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Infants' visual attention to form and content features of television.

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INFANTS' VISUAL ATTENTION TO FORM AND CONTENT FEATURES OF TELEVISION

A Thesis Presented

by

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ABSTRACT

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FORM AND CONTENT FEATURES OF TELEVISION

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Children younger than two are exposed to one or two hours of television per day, yet there has been little study of infant television viewing. Since infants rely heavily on visual and auditory stimulation in developing social interaction strategies, television may be an ecologically significant factor in their lives (Hollenbeck & Slaby, 1979). Despite the importance, there has been no prior research on how much attention infants ordinarily pay to television at home, or to what they attend.

The current study videotaped 9 nine- to twenty-one month-olds while with television at home for seven to 10 days. The videotapes were coded using a computer-controlled coding system, which sampled every 24 s of time the child spent with TV. If the child was looking at the TV, a number of TV program attributes were coded including movement, cuts, animation, puppets, animals, men, women and children. Also coded were two content related features: overt

purposeful action (other than talking) and violence. If the child was not looking at the TV, every fourth sample was coded (because it was expected that overall infant attention would be low).

Percent attention to television was calculated for each child, as was an attention ratio for each attribute. Attention ratios were calculated as A/(A + B), where A equals the percent of time the attribute was present when the child was looking, and B equals percent of time the attribute was present when the child was not looking. If attention is not related to the occurrence of an attribute, the attention ratio is a neutral .5.

Visual attention to television increased with age and analysis of attention ratios indicated that attention was enhanced in the presence of movement, action without movement, singing, children, puppets, animals, and child content. Attention was lower in the presence of adult male TV characters in adult content.

In order to assess developmental trends in attention, the 9 infants were compared to 9 two- to three-year-olds. Attention to attributes of television programs did not vary with age, with two exceptions - attention to violence and animation increased with age. Furthermore, the interaction of age and overall attention level predicted movement, animation, and action attention ratios.

The observed results show no discontinuities with those obtained from older children. The increase in overall attention to TV with age may reflect an increase in the comprehension of program content.

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CHAPTER 1

INTRODUCTION

Television figures prominently in the lives of today's children, as 99% of homes contain at least one set (Singer, 1980). To date, most of the research on children's television viewing behavior has been conducted on school age children, with five year olds being considered young viewers.

This thesis concerns the TV viewing of a group which has received little study: infants. It has been estimated that children younger than two years of age are exposed to television between one and two hours per day (Anderson & Levin, 1976; Anderson, Lorch, Field, Collins & Nathan, 1986; Hollenbeck, 1978; McCall, Parke, & Kavanaugh, 1977).

Hollenbeck and Slaby (1979) suggested three reasons why we should expect that television is an ecologically significant factor in the lives of infants: (a) Infants rely heavily on visual and auditory stimulation in developing social interaction strategies, (b) they are highly receptive to television stimulation, and (c) they are exposed to a great deal of television in their homes. Despite the importance, there has been little systematic quantitative study of infant and toddler television viewing.

This study aims to fill some of the gaps in our knowledge about the onset of attention to television. Specifically, it will document the amount of time that infants are exposed to television at home, to what information they are exposed, and how they attend to that information.

Literature Review

The research conducted thus far has focused on two aspects of infant and toddler television viewing: exposure and attention. While it is useful to know the amount and type of television to which children are exposed, it is also important to assess attention.

Exposure to Television

Commercial television rating services do not record exposure to television by children under two years of age. Information about exposure to television is therefore limited to a relatively few small scale academic investigations.

One of the earliest reports of the amount of time that infants are present in the viewing room with television was provided by Clarke-Stewart (1972). She observed nine- to eighteen-month-olds and their mothers at home on seven occasions: 36 infants were visited when they were 10.5-, 11-, 11.5-, 14-, 16-, 16.5-, and 17-months of age. Each visit consisted of three half-

hour observation periods, resulting in 10.5 hours of data. It was noted that television was on during 58% of those half-hour observational visits.

Other studies provide evidence that six- to eighteen-month-old infants are exposed to between one and two hours of television per day (Anderson & Levin, 1976; Hollenbeck, 1978; Hollenbeck & Slaby, 1979; Nelson, 1973). These studies used global parental estimates or diary records to assess exposure. McCall and colleagues (1977) also used parental estimates, and found a developmental trend in exposure: forty one minutes per day at 18 months, 65 minutes at 24 months, and 115 minutes at 36 months. Carew (1980) also reported a developmental trend in exposure: TV occupied less than 1% of an infants' time at 12-15 months, 2% at 18-21 months, 3% at 24-27 months and 8% at 30-33 months.

The ecology of the home plays a role in infant exposure to television in at least four ways: (a) available programming, (b) actions and attitudes of family members reflected in the programming viewed, (c) demographic features, and (d) structural features of family life dictated by parents' work schedules and alternate activities.

