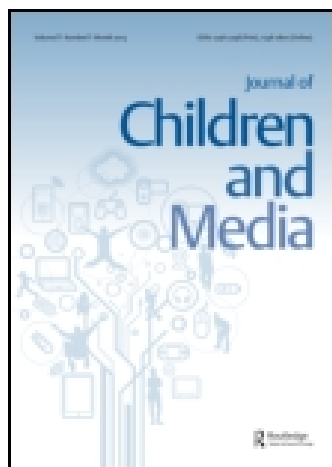


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# THE EFFECTS OF BACKGROUND TELEVISION ON THE QUANTITY AND QUALITY OF CHILD-DIRECTED SPEECH BY PARENTS

Tiffany A. Pempek, Heather L. Kirkorian and Daniel R. Anderson

*Prior research has identified negative effects of background television (TV) exposure on toddler toy play and parent–child interactions and has documented a negative association between early TV exposure and language development. It is hypothesized that background, adult-directed TV reduces the quantity and quality of parent language addressed to their young children. To test this hypothesis, the current study compared parent language directed at 12-, 24-, and 36-month-old toddlers (N = 49) in the presence and absence of background TV. In the presence of background TV, the number of words and utterances spoken per minute by the parent decreased as did the number of new words per minute. However, mean length of utterances did not differ. Because parent input is an important factor for language acquisition, development may be negatively affected by background TV exposure.*

KEYWORDS infant; toddler; background television; language development; parent–child interaction; parent speech

## Introduction

The effects of screen media on infants and toddlers are an increasing concern. When media for very young children first emerged on the market, Anderson and Evans (2001) hypothesized that any potential effect of television (TV) on this age group likely depends on whether the content is directed at younger or older viewers. They defined *background television* from the perspective of the infant or toddler as content of which they have little understanding and, consequently, to which they pay little active attention. Background TV typically occurs when an older family member chooses a program or when the TV is left on with no one but the toddler present. In contrast, *foreground television* was defined as content designed for very young children to which they likely pay active attention. Anderson and Evans argued that while well-designed foreground TV has the potential to be educational, background TV may be a negative influence on toddlers because of its dynamic distracting nature. In fact, several studies examining the proximal impact of background TV have pointed to disruptive effects on parent and child behavior. The current study re-examines data from one of these experiments (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009) in order to compare both quantity and quality of parent language in the presence and absence of background TV.

### *Infant and Toddler Background TV Exposure*

Young children are routinely exposed to background content. A large-scale, nationally representative survey of parents of children 6 months to 8 years old found that 31 per cent of 6- to 24-month-olds “watch TV” at least once per day with another 24 per cent watching at least once per week, and they do so for an average of approximately 1 hour per day (Rideout, 2013). At the same time, children are exposed to a substantial amount of adult-directed TV: When asked whether they allow their children to join them when watching their own (parent-directed) programs, 23 per cent of parents said they do this “often” and 40 per cent said they do this “sometimes”. In addition, 36 per cent reported that the TV is on “all the time” or “most of the time,” whether or not it is being watched (Rideout, 2013). Another nationally representative sample of caregivers was surveyed to assess background exposure in children 8 months to 8 years of age (Lapierre, Piotrowski, & Linebarger, 2012). Caregivers were asked to report all activities their child engaged in during the previous typical day and whether or not the TV was on in the background during each activity. This assessment revealed that children 8 months to 2 years of age are exposed to an average 5.5 hours of background TV per day, while those 2–4 years of age are exposed to an average of 4.4 hours. Thus, very young children spend a substantial proportion of their waking hours in the presence of background TV.

### *Effects of Background TV*

Because background TV typically includes content designed for older individuals, infants and toddlers presumably find it to be largely incomprehensible and consequently pay little active attention to it (cf. Anderson & Lorch, 1983; Pempek et al., 2010). Laboratory studies suggest that this is the case. For instance, Schmidt, Pempek, Kirkorian, Lund, and Anderson (2008) found that infants and toddlers looked at a background program just under 5 per cent of the time. On average, their looks were a few seconds long, and they looked less than once per minute. This level of attention is substantially lower than that observed for child-directed programming (see Richards & Anderson, 2004).

