

Short communication

## Televised social interaction and object learning in 14- and 18-month-old infants

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### Abstract

We examined object learning in infants who viewed a televised adult speaking about a novel toy in videos that varied in the social cues provided. Novelty preference in following test trials differed as a function of televised social cues in 18-month-old, but not 14-month-old infants.

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Recent years have seen a marked increase in infants' use of electronic media, and television in particular (Anderson & Evans, 2001; Anderson & Pempek, 2005; Barr & Hayne, 1999; Hughes, 2005; Kanner, 2006; Linebarger & Walker, 2005; Rideout, Vandewater, & Wartella, 2003), with an estimated 43% of children between the ages of 6 months and 2 years watching television every day (Rideout et al., 2003). Despite the prevalence of television in infants' daily lives, as well as a large literature examining the educational and potentially harmful effects of television viewing in older children, few studies have examined whether infants pay attention to or learn from televised displays, or what aspects of programming affect learning and attention at early ages.

Among the small number of studies that have addressed such questions, results have been mixed. This is especially true for infants between the ages of 14 and 18 months. Research to date has examined the questions of what infants between 1 and 2 years understand from television primarily by utilizing imitation or vocabulary learning paradigms (e.g., Barr & Hayne, 1999; Grela, Krcmar, & Lin, 2004; Meltzoff, 1988). For example, in a pioneering study, Meltzoff (1988) found that 14-month-old infants who viewed an adult modeling a simple 1-step action on an object were more likely to perform the same action 24 h later when compared to same-aged controls. Subsequent studies have varied aspects of the paradigm to gain insight into the specific stimuli necessary for such results with similarly aged infants. These studies have suggested that performance during such tasks is highly dependent on the task and on the way that televised stimuli are presented to infants. Barr and Hayne (1999), for example, found that 18-month-old, but not 15-month-old infants imitated a more complicated task after viewing an adult model the action on television. However, when the task was made simpler and infants were tested immediately rather than after a 24 h delay, imitation occurred significantly more often than in age-matched controls among 15-month-old infants. Barr and Hayne (1999) suggested

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that ‘sterile’ programming of very short duration and with reduced distraction is not comparable to actual programming marketed for young children, and likely has an effect on infant imitation in controlled studies compared to real-life contexts. In testing this hypothesis, they presented infants with televised displays more representative of children’s television shows, and found that imitation greatly decreased.

Several studies have also focused on the ways that young children, and sometimes infants, allocate attention in response to television program content. For older children, it has been argued that attention is positively correlated with understanding of content (see, for example, Anderson & Pempek, 2005). Although it was previously assumed that infants paid little attention to television because they could not understand it, studies with television programs designed for very young children have rendered this explanation questionable.

For example, several studies have shown that 18-month-old infants vary their attention to television programs based on content, allocating significantly more visual attention to programs marketed toward their age group, such as *Teletubbies*, than to news clips or shows geared to an older audience (Valkenburg & Vroone, 2004). In addition, 18-month-olds are sensitive to episodes of *Teletubbies* that are shown in random sequences, or with backward speech, compared to normal segments (Anderson, Lorch, Field, & Sanders, 1981). Even at 12–15 months of age, infants allocate a substantial amount of attention to baby videos (Barr et al., 2003), watching the screen 48–74% of the time. It is becoming clear that infants will spend substantial time focused on television given stimuli that they find interesting.

These prior studies leave open the question of infants’ abilities to take information from television between 14 and 18 months, and suggest that the content of television programming has a strong effect on both infants’ attention to and understanding of television. We tested this hypothesis in the present study by varying the televised social cues available to 14- and 18-month-old infants in order to examine the aspects of televised behavior that infants used to learn about a novel object. We tested the hypothesis that an interactive televised social partner who attempted to ‘engage’ the infant would be more effective in capturing infants’ attention and in providing information about a novel toy than would an onscreen adult who provided more ambiguous and less interactive social cues.

