Newborn infants maintain the ability to discriminate phonemes in all languages until 8 or 9 months of age (Eilers, Gavin, & Wilson, 1979; Werker, Gilbert, Humphrey, & Tees, 1981). Exposure to non-native phonemes through a book-reading interaction, but not a DVD, increases the length of time for which infants can continue to distinguish particular non-native phonemes (Kuhl, Tsao, & Liu, 2003). These findings may suggest that the mechanisms by which sounds on a DVD affect brain development

are different than the mechanisms by which sounds from a conversational partner affect brain development.

Most debates on the impact of media exposure on brain development have focused on developing attention or attention problems. [Courage and Steliff \(2009\)](#) provide a thorough outline of this debate as it relates to issues of attention and learning in the first years of life. As noted in their review, some research has suggested increased television viewing in infancy leads to cognitive difficulties (e.g., [Carew, 1980](#); [Christakis et al., 2004](#); [Gottfried, 1984](#)). However, recent evidence has suggested that once potentially confounded variables are accounted for (e.g., income, race/ethnicity, sleep patterns, breastfeeding duration), the amount of television viewing in infancy is not related to vocabulary or cognitive abilities at age 3 ([Schmidt, Rich, Rifas-Shiman, Oken, & Taveras, 2009](#)).

In addition, many researchers do not discuss the nuanced nature of the relationship between television viewing and cognitive difficulties like ADHD symptoms ([Courage & Steliff, 2009](#)). For example, parents of children already demonstrating hyperactivity may be more likely to encourage children to watch television in order to calm down. In this case, increased television exposure does not cause increases in attentional problems, rather children's natural hyperactivity leads to increased viewing. In addition, the patterns in the relationships change over the course of development.

Moreover, there is evidence of positive learning outcomes from viewing television. For children over 3, for instance, a systematic review of research has suggested that children can learn educational content from television, that certain shows can positively influence aspects of cognitive development such as imaginative play and racial attitudes, and that it is important to consider the content as well as the duration of children's exposure ([Thakkar, Garrison, & Christakis, 2006](#)). Thus, although the physical brain is shaped by the environment, regardless of whether the television is on or not, it remains unclear the mechanisms through which exposure to television in the early years may have long-term effects on the developing architecture of the brain.

Conclusions

The rise of baby media over the past decade has been the result of multiple factors, not the least of which is more positive parental views of the educational potential of educational media for preschool children. Academic research on the impact of such media is just starting to accumulate, and the popularization of such research is relatively meager. However, the trends suggest that baby media will be a part of American children's lives for the time to come. As we consider the influence of this media exposure on developing children, it is important to note that many models of cognitive development conceptualize the relationship between physical maturation (e.g., brain development) and the environment (e.g., media) as involving a series of bidirectional interactions. Thus, the question "How does media exposure influence cognitive development?" may be the wrong starting point for a debate of the role that media exposure plays in cognitive development. A better question might be "What are the mechanisms through which media interact with physical maturation, cognitive constraints, and environment (both physical and social) to influence cognitive development?"

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