Despite low levels of attention, laboratory studies indicate that background TV disrupts both toddler and parent behavior. For instance, background TV disrupts toddlers’ solitary toy play. In a study of children 12, 24, and 36 months of age, Schmidt and et al. (2008) compared solitary toy play across 60-minute free-play sessions in which a game show was on half of the time. In the presence of background TV, there was less toy play overall, toy play episodes were shorter on average, and bouts of focused attention during toy play were shorter. Similarly, Setliff and Courage (2011) found that 6- and 12-month-old infants demonstrated more frequent and shorter looks at toys and shorter bouts of focused attention with toys in the presence of background TV programs than when the TV was off.

Background TV also compromises parent–child interactions. Kirkorian et al. (2009) compared parent engagement with their 12-, 24-, or 36-month-old children in the presence and absence of background TV. During the 60-minute free-play session, the TV was on half of the time. Parents were instructed to act as they would in a similar situation at home. With TV, high-quality active involvement decreased by a third and time spent not interacting with the child increased by half. This study presents a secondary analysis of Kirkorian et al.’s data to explore the quantity and quality of parent language directed at the child.

### *Parent Input and Language Development*

Research has established that environmental input is critical for early language development. For instance, a longitudinal study found a substantial association between amount of maternal speech and child vocabulary acquisition between 14 and 26 months of age (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Likewise, Hoff and Naigles (2002) found that greater lexical richness and syntactic complexity of maternal child-directed speech were associated with greater productive vocabulary in 2-year-olds. Environmental input is important for syntactic development as well. For example, Huttenlocher, Vasilyeva, Cymerman, and Levine (2002) found individual differences among 4-year-olds on mastery of multiclausal sentences and number of noun phrases used, and that both abilities were significantly related to parent input in these domains. Preschoolers' syntactic complexity was also related to teacher input, suggesting that the relationship between input and language development is not entirely due to biological factors (Huttenlocher et al., 2002). Further evidence comes from a longitudinal study by Hart and Risley (1995) in which language exposure and outcomes were closely tracked throughout early childhood. This study revealed that greater parental input was predictive of more positive language outcomes. Parental language input also predicts cognitive outcomes, such as efficiency of speech processing (Hurtado, Marchman, & Fernald, 2008) and general cognitive abilities (Hart & Risley, 1995). Taken together, this research points to the importance of early language exposure for language and cognitive development. To the extent that background TV disrupts language input, chronic exposure may have a deleterious effect on development.

### *Background TV and Language*

Only a handful of studies have assessed the relationship between background TV and child language outcomes. Using an automated recording system, Christakis et al. (2009) assessed parent and child vocalizations in the homes of children 2–48 months of age, finding a 7 per cent decrease in discernible words the child heard from an adult for each additional hour of TV exposure. However, this study used a language environment analysis system (specifically, the LENA system) which counts number of words spoken and conversation turns but does not track the target of the vocalizations (Christakis et al., 2009). Thus, it is impossible to determine whether parent vocalizations were directed toward the child and how much of the TV content was in the background.

Research also indicates that impoverished language input due to background TV is associated with slower language development. A correlational study by Hudon, Fennell, and Hoftyzer (2013) found that parent report of toddlers' viewing of poor quality TV, including background TV, was associated with poorer vocabulary scores, particularly for bilingual children. Likewise, a longitudinal study employing a 24-hour media diary completed by low-income mothers found that exposure to media either for older children or for adults at 6 months of age was associated with lower levels of cognitive and language development at 14 months (Tomopoulos et al., 2010). Similar findings were reported for preschoolers, with children exposed to high amounts of adult-directed TV at age 4 scoring lower on measures of receptive vocabulary than those exposed to low to moderate amounts (Barr, Lauricella, Zack, & Calvert, 2010).

While it is clear that background TV exposure during early childhood may contribute to poorer language development, research has scarcely explored why. Two studies point to

negative influences on quantity of parent language. First, low-income mothers of 6-month-olds reported interacting with their infants (defined as talking about the program “a lot” or “some”) during only 14.7 per cent of adult-directed programs as compared with 42.8 per cent and 21.3 per cent of educational and non-educational child-directed programs, respectively (Mendelsohn et al., 2008). The quality of this communication was not reported. A second study by Kirkorian et al. (2009) reported that parent verbal interaction (i.e., the proportion of 10-second intervals in which at least one utterance occurred) was lower with background TV than when the TV was off. However, to date no research has assessed specific properties of the quality of parent language that may be affected by background TV. Research on the importance of parental input for early language development clearly indicates the need for fine-grained analyses of measures pertaining to both quantity and quality of child-directed language (e.g., Hoff & Naigles, 2002).

