

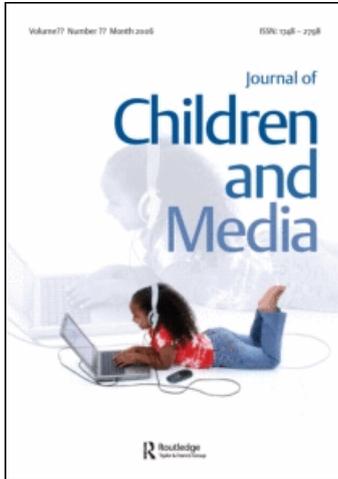
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# ASSESSING THE RESEARCH ON MEDIA, COGNITIVE DEVELOPMENT, AND INFANTS

## Can infants really learn from television and videos?

**Marina Krcmar**

*With the rise of television targeting very young children, it is important to ask if babies younger than two can learn from it. In this essay I review the literature on babies' attention to, imitation of, and language learning from television and I discuss the research that has found a video deficit in young children. The literature suggests that infants between the ages of approximately twelve and twenty-four months have a difficult time imitating and learning from television. This deficit may occur because television is perceived by babies as socially irrelevant; it may also occur because television is not as rich in detail as live images. Lastly, it may occur because of the complexity of dual representation. The extant literature also suggests that basic conceptual knowledge is needed in infants before more advanced learning, such as language acquisition, can be achieved. The essay explores whether television is capable of teaching these very basic cognitive skills.*

**KEYWORDS** children; imitation; infants; language learning; television; toddlers; video; video deficit

More than a generation of children has grown up watching *Sesame Street* and other educational programs and ample evidence exists that preschoolers aged two to five can learn skills including number recognition and new vocabulary words from these programs (Rice, Huston, Truglio, & Wright, 1990). However, with the introduction of *Teletubbies* in 1991, modern programs and videos now target children who have not even spoken their first words or taken their first steps (PBSKids.org, 2003). In terms of the educational value of these programs, top-selling infant videos and DVDs make educational claims despite the paucity of evidence to support these contentions (Garrison & Christakis, 2005). Therefore, there remains much that media researchers do not know about the potential effects of media on infant development, and additional research on this topic is sorely needed.

The present essay seeks to accomplish three major goals. First, I review the literature that exists on infants, babies, toddlers, and media. Although Anderson and Pempek (2005) reviewed the literature on television and very young children, my goal here is to extend their work. Therefore, and second, I discuss related research that has not taken infants, babies, toddlers, and *media* as its primary focus but, because of its focus on the development of early cognition, I draw potential links between this literature and media research. Third, I discuss the areas of research that I think should be pursued pertaining to infants, babies, toddlers, and media.

## Infants, Toddlers, and the Screen

Despite recommendations from the American Academy of Pediatrics (AAP, 1999) that children younger than 24 months should have no screen time whatsoever, the recent market for media targeting this age group has grown substantially. From videos such as *Baby Einstein* to the ever-popular *Teletubbies* program whose audience includes children twelve-month-olds and younger, babies consume media. In fact, a comprehensive study by Rideout and Hamel (2006) examined media use by children aged six months through six years and found that 70 per cent of those younger than one and 91 per cent of those aged two to three watch television at least several times per week. Among these age groups, 44 per cent and 83 per cent, respectively, watch DVDs and 4 per cent and 18 per cent spend time on a computer. However, as Anderson and Pempek (2005) point out, these data do not paint an entirely accurate picture. They found that on a typical day, 48 per cent of those younger than one, 40 per cent of one-year-olds, and 29 per cent of two-year-olds watch no television. Therefore, it appears that although some very young children are watching television and DVDs, nearly two hours per day in one study (Rideout & Hamel, 2006), others are watching none. Despite the current range of television exposure among very young children, an analysis of their exposure over the last three decades does suggest that children under two are now spending more time in front of a screen than ever (Anderson & Pempek, 2005).

Although parents often cite an understandable need for their own free time as the reason their young children consume television, it is unclear what very young children (birth to two years) understand when they watch it. Furthermore, the literature on children and media has not explored to any great extent what effect screen media has on very young children. What we do know is that very young children are watching. Anecdotal evidence supports this contention, the growth in the market for these products suggests it, and the research evidence (e.g. Rideout & Hamel, 2006) backs it up.

It is perhaps unsurprising that parents, eager to help their children grow and thrive, believe that media can help their children. After all, the claims made in the marketing of these products often cite the educational benefits of their consumption, despite the fact that neither academic nor corporate research has supported these claims (Garrison & Christakis, 2005). In fact, the research conducted by corporations traditionally is geared toward product development and discovering what infants, babies, and toddlers will watch, rather than what will provide any positive learning outcomes. Therefore, the responsibility of the academic community to ask these questions becomes that much greater.