The programming available to view in the United States is largely commercial entertainment television.

Children's programming makes up a small proportion of what is broadcast, and what does exist is geared towards children between two and 12 years. Also, approximately 15 - 20 percent of broadcast time is occupied by advertisements, according to a recent investigation by Collins (1992).

Family members' actions and attitudes are reflected in what parents and siblings choose to view. Children whose families provide a variety of intellectual stimulation at home (including reading) watch more educational television (Murphy, Talley, Huston, & Wright, 1991). Generally, viewing patterns of children reflect parental viewing habits (Chaffee & McLeod, 1972; Hollenbeck, 1978; Schramm, Lyle & Parker, 1961; Stein & Friedrich, 1972).

Demographic predictors of infant exposure to television have also been studied. Hollenbeck (1978) investigated the television viewing patterns of families with young infants, finding a negative correlation between infant exposure and mother's age. On average, six-month-olds were exposed to 2.03 hours of television per day. Socioeconomic status (SES) of the family did not correlate with infant exposure. Other studies, however, have detected SES differences: adults with higher educational and occupational levels generally

watch less television (Lyle & Hoffman, 1972). Similar SES differences in TV exposure have been found with three-month old infants (Roe & Bronstein, 1986).

Finally, the structural features of the family dictated by the nature of parents' work and child care arrangements contribute to large individual differences in viewing. Two and three year old children who attend out of home child care watch fewer children's educational television programs than those who stay at home (Pinon, Huston, Wright, 1989). However, preliminary work by Nancy Weinberger (personal communication, January 29 1994) found that when home-based day care owners were asked to rank the most important factors in infant day care, television ranked very highly, second only to safety. This suggests that children who attend day care in a home setting are exposed to more television than children enrolled in a center-based daycare program.

In summary, the data available verifies that infants are present in the viewing room much of the time the television is on. It is likely that large individual differences exist in the amount of television to which infants are exposed, but detailed information is not yet available on the variations in amount and types of programs viewed.

Attention to Television

Infant attention to television, operationally defined as looking at the screen, has also been documented. Anderson and Levin (1976) reported a dramatic increase with age in attention to *Sesame Street* shown in a laboratory setting for children ranging from one to four years. Younger infants tended to look for shorter periods of time than did older children (Anderson & Levin, 1976; see Figure 1). Four year olds looked at the television for an average of 15 seconds(s) per look, but the longest looks lasted up to seven minutes. One year olds, on the other hand, averaged 5 s per look with the longest look lasting about one minute. Anderson and Levin also noted a dramatic increase in the frequency of looking at the television at 30 months of age (See Figure 2, adapted from Anderson & Levin, 1976). Combined, the increase in frequency of looking and look length produced a linear increase in percent attention from age one to four years (See Figure 3, adapted from Anderson & Levin, 1976).

Lemish (1987), on the other hand, described children becoming "regular TV viewers" around 18 months of age, although her investigation did not attempt to quantify attention. She characterized "regular TV viewing" as selecting programs to view and having

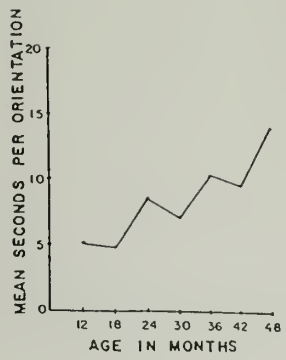

Figure 1 Mean duration of visual orientations to the TV as a function of age (adapted from Anderson & Levin, 1976).

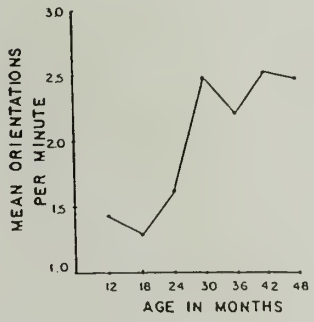

Figure 2 Mean number of visual orientations to the TV as a function of age (adapted from Anderson & Levin, 1976).

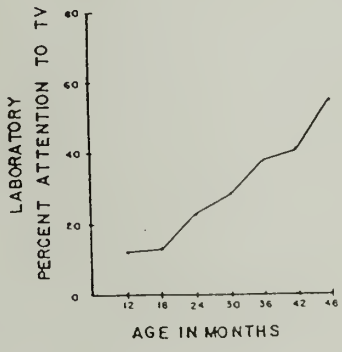

Figure 3 Laboratory TV viewing: percentage of viewing time as a function of age (adapted from Anderson & Levin, 1976).

favorite television shows that are watched at the same time each day.

Lemish conducted the most comprehensive study to date of infant and toddler television viewing behavior. She observed 16 children ranging in age from six months to three years over a six- to eight-month period. Mothers kept diary records and an experimenter visited each home on 4-5 occasions at varying times of day.