### *The Current Study*

The current study is a secondary analysis of the data collected by Kirkorian et al. (2009). The original study focused on the quality of parent–child interactions by assessing behaviors such as parents’ attention during toy play across 10-second intervals. For the present study, parent language was transcribed from the videos used by Kirkorian and colleagues. Measures of quantity (number of words and utterances) and quality (number of new words and length of utterances) of parent language were obtained. These measures were previously found to be most predictive of later language development (e.g., Hoff & Naigles, 2002). It was hypothesized that the quantity and quality of parent language would be lower in the presence of background TV than when the TV was off.

## **Method**

### *Participants*

This study included 49 children, ages 12 ( $n = 15$ , female = 8), 24 ( $n = 17$ , female = 8), and 36 ( $n = 17$ , female = 8) months, each with a parent (47 mothers, 2 fathers; both fathers within 2 standard deviations (SDs) of the mean for all measures). Children were within 1 month of their birthday. For highest level of education achieved, 14.3 per cent of participating parents completed high school, 16.3 per cent completed some college, 46.9 per cent completed college, and 22.4 per cent completed graduate work. The majority of children were identified by the parent as white/non-Hispanic (93.9 per cent; 6.1 per cent white/Hispanic). Two children from the original sample used by Kirkorian et al. (2009) were excluded here because the parents’ speech was incomprehensible for large portions of the session.

### *Procedure*

Sessions were conducted in a laboratory so that variables such as variety of toys and environmental distractions could be controlled. Upon arriving, families were greeted and escorted to the viewing room where they remained throughout the 60-minute session. Parents were told that the experimenters were interested in children’s play with and without TV, and the procedure was explained. Parents were asked to sign an informed consent form. For half of the session, a video was played, as chosen by the parent from 11

pre-recorded, adult-directed shows (e.g., sitcoms, reality show, and cooking show). The program was viewed on a 48.3 cm (19 in) monaural TV located on a credenza. For the other half of the session, the TV was off. Order of TV presentation was counterbalanced with the provision that equal number of children were assigned to each. Parents were asked to act as they would at home in a similar situation. They could watch TV while it was on, read magazines and newspapers, or interact with their child. Children were free to play with a range of age-appropriate toys selected to support sensorimotor, constructive, and symbolic play (e.g., doll and accessories, shape sorter, and blocks). All sessions were recorded through a one-way mirror; a microphone hanging from the ceiling captured speech. When the session was over, families were thanked and children were given a small gift.

### *Video Coding*

Videos of the sessions were viewed by trained research assistants who transcribed all speech by the parent directed at the child. Each utterance, defined as a sentence or phrase with silence occurring before and after it, was recorded on its own line. Similar forms of a word were not counted as new cases. For example, plural forms were made singular and verbs were recorded in their present-tense infinitive form (e.g., "I ate cookies" was transcribed as "I eat cookie"). This was done to avoid artificial inflation of measures intended to address complexity of speech. Scripting software (written in Python) was used to compile frequencies of utterances, words, and novel words. For all measures, approximately 25 per cent of the videos ( $n = 12$ ) were scored by two research assistants so that inter-observer reliability could be assessed. Intraclass correlations conducted to assess reliability were 0.90 for all measures except mean length of utterances, which was above 0.80. Child speech was not considered here because many of the utterances produced by the children were difficult to understand and, therefore, could not be reliably transcribed (e.g., child spoke too softly, child's words could not be deciphered).

### *Measures*

Following Hoff and Naigles (2002), measures of language quantity included the number of words spoken per minute (what Hoff and Naigles call "word tokens") and the number of utterances spoken per minute. One measure of quality was the number of new or different words spoken per minute (what Hoff and Naigles call "word type"). The other measure of quality was mean length of utterances. While this measure is sometimes calculated using morphemes, research demonstrates that utterance length measures using morphemes and words are nearly perfectly correlated (Parker & Brorson, 2005). We use words for consistency with our other measures.

### **Results**

Descriptive statistics for measures of quantity and quality of parent speech can be found in Tables 1 and 2. Correlations between all measures by condition can be found in Table 3. For all analyses, any participant for whom a score fell more than 3 SDs from the mean in either direction was excluded for that variable. This exclusion applied to one case for utterances per minute (a 24-month-old for the TV condition) and one for mean length of utterances (a 36-month-old for the No TV condition). Removing these cases did not affect

**TABLE 1**Means and standard errors by TV condition ( $N = 49$ )

	TV	No TV
Utterances per minute <sup>a</sup>	6.35 (0.41)	9.36 (0.58)
Words per minute	24.24 (1.80)	35.89 (2.47)
New words per minute	6.42 (0.36)	7.97 (0.42)
Mean length of utterances <sup>b</sup>	3.69 (0.11)	3.73 (0.10)

<sup>a</sup> One outlier was removed for this variable because the mean for the TV condition was more than 3 SDs above the mean ( $N = 48$ ).