## Attention to Television

When children younger than two years of age watch television, what do we know about their attention to it? Schmitt (2001) has found that at six months of age, children direct their eyes toward the screen only 11 per cent of the time, although this is true when looks are averaged across content types. In their study of very young children and attention to television, Valkenburg and Vroone (2004) found that six-month-olds attended to *Teletubbies* more than they did to *The Lion King* or to news, presumably because the program is designed for them. By the time a child approaches her third birthday, she directs her eyes toward the screen 39 per cent of the time across all programming; however, once

again, the amount of eyes-on-screen is higher for programming designed for children than it is for adult programming (Valkenberg & Vroone, 2004). In fact, when Barr et al. (2003) showed children aged 12 to 15 months actual videos designed for and marketed to this age group, children directed their eyes to the screen 48 per cent to 74 per cent of the time, depending on the video. Therefore, very young children will watch televised material. However, in a study designed specifically to test nine- and ten month-olds' preference for video versus real stimuli, researchers found that given a choice of near identical stimuli presented simultaneously, babies spent 82 per cent of the time looking at the real event and ignoring the one presented in vivo. Overall, then, babies will attend to television but, given a choice, they seem to prefer real events.

But what about television depictions attracts the attention of babies? Although three-year-olds seem to enjoy cuts, zooms, and colors (Anderson & Smith, 1984), there is some evidence to suggest that less visually stimulating content may also hold interest for younger children. In their study of fifteen- to twenty-four-month-olds, Krcmar, Grela, and Lin (2007) found that children between the ages of eight and twenty-four months attended to a five minute clip of the *Teletubbies* 86 per cent of the time but attended a clip of an adult speaker labeling and showing interesting objects 83 per cent of the time, despite the fact that the latter clip contained no cuts, zooms, music, or colorful animation. What then attracts the attention of very young children to the screen? Valkenberg and Vroone (2004) suggest that before the age of eighteen months, the formal features of television may well attract and sustain children's attention; thereafter, it appears that comprehensibility begins to play an important role (Anderson, Lorch, Field, & Sanders, 1981). In fact, it is interesting to note that as young children approach their second birthday, they begin to acquire words very rapidly in what has been referred to as the language spurt (Goldfield & Reznick, 1996). Perhaps for this reason, television containing comprehensible language, even an adult on video speaking simply, may be as interesting as the *Teletubbies*.

### Imitation of Television

There is obviously some relationship between comprehension and understanding of television and imitation of it; however, as the research discussed above suggests, comprehension is neither a necessary nor a sufficient condition for imitation. However, because studies on imitation from television do not rely on youngsters' language comprehension or production, imitation studies do offer an ideal method for studying infant learning from television. In general, early studies that focus on babies' imitation from television suggested that babies younger than eighteen to twenty months seemed unable or unwilling to imitate an action or follow a set of instructions that had been presented on video even when that action presented live, were imitated quite readily (McCall, Parke, & Cavanaugh, 1977); however, the age at which imitation from video occurs varies with the complexity of the task. This frequently replicated finding has come to be known as the *video deficit*.

Specifically, McCall et al. (1977) had eighteen-, twenty-four-, and thirty-six-month-old infants watch a modeled action on a television monitor. The control group watched the action live. Among both the eighteen- and twenty-four-month-old infants, imitation of the video modeled action, even immediately after exposure, was significantly inferior to those who saw the action live. Only among the thirty-six-month-old children did performance in the video condition reach that of the live condition. However, there were aspects of this

early study that may have made the task unduly difficult. For example, the modeled action contained several steps. In addition, during the test phase, the objects available to the children included some not initially present during exposure. These distractor items may have proved too tempting to the young viewers.

More recent research has attempted to both simplify the tasks being modeled and created test situations that are as unambiguous as possible in order to eliminate any confounds from the data collection process. In other words, in order to validly test whether babies can imitate actions from television, the situation must be set up in a way that allows babies to clearly demonstrate whether or not they can. For example, Barr and Hayne (1999) demonstrated a simple, one-step action (ringing a bell hidden inside a puppet) to a sample of twelve-, fifteen-, and eighteen-month-old infants, either live or on video. Both immediately, and after a twenty-four hour delay, infants in all three age groups were less likely to imitate the action if they had seen it on video than if they had seen it live, exhibiting a clear indication of the video deficit.