## 1. Participants

Participants were 29 14-month-olds ( $M = 4$  months, 3 days;  $S.D. = 6.0$  days; range: 13 months, 22 days–14 months, 14 days; 13 males and 16 females) and 26 18-month-olds ( $M = 17$  months, 27 days,  $S.D. = 7.6$  days; range: 17 months, 16 days–18 months, 14 days; 13 males and 13 females). An additional 13 14-month-olds and 8 18-month-olds were tested but not included in the final sample due to fussiness ( $X = 6$ ), technical problems ( $X = 10$ ), mother interference ( $X = 4$ ), or infants’ failure to become engaged by the video (looked to screen for less than 20 s;  $X = 1$ ). All infants were healthy and born full term, Caucasian, and living in a mid-sized German city. Infants were recruited from a database of caregivers who had expressed interest to participate in developmental studies. Infants were given a small toy for participation.

## 2. Apparatus and stimuli

Infants were tested in a quiet room at the infant laboratory. Each infant was seated on his/her caregiver’s lap, facing a table on which a television monitor was situated but hidden behind a white curtain until the start of the procedure. White curtains surrounded the testing area to prevent visual distraction and to prevent the experimenter (E) from being seen by the infant during the procedure. Two video cameras captured the experiment; one captured the table and the infant’s face, and the other captured a side profile of the infant and the video viewed by the infant. Caregivers were asked to wear a pair of opaque glasses and to refrain from interacting with their infant during testing.

## 3. Procedure

The procedure began when E, behind a curtain and out of the infant’s view, raised the curtain to reveal the television (Fig. 1a). E then started the video, which in all cases played for 1 min, 30 s. In a between-subjects design, infants viewed one of two videos: in an *Infant–Object Attention* video, and adult female first spoke to the infant (in the infant’s direction) for several seconds, then spoke in a positive tone about a toy situated either to her right or left (counterbalanced across infants), while alternating gaze between the onscreen toy and the infant’s direction. The *Object Attention* video was identical, except that after the initial few seconds in which the adult spoke in the infant’s direction, she did not look

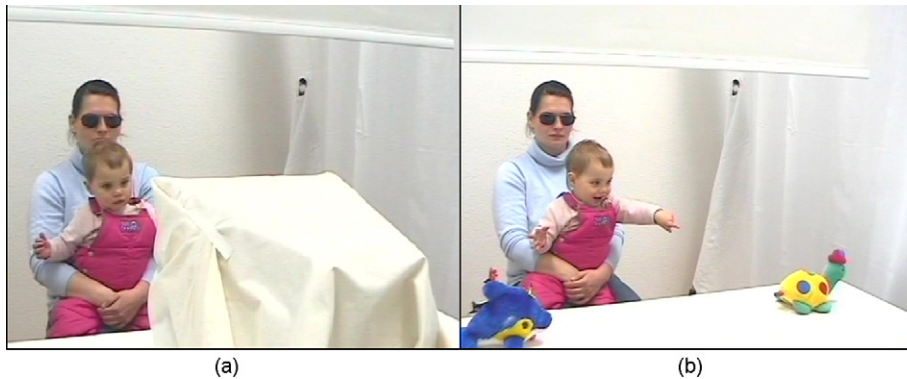


Fig. 1. Experimental set-up. (a) Infant viewing video and (b) test trial.

in the infant's direction again. Specifically, she spoke in a positive tone about the toy while alternating gaze between the toy and a spot on the ceiling. In all videos, the adult smiled pleasantly, spoke in a positive tone, used the same phrases, and performed an equivalent number of head movements. What differed across the videos was whether the adult alternated gaze to the infant. Two toys were used in the videos (a stuffed turtle and a stuffed dolphin), and these were counterbalanced across subjects.

At the end of the video presentation, E lowered the white curtain and removed the television monitor from the table. She then placed two toys (a stuffed turtle and a stuffed dolphin) on the table, one placed on the right side of the table and one placed on the left side, such that they were equidistant from the infant. One of these toys had been viewed by the infant in the video presentation, while the other was completely novel. E then hid behind a curtain and raised the white screen (Fig. 1b.). The infant's looking time to each toy was monitored. Test Trial 1 began when the infant looked to either of the toys on the table, and ended after 10 s. E then lowered the curtain, switched the right–left positioning of the toys, and raised the curtain. The procedure for Test Trial 2 was identical to Test Trial 1. The right–left positioning of the novel and video objects was counterbalanced across infants.