<sup>b</sup> One outlier was removed for this variable because the mean for the no TV condition was more than 3 SDs above the mean ( $N = 48$ ).

the overall pattern of results, significance of statistical tests, or conclusions that were drawn from the findings. Neither child sex nor parent education was significantly related to dependent variables, so they are not considered further.

### *Quantity of Parent Language*

A doubly (i.e., mixed design) multivariate analysis of variance (MANOVA) was conducted to examine the effects of background TV, age, and order of TV presentation on two dependent measures of quantity of parent language: utterances per minute and words per minute. TV condition (TV, no TV) was a within-subjects variable, while age (12, 24, and 36 months) and order (TV first, TV second) were between-subjects variables. Multivariate results revealed significant differences for the TV condition on the dependent variables, Wilks'  $\Lambda = 0.455$ ,  $F(2, 41) = 24.509$ ,  $p < 0.001$ , partial  $\eta^2 = 0.545$ . A significant difference was also found for age, Wilks'  $\Lambda = 0.115$ ,  $F(4, 82) = 4.625$ ,  $p = 0.002$ , partial  $\eta^2 = 0.184$ . There were no significant effects involving order.

A 2 (TV condition: TV, no TV)  $\times$  3 (age: 12, 24, and 36 months) repeated-measures analysis of variance (ANOVA) was conducted for each dependent measure as a follow-up to the MANOVA. Using a family-wise  $\alpha$  of 0.05, a Bonferroni correction was applied to adjust for the number of tests (3 in all) yielding a corrected  $\alpha$  of 0.017.

For utterances per minute, there was a significant main effect of TV condition, with approximately three fewer utterances spoken per minute on average with TV than without,  $F(1, 45) = 49.162$ ,  $p < 0.001$ , partial  $\eta^2 = 0.522$ . Neither the age main effect ( $p = 0.096$ ) nor the TV condition  $\times$  age interaction ( $p = 0.113$ ) was significant.

For words per minute, there was a significant main effect of TV condition with an average of nearly 12 fewer words spoken per minute during the TV session,  $F(1, 46) = 43.144$ ,  $p < 0.001$ , partial  $\eta^2 = 0.484$ . There was also a significant main effect of age,  $F(2, 46) = 6.201$ ,  $p = 0.004$ , partial  $\eta^2 = 0.212$ . Bonferroni post-hoc analyses revealed that parents of 1-year-olds spoke fewer words per minute than did parents of 2-year-olds ( $p = 0.049$ ) or 3-year-olds ( $p = 0.004$ ). The TV condition  $\times$  age interaction was not significant ( $p = 0.619$ ).

### *Quality of Parent Language*

A doubly multivariate analysis of variance was conducted to examine the effects of background TV (TV, no TV), age (12, 24, and 36 months), and order of presentation (TV first,

**TABLE 2**  
Means and standard errors by TV condition and age

	TV			No TV		
	12 <sup>a</sup>	24 <sup>b</sup>	36 <sup>b</sup>	12 <sup>a</sup>	24 <sup>b</sup>	36 <sup>b</sup>
Utterances per minute	5.22 (0.63)	6.15 <sup>c</sup> (0.67)	7.52 (0.73)	7.73 (0.89)	10.34 <sup>c</sup> (1.06)	10.21 (1.00)
Words per minute	16.24 (2.31)	25.21 (3.32)	30.33 (2.65)	25.58 (3.63)	38.84 (4.05)	42.05 (4.18)
New words per minute	4.52 (0.57)	6.52 (0.54)	8.01 (0.45)	5.82 (0.71)	8.10 (0.54)	9.73 (0.62)
Mean length of utterances	3.08 (0.14)	3.85 (0.20)	4.17 <sup>d</sup> (0.17)	3.23 (0.12)	3.86 (0.17)	4.05 <sup>d</sup> (0.16)

<sup>a</sup>  $n = 15$ .

<sup>b</sup>  $n = 17$ .

<sup>c</sup> One outlier was removed for this variable because the mean for the TV condition was more than 3 SDs above the mean ( $n = 16$ ).

<sup>d</sup> One outlier was removed for this variable because the mean for the no TV condition was more than 3 SDs above the mean ( $n = 16$ ).