In fact, the video deficit may persist beyond eighteen months, especially if the task is more complex. For example, rather than using a simple one-step task, Hayne, Herbert, and Simcock (2003) tested somewhat older infants (twenty-four and thirty months old) on their ability to imitate a three-step action. Although infants in both age groups imitated the action more when they saw it on video than when they had not seen it at all, their performance was better in the live condition than in the video condition. Thus, the complexity of the information presented on video is one important factor in understanding the video deficit.

In addition, the age of the child plays a clear role. Until somewhat recently, it appeared that this deficit occurred in a linear trajectory, with the video deficit occurring early on, and older children showing no such deficit. However, recent research paints a picture that is somewhat more complex. Barr, Muentener, and Garcia (2007) demonstrated that among six-month-old infants, imitation of an action occurred equally well whether that action was presented live or on video. Only among fifteen-month-olds did presentation via video seem to hamper imitation. Thus, evidence from very young infants (i.e. six-month-olds) suggests that the video deficit may not exist initially, at least when it comes to imitating simple tasks, but rather emerges at approximately fifteen months of age.

However, imitation is a fairly simple process compared to the complex object-retrieval task. In an interesting series of studies, children were shown an adult hiding a toy. The event was shown either live or via video and infants were then asked to retrieve it. Using this paradigm, Troseth and DeLoache (1998) found that thirty-month-olds, but not twenty-four-month-olds, could find the toy when they saw it hidden via video. In a similar study, Schmitt and Anderson (2002) demonstrated a toy being hidden to a group of twenty-four-, thirty-, and thirty-six-month-old toddlers. Although children obviously improved their performance with age, children outperformed their same-age counterparts at each age when the demonstration was shown live as compared to on video.

What do these most recent data suggest? Overall, imitation of simple actions can occur from video for infants as young as six months. However, by approximately fifteen months of age, simple imitation from video occurs less readily, suggesting that the video deficit emerges. Even repeat viewing of the action via video does not help fifteen-month-olds learn from video. Instead, the video deficit for imitation seems to persist into the second year. However, the more complex the information, the longer the video deficit seems to persist. In the toy retrieval task, children are not successful until approximately

thirty months of age. Perhaps this is because more complex instructions require children to demonstrate true understanding of modeled events on video, rather than simple mimicry. In order to both understand and imitate a symbolic event on television (e.g. watching a toy being hidden) and apply it to a real situation (e.g. finding the toy), infants must gain symbolic understanding. That is, they must comprehend what they see.

## Comprehension

Despite the attention that very young children may give to the screen, and the fact that imitation occurs, it is unclear what they understand about what they see. Infant comprehension is admittedly, a difficult thing to assess. For example, the studies cited above have looked at babies' ability to imitate various actions that they witness on video; however, as we will discuss shortly, mere imitation may indicate little or no comprehension on the part of the child. Therefore, some literature on toddlers' responses to video may offer insight; however, available developmental literature may provide a more detailed look at babies' comprehension of television.

Researchers attempting to understand children's ability to comprehend and learn from various stimuli often distinguish between mimicry and true imitative learning. The former refers to the ability to imitate the typography of an action without any understanding of intent; the latter refers to the reproduction of intentional acts including the end result of the act and an understanding of goals and strategies. Obviously the latter encompasses a series of more developmentally advanced actions. The latter also captures the essence of true comprehension. Sheer mimicry can occur quite early with some scholars placing mimicry at six months of age (Barr, Dowden, & Hayne, 1996) and others suggesting that mimicry can occur even at birth. However, mimicry may not indicate true learning because without the stimulus present and without an understanding of the *goal* of the action, the infant is unlikely to reproduce the action again, in another context. However, by about thirteen or fourteen months of age, there is evidence of imitative learning. In one study, Carpenter, Nagell, and Tomasello (1998) showed infants, nine to fifteen months in age, a simple action that made a light turn on. By about fourteen months, the children not only imitated the action, but looked toward the light, indicating that they understood both the action and the goal of the action. In an even more straightforward test of imitative learning, Meltzoff (1995) showed very young children an adult who tried, but failed, to perform various actions. By eighteen months old, babies could successfully perform the action at a rate similar to those who had the action properly modeled for them. These studies indicate that by approximately fourteen months, babies can engage in the more developmentally sophisticated act of imitative learning, and not just mimicry. Therefore, as researchers continue to explore infants' learning from television, it may be worth considering when and how infants learn *in vivo*. Prior to fourteen months, if we can encourage a toddler to imitate an action performed via video, but evidence suggests that the action is not truly comprehended, is comprehension, and indeed learning via video prior to this time even possible? Perhaps, more basic issues, such as conceptual development, a topic we will address shortly, should be achieved before infants embark on attempts at more advanced learning, whether via video or *in vivo*.