Lemish provided descriptions of babies' interactions with the television including: playing with TV knobs, walking up and touching the TV, asking to have the set turned on, talking back to *Sesame Street* characters and imitating television action. Prior to 9 months of age, infants' attention to the television seemed to be "captured" by the audio characteristics. Between 10 and 18 months, clear patterns of attention to particular content began to emerge. Of particular interest to this age group were commercials and *Sesame Street*, both of which have short segments. Of the 11 babies aged 12 to 18 months, seven were regular *Sesame Street* viewers. In addition to showing recognition of the music by dancing or running in from another room, mothers' reports and direct observations revealed that infants may have personal preferences for particular characters. Eighteen-month-old regular *Sesame Street*

viewers showed increased attention (as compared to segments of human conversation) to the following: (1) number and letter segments, (2) short skits, and (3) animated segments. This trend was observed for all viewers regardless of the age they began viewing *Sesame Street*. Across the ages (six months to three years), *Sesame Street* was the most popular program and the children watched between 3 and 6 hours per week with little seasonal variation.

While Lemish's study contributes important descriptive information, it is not without methodological limitations including: (a) great variation in detail of parents' diary records, resulting in vast differences in the amount of data on each child; (b) infants' interest in the experimenter during the session may have distracted them from their normal viewing behavior; and (c) presence of the experimenter may have increased parents' emphasis on television.

While research suggests that infants pay some attention to television, there is some debate concerning which factors draw a very young child's attention to TV and which factors then sustain that attention. One line of investigation concerns formal features of television (Alwitt, Anderson, Lorch & Levin, 1980; Anderson & Levin, 1976; Calvert, Huston, Watkins, & Wright, 1982;

Wright & Huston, 1983). Formal features are defined as the visual or auditory attributes of the medium which can be described without reference to thematic content. Features common to children's programming such as animation, peculiar voices and children's voices have been investigated.

Research on children 3 to 12 years of age has indicated that attention is depressed in the presence of men, neutral in the presence of women, and enhanced by animation, movement, lively music, and the presence of children or puppets (Alwitt et al., 1980; Anderson & Levin, 1976; Calvert et al., 1982; Schmitt, Collins, & Anderson, 1993).

The only study involving children younger than three was conducted in a laboratory using *Sesame Street* as a stimulus program (Anderson & Levin, 1976; Levin & Anderson, 1976). Seventy children, ranging in age from 12 to 48 months (10 children at each half-year interval), were observed and their attention to the TV during the presence and absence of a number of different formal features was coded. Levin and Anderson (1976) calculated percent attention in the presence minus percent attention in the absence of each attribute and averaged this for each age group. They demonstrated a relationship between attention, age, and formal features

such that attention to a particular formal feature increases or decreases, relative to the absence of that feature, with age (see Figure 4 for a graphical representation of significant results).

Some formal features, such as animation and cuts, did not influence attention in children younger than three years of age (Levin & Anderson, 1976; see Figure 4). Alwitt et al. (1980) have suggested that children may learn to attend in the presence of some formal features and learn to suppress attention in the presence of others. Infants under 30 months presumably have not yet accomplished this learning.

While the presence (or absence) of many formal features does not appear to influence attention in children younger than three, several of the attributes seem to enhance attention. Levin and Anderson's data suggest that 12- to 24-month-olds' attention is enhanced in the presence of animals and group singing. Also, twelve- and 24-month-olds' attention was enhanced during peculiar voices (see Figure 4).

Several of the formal features influenced attention, but did not interact with age. That is, these features were equally effective for infants and four year olds. Formal feature main effects were found such that attention was greater in the presence (than