**TABLE 3**  
Correlations for measures of quantity and quality of parent language

Measures	TV condition				No TV condition			
	1	2	3	4	5	6	7	8
<i>TV condition</i>								
1. UPM <sup>a</sup>	–							
2. WPM	0.907*	–						
3. NWPM	0.836*	0.931*	–					
4. MLU <sup>a</sup>	0.157	0.468*	0.497*	–				
<i>No TV condition</i>								
5. UPM <sup>a</sup>	0.681*	0.606*	0.591*	0.108	–			
6. WPM	0.667*	0.711*	0.712*	0.332	0.933*	–		
7. NWPM	0.682*	0.745*	0.844*	0.413*	0.832*	0.927*	–	
8. MLU <sup>a</sup>	0.278	0.509*	0.550*	0.869*	0.152	0.418*	0.491*	–

Note: UPM, utterances per minute; WPM, words per minute; NWPM, new words per minute; MLU, mean length of utterances.

\* $p < 0.01$ .

<sup>a</sup>One outlier was removed for this variable because it was more than 3 SDs above the mean.

TV second) on two dependent measures of quality of parent language: new words per minute and mean length of utterances. Multivariate results revealed a significant difference for TV condition on the dependent variables, Wilks'  $\Lambda = 0.500$ ,  $F(2, 41) = 20.512$ ,  $p < 0.001$ , partial  $\eta^2 = 0.500$ . A significant difference was also found for age, Wilks'  $\Lambda = 0.553$ ,  $F(4, 82) = 7.073$ ,  $p < 0.001$ , partial  $\eta^2 = 0.257$ . There were no significant effects involving order.

Again, repeated-measures ANOVAs were conducted as follow-ups for each dependent measure using the Bonferroni corrected  $\alpha$  of 0.017. For new words per minute, there was a significant main effect of TV condition with approximately 1.5 fewer new words spoken per minute on average with TV than without,  $F(1, 46) = 45.097$ ,  $p < 0.001$ , partial  $\eta^2 = 0.495$ . There was also a main effect of age,  $F(2, 46) = 11.560$ ,  $p < 0.001$ , partial  $\eta^2 = 0.334$ . Bonferroni post-hoc analyses revealed that parents of 1-year-olds spoke fewer new words per minute than did parents of 2-year-olds ( $p = 0.024$ ) or 3-year-olds ( $p < 0.001$ ). The TV condition  $\times$  age interaction was not significant ( $p = 0.745$ ).

Finally, for mean length of utterances, the main effect of TV condition was not significant ( $p = 0.472$ ). However, there was a significant main effect for age,  $F(2, 45) = 9.289$ ,  $p < 0.001$ , partial  $\eta^2 = 0.292$ . Bonferroni post-hoc analyses revealed that utterances directed at 1-year-olds were shorter on average than those directed at 2-year-olds ( $p = 0.008$ ) or 3-year-olds ( $p < 0.001$ ). The TV condition  $\times$  age interaction was not significant ( $p = 0.382$ ).

## Discussion

The current study compared the quantity and quality of parents' language directed at their toddlers in the presence and absence of background TV. Background TV reduced words per minute, utterances per minute, and number of new words. Syntactic complexity (i.e., length of utterances) was not affected. In addition, this study replicated previous findings for differences by age in child-directed speech (e.g., Huttenlocher et al., 1991).

Namely, parents of the youngest children in this sample spoke fewer words overall, produced fewer new words, and had shorter utterances. Because data-providing properties of parent language are important for toddler language development, the results suggest that chronic exposure to background TV may be a negative influence. In light of findings that American children under 24 months are exposed to an average of 5.5 hours of background TV per day (Lapierre et al., 2012), this effect may be substantial.

Background TV for a toddler is often foreground TV for an adult. Whereas the children in this study presumably found little of the content comprehensible, and consequently paid little attention to the screen, parents chose the particular program and paid attention at least some of the time. This attention paid to the TV displaced attention paid to the child. This is evident in the finding that the overall number of words and utterances varied by TV condition, but mean length of utterances did not. When the parent's attention was directed at the TV, he or she likely ignored the child, providing fewer opportunities to interact and to introduce new words. However, when the child was able to capture the parent's attention or when the parent shifted focus to the child, the utterances were just as complex as when the TV was off. This also likely led to the reduced parent engagement observed in the original Kirkorian et al. (2009) study.