## Language Learning

One line of research that has been investigated looks at language learning. However, it is important to distinguish here between initial language learning, which occurs during the first twenty-four months of life for most normally developing toddlers (Bloom & Marksom, 1998), and vocabulary growth. Although the latter appears to occur quite readily from exposure to television, the effect of television on initial language acquisition is not as clear. The process seems to differ for preschoolers (age three to five) as compared to their toddler counterparts. For example, in an oft-cited, longitudinal study of *Sesame Street* and vocabulary growth, Rice et al. (1990) showed that children who watched more *Sesame Street* from age three to five actually had higher vocabulary scores than those who watched less of the educational programming. Although these findings do not seem to replicate across all program genres, evidence does suggest that, for older children (three plus), watching educational programs can teach new words (e.g. Rice, 1990; Rice, Oetting, Marquis, Bode, & Pae, 1994). However, can younger children learn *initial* words from television?

To answer this question, we can look to two sources of data. One has utilized actual television programs to test initial language acquisition in toddlers. The second has used stimulus materials that are shown on a television screen in order to assess specific details regarding language acquisition and very young children. Both types of studies have focused on children who are younger than twenty-four months, in order to look at initial language learning and not vocabulary growth.

Relatively few studies have examined the effect of actual television programs on language acquisition in babies and toddlers. This is due in part to the fact that, until recently, few programs have targeted preverbal children. However, programs such as *Baby Einstein* and *Teletubbies* target this very age group. For example, *Teletubbies* was used as stimulus material in a recent experimental study by Krcmar et al. (2007). This study tested if children aged sixteen to twenty-four months, that is, those in the earliest stages of language acquisition, could learn a novel word from *Teletubbies*. The results indicated that until approximately twenty-two months of age, children were not able to learn initial words from *Teletubbies*, despite their ability to learn the same word quite readily from an adult in vivo. This finding is consistent with research that finds a video deficit. However, because this study did not look at children younger than sixteen months, it is unclear if the video deficit, as it relates to *language acquisition* from videos, emerges some time after the first birthday, as it seems to for imitation, or if it exists from the earliest months of life *until* approximately twenty-two months.

In another study of language learning and television, Linebarger and Walker (2005) tested very young children; however, due to the longitudinal nature of the study, it is difficult here to differentiate between initial language learning and vocabulary growth. It is likely, instead, that Linebarger and Walker assessed both, with language acquisition occurring in the early phases and vocabulary growth occurring in the later phases of the study. In this longitudinal research, children who were six months of age at the beginning of the study were tested every three months for two years. The authors found that even after controlling for demographic factors such as the age and educational level of the parent, exposure to *Dora the Explorer*, *Blue's Clues*, *Arthur*, *Dragon Tales*, or *Clifford* was related to greater vocabulary and higher expressive language scores; whereas watching *Teletubbies* was related to lower vocabulary scores and a smaller expressive vocabulary.

The authors suggest that the narrative structure, combined with the modeling of correct language use on these programs, may have contributed to learning outcomes.

Thus, from the research on the effects of actual children's programs on toddler language acquisition and vocabulary growth, it appears that vocabulary growth occurs more readily than language acquisition and learning occurs more easily with somewhat older (i.e. < twenty-two months) infants. However, more naturalistic studies have found that infants as young as twelve months repeat words that they hear on television. For example, Lemish and Rice (1986) used in-home observations to discover that at least half of the twelve- to twenty-four-month-old toddlers labeled objects and actions that they saw on television. Those approaching their second birthday even asked questions about words they had heard. Therefore, additional research is needed to test both initial language learning and vocabulary growth from television. On one hand, perhaps the nature of laboratory studies makes it difficult to assess real, contextually meaningful language acquisition. On the other hand, because naturalistic studies examine words that are also likely to occur in the everyday lives of toddlers, it is difficult to ascertain if these studies are measuring language acquisition, vocabulary growth, or merely existing vocabulary. In any case, more work is needed to identify the particular features of actual toddler programming, such as program pacing and narrative structure, that may encourage initial language learning.