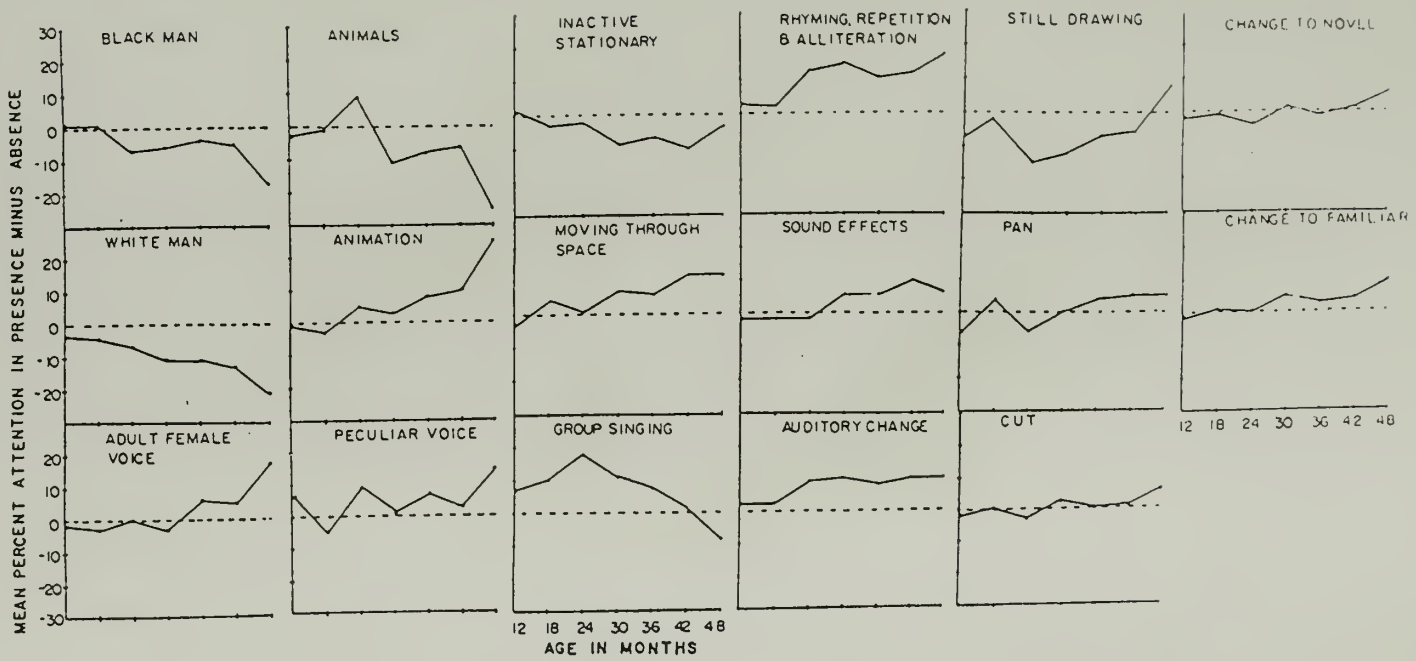

Figure 4 Significant formal features and mean difference in percent attention in the presence of the attribute minus percent attention in the absence of the attribute, as a function of age (adapted from Levin & Anderson, 1976).

the absence) of black females, children, childrens' voices, eye contact, dancing, singing and lively music. In addition, main effects were found such that attention was depressed in the presence of body parts (i.e. when the character's face could not be seen) and adult voices.

One study of the effects of formal features on attention (Alwitt et al., 1980) included commercials as part of the stimuli. Three, four, and five year old childrens' attention was continuously coded as they viewed tapes on three different occasions. Attention to commercials was enhanced relative to programs in three year olds, depressed in four year olds, and even more depressed in five year olds.

McCall, Parke, and Cavanaugh (1977) asked parents of 18-, 24-, and 36-month-olds which types of programs their children watched most. More than half of the parents reported that a children's educational program was the most regularly watched. Surprisingly, almost one-fifth of the parents of 18-month-olds reported that the most frequently watched TV "programs" were commercials. This is consistent with anecdotal reports: parents frequently report that their toddlers will attend to commercials before they begin to attend to programs. Nevertheless, two year olds' attention to

advertising and programming was virtually the same in one prior study of looking at TV in the home (Collins & Schmitt, 1993).

Another aspect of infants' attention to television was investigated by Hollenbeck and Slaby (1979). Six-month-olds were observed for four days watching 16 minutes of children's programming at home. The infants were placed in a playpen in front of a television without toys available: some were exposed to the picture only, some to the accompanying audio track only, and others to both the picture and the sound. Prior to and following each session, the TV was turned to a nonbroadcast station, so that audio noise was the only clear feature. Mothers were trained to record cumulative amount of time the infant's eyes were fixated on the television set. Infants looked at the TV almost twice as much when there was both sound and picture (49% attention) as when the picture only (31%), the sound only (23%) or the unpatterned sound-plus-picture (20%) were available. This study indicates that infants prefer an audio-visual display in which the audio is not discrepant. This verifies laboratory experiments investigating the ability of 3- to 6- month-old infants to perceive a relationship between the sound and visible appearance of an event (for a review see Spelke, 1987).

In sum, infants have been observed attending to television as young as six months of age. However, the available research also indicates that between 24 and 30 months there is a sharp increase in attention. Parents' anecdotal reports indicate that toddlers attend to commercials before they attend to television programs and a few studies have reported early attention to *Sesame Street*, which has a short segment format similar to commercials. The formal features research reported here suggests that infants' attention is not influenced by formal features, presumably because they have not learned their significance as older children have been theorized to do.