#### 4. Coding and analyses

The primary dependent measures were infants' looking times to the novel and familiarization toys during the two test trials. Looking times to the novel and familiar toys during test trials were coded offline by a trained coder. In addition, we coded infants' gazing times to the video monitor during the presentation as a measure of attention. A second trained observer coded infant gazing in 32% of the videos to assess reliability for gazing. Pearson's product moment correlation for infant gazing was .95 for gazing to the video screen during familiarization and .91 for gazing to the toys during test trials. For each infant, we calculated a novelty preference score to indicate the percentage of time the infant looked to the novel toy relative to the familiarization toy during a single test trial. The novelty preference score was calculated as:  $((\text{looking time to novel toy}) / (\text{looking time to familiar} + \text{novel toy})) \times 100$ . Higher novelty preference scores were considered indicative of greater stimulus encoding of the familiarization toy (e.g., Hunter & Ames, 1988; Miceli, Whitman, Borkowski, Brautgart-Rieker, & Mitchell, 1998).

Preliminary analyses revealed no significant effects of infant sex, the familiarization toy used, or the side to which the toy was placed on novelty preference scores. These variables were collapsed in subsequent analyses. We did, however, note a significant difference in novelty preference scores across test trials for 14-month-olds ( $t(28) = -2.46$ ,  $p = 0.02$ ). Consequently, we analyzed data separately for each test trial. Data reported here are for Test Trial 1; analyses for Test Trial 2 were not significant.

An univariate analysis of variance (ANOVA) with age (14 months versus 18 months) and video condition (*Infant–Object Attention* versus *Object Attention*) entered as the between-subjects factors and novelty preference score as the dependent measure revealed a significant main effect for age ( $F_{1,51} = 8.29$ ,  $p = .006$ ) as well as an age  $\times$  condition interaction ( $F_{1,51} = 4.85$ ,  $p = .03$ ). As shown in Fig. 2, 14-month-olds looked to the familiar toy for a slightly greater percentage of time following both videos, and there was no significant difference in novelty preference scores across conditions ( $t(27) = -0.64$ ,  $p > 0.52$ ; novelty preference scores: *Infant–Object Attention*:  $M = 36.6$ ,

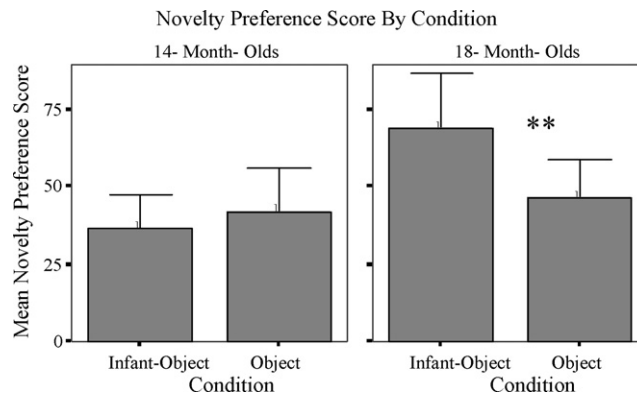


Fig. 2. Novelty preference scores in Test Trial 1. \*\*significance at  $p < .05$ .

S.D. = 21.8; *Object Attention*:  $M = 41.9$ , S.D. = 21.2). In the 18-month-old sample, infants who viewed the *Infant–Object Attention* video displayed significantly greater novelty preference scores than infants who viewed the *Object Attention* video ( $t(24) = 2.31$ ,  $p = .03$ ; novelty preference scores: *Infant–Object Attention*:  $M = 69.2$ , S.D. = 25.3; *Object Attention*:  $M = 46.2$ , S.D. = 24.2; see Fig. 2).