Besides these studies that have examined the effect of television programs, other research has looked at the impact of constructed video stimulus on children's initial language learning and vocabulary growth. Although these laboratory-based studies do utilize a television screen and thus share something in common with the research just discussed, the format of the video presentation is not designed for commercial broadcast. Rather, it is designed to examine precise variables that may encourage learning. As a result, the videos are both related, and unrelated to our understanding of television. For example, Naigles (1998) demonstrated that toddlers could learn novel verbs by attending to the sentence frame the verb was presented in. The novel verbs, accompanied by a video of the new action being enacted by a duck, were later accurately able to identify the action. Other research, also using video stimulus, has shown that toddlers can learn not only verbs, but novel nouns from videotaped material (Naigles & Mayeux, 2001). It is important to note, however, that a majority of the children participating in these studies were at least twenty-four months, making it likely that the research tests vocabulary growth and not initial language learning and making it less likely that the research could tap the video deficit.

### Explaining the Video Deficit

What can account for the video deficit? First, the *perceptual impoverishment theory* suggests that the video deficit occurs due to the relative lack of richness in detail of two-dimensional (2-D) images compared to real, in vivo three-dimensional (3-D) images. Specifically, Johnson and Aslin (1996) proposed that fewer details are encoded from 2-D images than from 3-D images. Younger infants may require more details in order to create a cognitive representation, making it more difficult, and thus less likely, that encoding, and subsequently retrieval, will occur from information provided from impoverished sources. In fact, Carver, Meltzoff, and Dawson (2006) have demonstrated that eighteen-month-old infants process 2-D images more slowly than 3-D images, and consequently recognized 3-D

images more quickly. Thus, one possible explanation for the video deficit is that infants process 2-D images less efficiently than those in 3-D.

A second explanation for the video deficit has been proposed by Troseth and colleagues (Troseth, 2003b; Troseth, Pierroutsakos, & DeLoache, 2004). The *dual representation theory* suggests that symbolic representation is a cognitively complex idea that is difficult for infants. Early on infants are likely to confuse symbols and referents, showing no understanding that a symbol is both a thing and a representation of something else. Faced with a symbolic representation (e.g. a video image) they are likely to understand it only as an object in and of itself, only later gaining representational insight, or, understanding the image as a representation of an object. For this reason, infants do not imitate or follow instructions from television because they do not understand that the actions and instructions stand for things *in vivo*. In order to be successful at, for example, toy retrieval, toddlers must interpret what they see on the two-dimensional screen, create a representation of it, then match that representation to the real room. In order to test this theory, Troseth (2003a) trained children about the symbol-referent relationship by showing them the videotaped and live event simultaneously. Then, children engaged in the standard procedure, watching the toy being hidden via video and searching for it in the real room. Even after four training trials, where the match between the videotaped and live event were demonstrated, twenty-four-month-old infants were unable to find the toy when they saw it hidden on a video screen, suggesting that the video deficit is not readily overcome by training, at least not for something as complex as the hidden toy task.

For simpler processes, however, infants may learn to associate symbols and their referents through mere repetition. For example, Barr, Muentener, Garcia, Chavez, and Fujimoto (2007) found that infants of twelve to twenty-one months *could* engage in deferred imitation of a videotaped action when the videotape was twice as long as the live demonstration *and* when it had been viewed twice. On the other hand, simply doubling the number of times that an infant saw an action on video did not ameliorate the video deficit for fifteen-month-olds (Barr, Muentener, & Garcia, 2007). Thus, perhaps infants can learn about symbol-referent relationships through repeat viewing but it takes both more time and increased repetitions to do so.

Why is this the case? A third possibility, the discounting hypothesis, suggests that toddlers may be discounting what they see on television as irrelevant because socially relevant information, in their experience, has always come *in vivo*, from another human being. Several studies have been conducted to test the discounting hypothesis in order to see if toddlers can, in effect, be taught to watch television. For example, Troseth, Saylor, and Archer (2006) suggested that perhaps toddlers could perform the search task successfully if they understood that information from a video could be socially relevant and thus, not discounted. In a series of studies, toddlers engaged in interactions with the experimenter, watched her being videotaped, and then watched her on the video. However, this socially interactive video condition did not seem to help toddlers successfully perform the search task when they subsequently watched a toy being hidden by the experimenter on video. In a second study, however, the experimenter first obtained socially relevant information about the child, such as the names of family pets and siblings, and incorporated this information into the video. In this case, toddlers did seem to perform somewhat better on the search task.

Further evidence that babies discount television as a relevant source of information comes from Schmitt, Crawley, and Anderson (2007). These researchers compared toddlers' object retrieval performance in two conditions. In both, they simply *told* the infants where

to find the appealing object either live or via television. Once again, children did not perform as well in the video condition as they did when they were told live where the object was hidden. However, in a related study, when two-year-olds watched a video of an adult hiding a toy but were *told* that they were watching the adult live, through a window, they actually performed better than when they saw the same video but were not told anything about the video (Troseth & DeLoache, 1998). Therefore, it appears that it is not the quality of the video or the image that negatively impacts babies' ability to learn from it. Rather, children seem to place such importance on real experiences that video images are rendered less meaningful to them.