Infant Learning from Television

While toddlers pay some attention to television, a study by McCall and colleagues (1977) suggests that they may be less interested in televised events than in identical events performed in their environment (McCall et al., 1977). In the first experiment, 18-, 24-and 36-month-olds watched a female adult live or on television. Three year olds attended equally to both live and televised models, but eighteen-month-olds were less attentive to the televised models. The younger children imitated some of the behaviors of the televised model, but did so less than those of the live model. This may

be due to younger children's lower attention to the televised model. By three years of age imitation of target behaviors shown on TV was near perfect. In the second study, two year olds watched a same-sex child playing with toys. Imitation of children using the toys modeled on TV occurred almost 60% more frequently and/or accurately than nonmodeled toys. Seeing a toy modeled on TV also influenced style of play: modeled toys were contacted sooner than nonmodeled toys, and more time was spent playing with modeled toys than nonmodeled toys. This was manifested both in the play session immediately following modeling and 24 hours later.

Further evidence that young children remember and imitate what they see on TV comes from Meltzoff (1988). Fourteen- and 24-month-old infants were exposed to a TV depiction of an adult manipulating a novel toy in a particular way. Control groups were used in which the model was (a) seen alone, or (b) playing with the toy without the specific actions. When they played with the toy immediately after viewing, children at both ages imitated the specific action. This was further substantiated by the fact that almost half the 14-month-olds imitated the action a day later even though they had not played with the toy immediately after viewing.

While Meltzoff's study contributes important information about childrens' ability to retain and reproduce details 24 hours after viewing, even more striking evidence for the impact of TV on infants comes from work showing their ability to acquire language from television (Lemish & Rice, 1986). Infants and their mothers were observed using television in a manner analogous to a talking picture book. Picture-book reading is characterized as a situation that calls for joint attention and joint references, elicits a great deal of verbal labeling, and involves test questions from the parent as well as repetitions by the child of adult utterances. Television viewing, as observed by Lemish and Rice, could be characterized in the same way. The two situations differ in three ways: (a) Television does not allow one to control the presentation, so children and adults must react to what is presented; (b) children can view without the active participation of adults; and (c) the child and parent often time-share viewing with other activities. As parents engage in other activities they may call their babies' attention to the TV.

This study provided little quantitative data on babies' language learning but descriptives were plentiful. According to Lemish and Rice, babies were

observed pointing/labeling, asking questions about television content, repeating television dialogue and talking to their caregiver about what they saw. Children throughout the age range studied (6 months - 3 years) were observed designating what they saw on TV by pointing, and when old enough to speak, labeling objects. Between 1 year 8 months and 2 years, children's TV related comments broadened to include questions, repetitions & descriptions. For the children older than two years, designating disappeared at 2 years 5 months whereas questions, repetitions, and descriptions were still evident.

Nelson (1973) investigated the influence of physical and social factors, such as television viewing, on language acquisition. Eighteen children, who were 10- to 15-months-old when the experiment began, were studied until 25 months of age. Throughout the duration of the study, mothers kept records of their child's acquisition of first words. In addition, each child was visited at home once a month. Environmental reports were also requested from the mother, including the amount of time TV was on per day and the amount of time the child spent watching it. At 18 months, the mean number of hours per day that the child watched TV was 1.1 hours. Amount of viewing was significantly

negatively correlated with child's age at 50 words and age at 10 phrases. TV viewing was also negatively correlated with rate of acquiring words. Among environmental factors, amount of TV viewing was the second most important predictor of language acquisition. Contrary to the results of Lemish and Rice, this study suggests that large amounts of television viewing by infants may worsen language learning. However, amount of television viewing was negatively correlated with both mother's and father's education, constraining the interpretations one can draw about the relationship between TV viewing and language learning.

Clearly, infants **can** and **do** learn from television (McCall et al., 1977; Meltzoff, 1988; Lemish & Rice, 1986). Thus it is important to document exactly what they watch, how much is watched, and why they watch TV.

Theories of Attention to Television

There are three main theories of the development of attention to television. The first emphasizes orienting responses to perceptually salient forms, the second considers attention to be driven by comprehension, and the third proposes a developmental shift from attention being driven by forms to being driven by comprehension.

Forms. According to this theory (Singer, 1980), children are powerless to resist the mesmerizing, addictive appeal of television. "The activity in the TV is continuous but not rhythmic - new faces or settings appear from moment to moment and evoke an orienting response from us" (Singer & Singer, 1981). Moving figures capture the child's attention and even though they can only partially comprehend the meaning, they are powerless to resist looking at the screen. Other forms of television hypothesized to elicit and maintain attention include visual complexity, rapid changes, pans, zooms, and sound effects.

Comprehension. Anderson & Lorch (1983) propose a theory in which there is an active cognitive transaction between the viewer, the television, and the viewing environment. The viewer does not simply respond reflexively to inherently meaningless salient features of the medium. Rather, the viewer applies viewing strategies more or less appropriate to the program and viewing environment. In other words, if something understandable appears on the television and the child's alternative activity momentarily ceases, attention to television is prompted. Thus, factors that signal comprehensible content should receive the highest levels of attention.