We also examined infants' looking times to the video monitor during the presentation as a measure of infants' attention. A univariate analysis of variance with looking time as the dependent variable and age (14 versus 18 months) and condition (*Infant–Object Attention* versus *Object Attention*) as factors revealed a significant main effect of condition ( $F_{1,51} = 5.15$ ,  $p = .027$ ). At both ages, infants looked to the screen longer during the *Infant–Object Attention* presentations relative to the *Object Attention* presentations ( $M = 67$  s for *Infant–Object Attention* and 55 s for *Object Attention*). Effects of age and the age  $\times$  condition interaction were not significant ( $p = .88$  and  $.14$ , respectively).

In this study, 14- and 18-month-old infants viewed a televised social interaction in which an adult female spoke to them about a toy in one of two ways. The adult either alternated visual attention between an onscreen toy and the direction of the infant (*Infant–Object Attention*), or toward the toy and a spot above her head (*Object Attention*). We found that 18-month-olds, but not 14-month-olds, showed a significant difference in novelty preference across conditions. Specifically, 18-month-old infants showed greater novelty preference following the *Infant–Object Attention* video. Given that greater novelty preference is indicative of greater stimulus encoding (e.g., Hunter & Ames, 1988; Miceli et al., 1998), these results suggest object learning in 18-month-olds varied as a function of the televised social cues presented to them.

In addition, we found a significant main effect for condition in terms of infants' visual attention to the video presentation. At both ages, infants looked longer to the video screen when the adult provided cues that involved both the toy and the infant, rather than looking only to the toy and never in the infant's direction. It has been suggested that infants allocate greater levels of visual attention to programming that is comprehensible to their age group (e.g., Anderson et al., 1981; Anderson & Pempek, 2005; Barr et al., 2003; Valkenburg & Vroone, 2004). It is possible that this was true in the current study, as the adult's actions in the *Infant–Object Attention* condition are more like a social interaction that infants at 14 and 18 months would encounter in real life and may thus be more comprehensible in general to the infants. However, we found a higher novelty preference in test trials following the *Infant–Object Attention* condition only in the 18-month-old group, suggesting a cognitive shift in infants' understanding of inherently interesting televised social cues sometime between 14 and 18 months. In other words, although infants at both age groups may have found the infant–object attention video more interesting, the information they extracted from the actions of the televised adult appeared to vary across ages.

At or around 18 months, infants show strong sensitivity to the content of television programs. For example, several studies have shown that 18-month-old infants vary their attention to television programs based on content, allocating significantly more visual attention to programs marketed toward their age group, such as *Teletubbies*, than to news clips or shows geared to an older audience (Valkenburg & Vroone, 2004). In addition, 18-month-olds are sensitive to episodes of *Teletubbies* that are shown in random sequences, or with backward speech, compared to normal segments (Anderson et al., 1981).

Our present findings suggest that the design and specific content of television programming for infants have an impact on the information infants extract from televised stimuli. In the present study, an ‘interactive’ design in which the adult spoke to and attempted to engage the infant resulted in greater novelty preference in 18-month-olds than the video in which the adult did not direct visual attention toward the infant. These observations are consistent with those of Linebarger and Walker (2005), who conducted a study examining correlations between television viewing from 6 months and language outcomes at 30 months. They found that viewing of children’s television programming with interactive characters who speak directly to the child, such as in *Blue’s Clues* and *Dora the Explorer*, was associated with greater vocabulary and higher expressive language scores at 30 months. Paralleling these results with an older age group, Troseth, Saylor, & Archer (2006) found that 2-year-olds who interacted with an interactive televised adult in a contingent way before viewing a televised hiding event showed enhanced performance when searching for and retrieving a hidden toy.

The present results are also consistent with the theory that infants become increasingly proficient with televised displays between the ages of 14 and 18 months. Pierroutsakos and Troseth (2003) found that infants show a developmental change in understanding of the representational nature of objects presented on video between the ages of 9 and 19 months, and that the transition appears to occur gradually. For example, 9-month-old infants treated onscreen objects much as they would objects in real life—they attempted to grab and manipulate them. At 14 months, the behaviors were less likely than in 9-month-olds, but still occurred, while at 19 months, infants no longer attempted to manipulate the televised toys, but instead pointed and vocalized. Findings such as those of Pierroutsakos and Troseth are interesting in that they might suggest that younger infants could be less sensitive to differences between television and real-life, and thus may gather information more easily in both contexts (see discussion in Troseth et al., 2006). Because research in this area with infants 1 year and younger is so greatly lacking (but see, for example, Mumme & Fernald, 2003), future research will be needed to broaden our understanding of what and how infants learn over the first year, and the pattern of television learning throughout early infancy. As early as 2–3 months of age, infants are sensitive to the quality of social cues even when these are shown over television (Striano, Henning, & Stahl, 2006), so the exact reason for 14-month-olds’ performance still remains open.