Despite evidence supporting the discounting hypothesis, it seems likely that both it and difficulties with dual representation may account for the video deficit. Specifically, Troseth (2003b) attempted to teach babies that television could represent reality and that it could be socially relevant by using a more naturalistic method over time. In this study, families were randomly assigned either to teach toddlers about the television-reality relationship, or no training was given. In the training condition, 24-month-olds and their parents were videotaped in their own homes doing a variety of activities. Parents were instructed to show this video to the toddlers at least five times over a two week period. Parents were further instructed to do everything they could to indicate to their children that television represented the live events, including explaining this to the child and pointing out similarities between the video and reality. Subsequently, toddlers in both the test group and the control group were brought into the lab and tested using the standard toy hiding procedure. With this more extensive training, those in the test group were more successful than those in the control group on the search task. Interestingly, those in the training condition also did better on a picture transfer task, where they had to identify a real object from a picture, than those in the nontrained condition. Therefore, at two years of age, babies are able to gain what Troseth refers to as representational insight, but learning this occurs over time, with intervention and with efforts from adults to emphasize the potential social relevancy of video.

Thus far, no single hypothesis has adequately accounted for the video deficit. Therefore, I will propose an additional constraint, that of concept formation, in order to gain a clearer picture of babies' understanding of video. Before infants can learn to imitate actions, follow instructions and learn words to represent objects, whether that process occurs *in vivo* or *via video*, a set of fairly complex cognitive skills must be in place. One of the main achievements that infants need is that of conceptual development (Mandler, 2005), a process that requires several cognitive developmental milestones and occurs over many months. Specifically, she suggests that much of what is developed on the road to concept formation and ultimately, attaching language to those concepts, occurs through interaction with the world. As she argues: "no amount of looking alone will result in [mental] imagery. One must analyze what one is looking at" (p. 24). In other words, what one sees must be acted upon, interacted with and understood in the context in which an object or action is normally seen. In order to create a mental construct of an object or action, she argues, the infant must see how it is used, where it is used, who acts upon it and how. Without context, conceptual development is unlikely. And without concepts, language learning and, indeed, an understanding of the actual conscious world is impossible. All of this suggests that physical interaction with the world is an important aspect of learning, a point that has been made by other scholars who argue about the importance of physical exploration to infant learning (Thelen, 2000). Therefore, conceptual

development is vastly aided by an initial mapping of the infant's environment, and only after that occurs can initial word learning and intentional action occur. Vocabulary growth and more complex actions, on the other hand, capitalize on the success of early conceptual development and require much less of the infant.

In addition to Mandler's (2005) contention that conceptual development is both necessary for language development and the hallmark of conscious thought in children, other research also suggests, however obliquely, that initial language learning may not occur very readily via television or, at least, it may occur more readily with human interaction to supplement it. For example, Lemish and colleagues (Lemish, 1987; Lemish & Rice, 1986) used ethnographic methods to examine the viewing and coviewing of one- and two-year-olds. From this research, it is clear that very young children do comment on television, point things out to their parents and label objects appropriately. In addition, older children ask specific questions about the content of television that both are attending to, indicating the importance of intersubjectivity between parent and child in the viewing process. Furthermore, Tomasello (1992) has argued that children's cognitive abilities emerge predominantly from their ability to participate intersubjectively with adults in a variety of situations. That is, children must be able to respond to their environment and be responded to in it. It is not merely the act of hearing language or seeing actions that teaches babies how to communicate or how to perform action sequences, it is the intersubjective interaction, based on a shared and acknowledged context that allows them to hear a speech stream or see an action sequence, evaluate the situation and the environment, and associate individual words and actions from the stream with things from that environment. Furthermore, in terms of language specifically, Tomasello argues that children establish lexical, syntactic, and pragmatic skills based largely on *feedback* in a given situation. Although programs such as *Blue's Clues* do an admirable job simulating feedback, and therefore may help older children learn from television, it is possible that this type of feedback is not rich enough, nor responsive to the child's particular utterance, to help toddlers in the more complex task of initial language learning.