Shift from form to content. The final theory of visual attention to be discussed was proposed by Huston & Wright in 1983. They draw upon the theory of Wright & Vliestra (1975) which proposes a major developmental shift from control by salient features to information-oriented scanning. Exploratory behavior, which is perceptually organized and predominates in less familiar situations, is a necessary precursor to systematic search behavior, which is more task- and goal-oriented. Beginning with the acquisition of object permanence, there is an increasing tendency to organize and systematize search in a logical manner. Perceptually salient forms would have their greatest influence on the attention of young or inexperienced TV viewers and the effects of salience would **gradually** decline with age and exposure to television. Attributes considered to be perceptually salient include physical motion, rapid pace, change, novelty, and intense auditory stimulation.

Summary

Clearly, infants are present in the viewing room with the television on, pay some attention to television, and are capable of learning from television. Despite television's role in the ecology of childhood, there has never been systematic quantitative observations of infants' attention to television at

home. The existing research is insufficient for two reasons. First, it is not clear how much infants actually pay attention to TV. This is important because if infants do pay attention, TV is potentially an important part of the learning environment. If infants pay no attention to TV, presumably they are not learning anything from television per se, except perhaps information about how family members respond when the television is on. Television may influence infants by distracting them from play or social interactions, but this hasn't been studied. Second, it is important to determine what infants pay attention to. If they are paying attention to television, it is important to ascertain what factors draw their attention. It is possible that principles for design of appropriate programming for children in this age group could be inferred from their attention to programming designed for older children or adults.

Goals of the present study

In the proposed study, nine 9- to 21- month-old infants were examined in the home television viewing environment. These children were videotaped watching TV for 10 days in their homes. Tapes were coded for visual attention to television and formal features of television.

These infants were also compared to nine children (ranging in age from 25- to 32-months-old) that were previously observed using a similar procedure so that age trends in attention could be assessed.

Predictions

Hypotheses based on the theories of attention to television will be generated about infant attention to TV. Within the different categories of television attributes, predictions will be made about the youngest group proposed to be studied (i.e. nine 9- to 21-month-olds) followed by predictions about age trends (i.e. including the nine two to three year olds, total N = 18).

Level of attention (Hypothesis one)

Singer. There should be high levels of attention as soon as the orienting reflex is well established (approximately 3 months old). According to this theory, age trends in attention are flat. Therefore, no age differences in attention are expected and we have no reason to believe that infants' attention would be different from 5 year olds' attention to television (i.e. approximately 60 percent based on one prior home viewing study; Anderson et al., 1986).

Anderson & Lorch. Infants should have low levels of attention to television because little TV content is

likely to be comprehensible to infants. Attention to television should increase with age, because of developmental changes in cognitive capacity (Stone, Smith & Murphy, 1973). Later in infancy, somewhat higher attention is predicted, based on content being more understandable.

Huston & Wright. It is not clear whether attention should be high or low. Although this theory would predict that infants' attention is driven by salient features (similar to Singer), it does not talk about attention in terms of the orienting reflex or other attentional mechanisms. Huston and Wright hypothesize that attention to some salient features decline with age and attention to features with meaning increase with age. Thus, while what they are paying attention to changes with age, it is still not clear whether attention should also show a developmental progression. Furthermore, while attention declines to salient features in general, there will still be some attention to perceptual features.

Cuts (Hypothesis two)

Singer. Greater likelihood of looking when cuts and/or scene changes are present than not looking when cuts are present. No differences in attention to cuts with age.

Anderson & Lorch. Slightly lower likelihood of looking than not looking in the presence of cuts. In general, cuts transmit meaning and are difficult for a very young child to understand. For example, a scene could abruptly change from a shot of the outside of a cabin to a shot of a woman sitting inside the cabin reading a book. The viewer would ordinarily infer that the woman is inside the cabin. Such an inference is likely beyond most infants. With age, attention should increase slightly in the presence of scene changes or cuts as toddlers should be able to better comprehend action sequences conveyed by montage.

Huston & Wright. Attention should be higher in the presence of cuts and scene changes. Attention to cuts should decrease with age as perceptually salient features receive less attention.

Action (Hypothesis three)

Singer. Attention may be slightly higher in the presence of action since it is typically associated with movement. Action segments without movement should not receive more or less attention than segments without any action. No differences in attention to action with age.

Anderson & Lorch. Greater likelihood of looking than not looking in the presence of action. Many of the actions portrayed on television are likely to be

comprehensible to infants (cf, Anderson & Smith, 1984), whereas many of the nonaction segments are likely to be incomprehensible since these are typically based on dialogue or narration. There should be no difference in attention to actions with movement and actions without movement. Attention to action should increase with age, as it becomes more comprehensible.