In summary, the present findings point to a transition in infants’ use of televised social cues between 14 and 18 months of age. Our results suggest that, for infants by 18 months of age, an ‘interactive’ televised adult aided infants in gathering information about a novel toy to a greater extent than an adult who provided less interactive, more ambiguous social cues. Future studies should expand these results to infants of different age groups, and with varying social interactive stimuli.

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## References

- Anderson, D. R., & Evans, M. K. (2001). Peril and potential of media for infants and toddlers. *Zero to Three, Oct/Nov*, 10–16.
- Anderson, D. R., Lorch, E. P., Field, D. E., & Sanders, J. (1981). The effect of television programming comprehensibility on preschool children’s visual attention to television. *Child Development, 52*, 151–157.
- Anderson, D. R., & Pempek, T. A. (2005). Television and very young children. *American Behavioral Scientist, 48*, 505–522.
- Barr, R. F., Chavez, V., Fujimoto, M., Garcia, A., Muentener, P., & Strait, C. (2003). *Television exposure during infancy: Attention to Baby Mozart by 12- and 15-month-olds*. Tampa, FL: Poster presented at the biennial meeting of the Society for Research in Child Development.
- Barr, R. J., & Hayne, H. (1999). Developmental changes in imitation from television during infancy. *Child Development, 70*, 1067–1081.
- Grela, B. G., Kremer, M., & Lin, Y. -J. (2004). Can television help toddlers acquire new words? [http://www.speechpathology.com/articles/article\\_detail.asp?article\\_id=72](http://www.speechpathology.com/articles/article_detail.asp?article_id=72).
- Hughes, P. (2005). Baby it’s you: International capital discovers the under threes. *Contemporary Issues in Early Childhood, 6*, 30–40.
- Hunter, M. A., & Ames, E. W. (1988). A multifactor model of infant preferences for novel and familiar stimuli. *Advances in Infancy Research, 26*, 421–428.
- Kanner, A. D. (2006). The corporatized child. *The California Psychologist, 3*, 1.

- Linebarger, D. L., & Walker, D. (2005). Infants' and toddlers' television viewing and language outcomes. *American Behavioral Scientist*, *48*, 624–645.
- Meltzoff, A. (1988). Imitation of televised models by infants. *Child Development*, *59*, 1221–1229.
- Miceli, P. J., Whitman, T. L., Borkowski, J. G., Brautgart-Rieker, J., & Mitchell, D. W. (1998). Individual differences in infant information processing: The role of temperamental and maternal factors. *Infant Behavior and Development*, *21*, 119–136.
- Mumme, D. L., & Fernald, A. (2003). The infant as onlooker: Learning from emotional reactions observed in a television scenario. *Child Development*, *74*, 221–237.
- Pierroutsakos, S. L., & Troseth, G. L. (2003). Video verité: Infants' manual investigation of objects on video. *Infant Behavior and Development*, *26*, 183–199.
- Rideout, V. J., Vandewater, E. A., & Wartella, E. A. (2003). *Zero to six: Electronic media in the lives of infants, toddlers and preschoolers*. Menlo Park, CA: Kaiser Family Foundation.
- Striano, T., Henning, A., & Stahl, D. (2006). Sensitivity to interpersonal timing at 3 and 6 months of age. *Interaction Studies*, *7*(2), 251–271.
- Troseth, G. L., Saylor, M. M., & Archer, A. H. (2006). Young children's use of video as a source of socially relevant information. *Child Development*, *77*, 786–799.
- Valkenburg, P. M., & Vroone, M. (2004). Developmental changes in infants' and toddlers attention to television entertainment. *Communication Research*, *31*, 288–311.