Hoff and Naigles (2002) found that the measures used in this study were the best quantitative predictors of later language development. If the reduced quantity and richness of language found in the present research extends to chronic interactions in the presence of background TV at home, then there should be consequences for language development. In line with this prediction, a longitudinal study by Tomopoulos et al. (2010) found reduced vocabulary in 14-month-olds in relation to background TV exposure at 6 months. This distal relation, insofar as background TV is presumed to play a causal role, is likely due to the direct disruptive proximal effect of background TV not only on the child, but also on the parent. However, future research should assess connections between parent and child behaviors to confirm whether this effect is direct in both cases.

Reduced quantity and quality of language by parents have also been found in an analysis of parent-toddler coviewing of infant-directed videos (Lavigne, Hanson, & Anderson, 2014). Similarly, Soderstrom and Wittebolle (2013) found that the frequency of words spoken to toddlers by a small sample of caregivers in their homes during viewing of child-directed TV was much less than during structured activities, such as reading a book with the child or engaging in organized play. Taken together, regardless of content, parents speak less to their children in the presence of TV. Zimmerman et al. (2009), in an analysis of longitudinal data, argued that the negative impact of TV on child language development is entirely mediated by reductions in parent language. The present findings are consistent with that interpretation.

The American Academy of Pediatrics (AAP) recently upheld their recommendation discouraging media exposure for children under 2 years of age (AAP, 1999, 2011, 2013). Much of the focus of the AAP reports has centered on limiting foreground screen media exposure, but the most recent report specifically noted the potential harm of background exposure. The current study strengthens the argument for limiting background TV by adding to the growing body of research indicating that not only is it distracting and disruptive to infants and toddlers, but it also reduces the quantity and quality of parent-child interactions. We hypothesize that caregivers assume that background TV has little or no effect because very young children do not appear to pay attention to it. Comments from parents in our study indicate that this is a common assumption.

The effects found in the current study are likely true of any information or entertainment medium with which parents engage. For example, it is likely that a parent reading a newspaper or working on a laptop would reduce attention and responsiveness to the child. To the extent that this is true, parent media use in general may detract from interactions that are beneficial to children. For example, preliminary findings from an experiment on the effects of maternal distraction revealed that word learning by toddlers was negatively influenced when the mother's teaching was interrupted by a brief cell phone call (Reed, Hirsch-Pasek, & Golinkoff, 2012). Future researchers should examine the impact of other media used by parents.

It is impractical and probably not desirable for a parent to actively engage their child at all times. That said, there is wide and substantial evidence that children greatly benefit from frequent high-quality interactions with their parents. Insofar as parent media use reduces both interaction frequency and quality, the benefit of interactions with the parent is reduced. Not surprisingly, most concern about media, to date, has focused on the direct effects of child-directed media on children. The present study suggests that adult-directed media affects parents and therefore may indirectly affect their children. Along with other research on background TV, an implication of the present research is that parents should be made cognizant of the impact of their own media use on their children.

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**Tiffany A. Pempek** (author to whom correspondence should be addressed), received a Ph.D. from the University of Massachusetts-Amherst and completed a postdoc at the Children's Digital Media Center, Georgetown University. She is an Assistant Professor of Psychology at Hollins University. Dr. Pempek's research interests include the impact of media on toddlers, the development of cognitive processes involved in media comprehension and learning, and parent-child interaction during media use. Her current work focuses on the effects of interactive media devices on toddlers. Department of Psychology, Hollins University, PO Box 9687, Roanoke, VA 24020, USA. E-mail: [pempekta@hollins.edu](mailto:pempekta@hollins.edu)

**Heather L. Kirkorian** received her Ph.D. (2007) in Developmental Psychology from the University of Massachusetts-Amherst, where she also completed her postdoctoral training. She has been an Assistant Professor in the Human Development and Family Studies Department at the University of Wisconsin-Madison since 2010. Her research interests include attention and learning, young children's attention to and comprehension of video, and the impact of television on cognitive development. Department of Human Development and Family Studies, University of Wisconsin at Madison, 4105 Nancy Nicholas Hall, 1300 Linden Drive, Madison, WI 53706-1523, USA. E-mail: [kirkorian@wisc.edu](mailto:kirkorian@wisc.edu)

**Daniel R. Anderson** is Professor Emeritus of Psychology at the University of Massachusetts-Amherst. His research has focused on the cognitive aspects of young children's television use. Department of Psychology, University of Massachusetts at Amherst, Tobin Hall, Amherst, MA 01003, USA. E-mail: [anderson@psych.umass.edu](mailto:anderson@psych.umass.edu)