This contextually understood, feedback-based interaction with the world may be necessary for infants and toddlers to build the framework for additional learning. In other words, initial learning may not be aided by television because adequate conceptual development has not yet taken place. Furthermore, this initial conceptual development is most likely to occur through real live interactions. However, recall that two recent studies have demonstrated that very young children do not seem to exhibit a video deficit for the simplest of tasks: matching an object in vivo to one being shown simultaneously on television (fifteen-month-olds; Krcmar et al., 2007) and engaging in deferred, albeit simple, imitation (six-month-olds; Barr, Muentener, & Garcia, 2007). How can this be explained? Perhaps the answer does have to do with conceptual understanding and representational insight. Before an infant develops a particular concept (e.g. for an object or for an action), both the in vivo referent and the one on video can be treated as separate, independent things. Without a *concept* for the object or action, no representational insight is necessary because the symbol and referent exist independently. Thus, when an infant is shown a simple action and later given the same toy to perform the action, she is able to *mimic* the action, but not imitate it. The video toy and the in vivo toy can be understood as similar, not the same. In the absence of a concept for the thing, no conceptual, or indeed representational, match is necessary. Imitation would require having acquired a concept for

that thing, complete with an understanding of the motives, the environment in which it might occur, or its use.

However, once the cognitive concept (e.g. for a toy or for an action) is in place, the video deficit emerges because, as argued by Troseth and colleagues (e.g. Troseth, 2003a, 2003b), the child must match the concept or mental representation to the *in vivo* thing itself. It is this process of matching the two, and difficulties with this process, that account for the video deficit. Similarly, pointing to an object *in vivo* that is seen on the screen (Krcmar et al., 2007) does not require dual representation and may in fact benefit from lack of it. In sum, without a contextual understanding and conceptual representation of particular objects or actions, an infant may well demonstrate no video deficit. However, as concepts are learned, they require a mental representation. Later, symbolic representations appear in the environment and a child must learn to associate the two. Therein lies the problem. Furthermore, the more complex the object or action, the more complex the concept for it and the more difficult it is for children to match the two. Thus, the video deficit emerges only after conceptual development takes place and lasts longer for more complex concepts and actions. Therefore, I would argue that conceptual development is necessary for word learning and for true imitation of more complex interactions with real objects. Prior to conceptual development of a given object or given task, any parallel between the action and one previously witnessed is better described as mimicry. Although the work of Mandler (2005) and Tomasello (1992) would suggest that live interaction is necessary for conceptual development, additional research on media and very young children is needed to test this.

### **What Do Babies Need to Know and Can They Learn it from Television?**

In the end, in asking what effect television has on very young children, we perhaps miss an important question. What is it that babies *need* to learn *initially*, to function? Certainly much learning comes before an understanding of numbers, for example, making an early understanding of numbers unlikely and unnecessary. Letter, number, and even word recognition may be important, but the most crucial tools in the first year of life are more basic.

Although the true extent of knowledge and skills that infants develop in the first twenty-four months of life has yet to be exhaustively documented, many developmental theorists believe that, at the very least, infants must gain a knowledge about objects themselves, including concepts of causality and agency; an understanding of and ability to create perceptual categories; and an understanding of basic characteristics of objects such as animate versus inanimate. In other words, babies require the *idea* of various concepts before those concepts can have labels. From there, they need to learn to engage in the process of inductive inferencing in order to link those concepts with words. All of that, ultimately, lays the groundwork for initial language acquisition (Mandler, 1998).

This groundwork is set in place through many experiences. For example, Thelen (2000) suggests that knowledge of objects comes initially from our physical experiences with objects, or, more precisely, our *bodily* experiences with them. Cognition, she argues, "depends on the kinds of experiences that come from having a body with particular perceptual and motor capabilities ... that form the matrix within which reasoning,

memory, emotion, language and all other aspects of mental life are embedded" (p. 5). Given this notion of embodied cognition, object knowledge, language learning, and many other cognitive functions that arise early in the life of a child come from physical interaction with the world. In other words, television may not be well-suited to basic object knowledge, which is a necessary condition for language learning.

Similarly, an infant's understanding of causality and agency, and the subsequent labeling of terms related to causality and agency (i.e. verbs), requires some inductive inferencing. That is, in order to understand that one event can cause another or that one thing can cause some outcome, an infant might best learn this through *experiencing* cause and effect. *Drinking*, for example, may be conceptually more meaningful when one is engaged in the action than when one watches it on television. Therefore, both object categories and verb categories are less likely to be learned from television than from actual interactions with one's environment.

However, all may not be lost for the potential of television to teach infants. At least one study (Troseth, Casey, & Lawver, 2007) suggests that children with greater experience with the symbolic medium of television may be more likely to learn from it. However, several studies have shown that even if toddlers are able to learn how to utilize information from a video screen to guide their behavior, that information is readily overridden by any information that they may receive in vivo (Schmitt & Anderson, 2002). Perhaps understandably, with their relative wealth of real experiences, video images are simply neither potent enough nor convincing enough to teach them. Toddlers prefer reality to video, at least as a source of useful information.