Huston & Wright. Infants' attention may be slightly positive in the presence of action, because most action segments contain movement. However, infants that have acquired object permanence (older than 18 months) should find televised actions more comprehensible than the younger infants and attention should increase. To the degree that action is associated with a high number of cuts, attention should decrease. Thus, it is not clear whether attention to action should increase or decrease with age.

Movement (Hypothesis four)

Singer. Greater likelihood of looking than not looking in the presence of movement. No age difference in attention to movement.

Anderson & Lorch. Attention should be slightly greater in the presence of movement, due to its correlated status with action. Since this theory predicts increased attention to action with age, attention to movement should also increase with age.

The effect should be smaller than the effect for action.

Huston & Wright. Attention should be greater in the presence of movement. Attention to movement should decrease with age.

Violence (Hypothesis five)

Singer. Infants will pay greater attention when violence is present, because of high amounts of movement. No age differences in attention to violence.

Anderson & Lorch. Looking behavior will not differ in the presence of violence. Attention to violence should increase with age, as it becomes more comprehensible.

Huston & Wright. Greater likelihood of looking when violence is present than not looking. Attention to violence should decrease with age as what was drawing attention was primarily movement.

Human TV characters (Hypothesis six)

Singer. Attention should be higher in the presence of human TV characters, as the human face is perceptually salient. No differences in attention with age.

Anderson & Lorch. Infants' attention will not differ in the presence or absence of human TV characters. Attention to human TV characters should not change with age.

Huston & Wright. No attentional difference when human characters are present or absent. Attention to human TV characters may increase because they are nonsalient and content-oriented.

Human Child TV Characters (Hypothesis seven)

Singer. Greater likelihood of looking than not looking in the presence of child TV characters, as the human face is perceptually salient. No differences in attention to child TV characters with age.

Anderson & Lorch. Equal likelihood of looking when child TV characters are present and not looking when child TV characters are present. Attention to child TV characters should increase with age, because they signal comprehensible content.

Huston & Wright. Equal likelihood of looking in the presence and absence of child TV characters. Attention to child TV characters should increase with age, as features with meaning receive more attention.

Human Adult Male TV Characters (Hypothesis eight)

Singer. Attention in the presence of male characters should be higher, as the human face is perceptually salient. No differences in attention with age.

Anderson & Lorch. Attention should not differ in the presence or absence of male TV characters. Infants

presumably have not yet learned to suppress their attention to male characters as older children do, which has been theorized to occur because males predominantly occupy adult programming and are associated with content that is difficult to understand. Attention to human adult male TV characters should decrease with age because toddlers will presumably have begun to learn that males are associated with adult content that is less comprehensible.

Huston & Wright. Attention should not differ in the presence of male TV characters. With age, attention to adult male characters should decrease, as they signal adult content.

Human Adult Female TV Characters (Hypothesis nine)

Singer. Attention should be greater in the presence of female TV characters. No age differences in attention to female TV characters.

Anderson & Lorch. Slightly greater likelihood of looking than not looking in the presence of female TV characters. Presumably infants have not yet learned that females on television typically signal children's programming and speak children's language. Nonetheless, attention is expected to be greater due to the learning that has occurred outside of television viewing, most infants have significant interactions with women as

caregivers. Attention to female TV characters should increase with age because toddlers will presumably have begun to learn that females on TV dance, sing, recite poetry and talk to children.

Huston & Wright. Equal likelihood of looking in the presence of female characters and not looking in the presence of female characters. Attention to adult female characters should increase with age, as they signal child content.

Nonhuman TV characters (Hypothesis ten)

Singer. Equal likelihood of looking and not looking in the presence of nonhuman TV characters (e.g. puppets, animate objects, animals, etc.). No age differences in attention to nonhuman TV characters.

Anderson & Lorch. Greater likelihood of looking than not looking when nonhuman TV characters are present on the screen, because they are comprehensible to very young children (i.e. animals and puppets are present in many homes and are represented in infant books). Likewise, animals and puppets on television are labeled by children at an early age (Lemish & Rice, 1986; Nelson, 1973). Attention to nonhuman TV characters should increase with age, as they signal comprehensible content.

Huston & Wright. Slightly greater likelihood of looking than not looking in the presence of nonhuman TV characters because their voices are perceptually salient. Attention to nonhuman TV characters should increase with age because they indicate child content. Also the peculiar voices of nonhuman TV characters signal humor (Huston & Wright, 1983).

Commercials (Hypothesis eleven)

Singer. Attention in the presence of commercials is expected to be higher than attention in the presence of programs. Advertisements contain more cuts and scene changes, as well as high levels of action. It is not expected that age differences in attention to advertisements will be found.