In sum, television may not, in general, offer much to infants and very young children (under two years), because from it they seem unlikely to learn basic skills such as concept formation and, even as they age, they do not seem to use television as a source of relevant information. In addition, infants younger than sixteen months have not been tested extensively so it is unclear how they respond to television. Overall, then, I argue that in order to understand why babies cannot benefit from television, other than as a source of entertainment, it is best to look to cognitive explanations such as those put forward above. Although other explanations have been suggested (e.g. babies have problems with the two-dimensional images of television), these explanations ultimately have not been supported.

### Directions for Future Research

As mass media scholars, there are many questions that we might continue to pursue. First, one area of study should continue to investigate why babies do not learn from television as readily and easily as they do from real experiences. Although current research suggests that the *discounting hypothesis* is compelling, recent findings concerning babies from six to fifteen months suggests that conceptual development may also prove an important area of study in understanding the video deficit. Perhaps concepts must be learned live, in advance of any additional learning that might occur via video. Related to this issue, it is possible that the experimental paradigms that most often tap into the video deficit are not the sole, or even best, method for studying babies' learning from television. Consider the tasks used to test infants' learning from video. These tasks have been deconstructed in order to make them more comprehensible, but, in doing so, they may have become less so. For example, it is common for a child to

imitate an adult *in vivo*. But why might that child imitate an adult on video? Is there any benefit to that, from the child's point of view? Removed from the context of real, day-to-day situations, why would a child imitate or learn from television? This suggestion may mesh with the discounting hypothesis. Children do not learn from television because to do so may seem strange to them. Furthermore, this suggestion also coincides with the developmental trajectory. Learning from television may occur more readily before twelve months because the child has not yet learned that television *is* socially irrelevant. As a consequence, researchers must make every effort to devise tests that retain their social integrity in order to ascertain if the video deficit is a developmental phenomenon or an artifact of the research environment.

Second, we also know that certain kinds of knowledge are necessary in order to build additional skills. For example, conceptual knowledge is a necessary condition for language learning. An understanding of the singularity of objects is necessary in order to learn to count a series of objects. Therefore, it is important to investigate whether or not this type of basic understanding can occur through media input or if this base level knowledge can only occur through *in vivo* interaction.

Third, if television *can* teach this kind of basic knowledge, a third area of research must be pursued, as well. This third line of research should attempt to map the specific ages at which various types of knowledge can be learned via video. Perhaps conceptual knowledge can be learned from television at twelve months, or perhaps at twenty months. It is unclear, therefore, how younger infants may respond to television or how early (under two) exposure to television may influence—positively or negatively—babies' subsequent receptivity to it. In order to create environments for babies that best suit their developmental needs, it is crucial to precisely identify this developmental trajectory and understand its causes.

Lastly, once we discover the age at which various production strategies become effective, it is crucial to create developmentally appropriate media and to test the quality of that media. For example, programs such as *Blue's Clues* and *Dora the Explorer* talk to young children, inserting pauses that allow them to respond. This strategy seems to increase the socially contingent nature of television and, thus, has been found to encourage learning in preschoolers (Anderson, 2004). And, as mentioned earlier, social contingency is one condition necessary for children to learn from television. However, an additional factor, social relevancy, has not been utilized in any television programs, perhaps because it is more difficult to achieve. Recall that previous research has shown that children younger than two seem to resist even quite elaborate efforts to improve relevancy. Even seeing their own parents on the screen does not immediately improve matters (Troseth, 2003b). Perhaps two years' worth of accumulated real experiences is difficult to overcome by simply watching several television programs. Instead, toddlers continue to see real, live interactions as relevant and television programs as less so. Nevertheless, it may be worth pursuing how programs might be created to increase social relevancy if the goal is to have children younger than two learn from television.

In conclusion, more research is needed to understand if children younger than two can learn from television under any circumstances. Alternately, because some research (e.g. Zimmerman, Christakis, & Meltzoff, 2007) has shown a negative link between early television viewing and language development, perhaps television for babies should be avoided entirely. At any rate, additional information about infants and television is needed

in order for well-informed recommendations regarding infants and television to be made. Once we examine the various factors that are necessary for basic learning and apply those to media research, we can either begin to develop programs that are developmentally appropriate for very young children or encourage parents and caretakers to eliminate screen time for infants and toddlers.

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