Anderson & Lorch. Equal likelihood of looking and not looking in the presence of advertisements. Although older children learn to suppress their attention to advertising, it is not expected that age differences in attention to ads will be found in the proposed study. Understanding of the intent of commercials is not present until approximately six years of age (for a review see Collins, 1992).

Huston & Wright. Greater likelihood of looking when an advertisement is broadcast than not looking when an ad is present. Attention to commercials should

decrease with age, as perceptually salient features are no longer the main determinant of attention.

Child Programs (Hypothesis twelve)

Singer. No differences in looking when adult and child programs are on with the exception of children's programs that contain more cuts and movement. Those programs should receive more attention. For example, *Sesame Street* should receive high levels of attention because it contains many cuts and a great deal of movement, whereas *Mister Roger's Neighborhood* should not.

Anderson & Lorch. Greater likelihood of looking at children's programming than adult programming. In particular, *Mr. Rogers, Sesame Street*, and *Captain Kangaroo* should receive the highest levels of attention. Numerous aspects of preschool children's programming such as puppets, animals, and the language of children's TV (Rice, 1979) are more understandable to infants. Attention to child programs should increase with age.

Huston & Wright. Equal likelihood of looking and not looking when children's programming is on. Early on, attention should be diffuse, spread across both adult and child programs, given the presence of salient features. Attention to child programs should increase with age.

Animation (Hypothesis thirteen)

Singer. Attention should be greater in the presence of animation. No age differences in attention to animation are expected.

Anderson & Lorch. Equal likelihood of looking and not looking when animation is broadcast, presumably infants have not yet learned that it signifies content appropriate for children. Attention to animation should increase with age.

Huston & Wright. Greater likelihood of looking than not looking when animation is present, due to the perceptual salience. It is not clear whether attention to animation should change with age. To the degree that animation is perceptually salient, attention should decrease. To the extent that animated programs are generally aimed at children, attention should increase.

Summary of Predictions

In general, Singer and Huston & Wright make the same predictions about infants' attention to television (see Table 1). According to these theories infants' attention to the television should be driven by that which is perceptually salient. Singer's theory does not recognize any differences in attention with age. Huston and Wright, on the other hand, believe that attention to salient features declines with age and attention to

features with meaning increases with age. Anderson and Lorch's predictions are based on the hypothesis that children pay attention to that which is understandable, and learn to pay attention to TV based on cues to comprehensible content.

Table 1

Predictions based on theories of attention

	Singer		Anderson & Lorch		Huston & Wright	
	infants	age trends	infants	age trends	infants	age trends
Overall Attention	High	none	Low	increase	.[e]	.
Cuts	++[a]	none	-[d]	increase	++	decrease
Action	+[b]	none	++	increase	+	.
Movement	++	none	+	increase	++	decrease
Violence	++	none	N[c]	increase	++	decrease
Human Characters	++	none	N	none	N	increase
Child Characters	++	none	N	increase	N	increase
Adult Males	++	none	N	decrease	N	decrease
Adult Females	++	none	+	increase	N	increase
Nonhuman Character	N	none	++	increase	+	increase
Ads	++	none	N	none	++	decrease
Children's Programs	N*[f]	none	++	increase	N	increase
Animation	++	none	N	increase	+	.

[a]++= enhanced attention
[b]+ = slightly positive
[c]N = neutral
[d]- = slightly depressed attention
[e]. = not clear what theory would predict
[f]* = neutral with the exception of programs with many cuts/ scene changes (e.g. Sesame Street)

CHAPTER 2

METHOD

Subjects

Data for this study are part of a larger investigation of childrens' television viewing behavior at home that was conducted in Springfield, Massachusetts during 1980 and 1981. The larger study included 334 families, 106 of whom had observational equipment installed in their homes. All the families had a child within one month of their fifth birthday. The sample was predominantly white, middle class and two-parent. Of the 106 families who agreed to have cameras installed, 99 provided usable video tapes. The families that did not have cameras installed in their homes served as controls. There was no systematic evidence that the families that had the television cameras installed were different from the control families (Anderson, Field, Collins, Lorch, & Nathan, 1985). Furthermore, it is unlikely that viewing by infants would be affected by the presence of cameras. For a more detailed description of the families and procedures see Appendix A.

Subjects for this investigation were nine children ranging in age from 9 to 21 months: two each were 10 months, 20 months, and 21 months, one each was 9 months,

1 months, and 15 months. Only two children were male. While it may be difficult to generalize the results obtained for girls to a population of boys, one prior study of looking at TV in the home did not find sex differences among two year olds (Collins, 1992). Sex differences have not been found in laboratory based studies of attention to TV by one- and two-year-olds (Anderson & Levin, 1976; Anderson, Lorch, Field & Sanders, 1981). The children in the present study had an average 2 siblings (range = 1 to 4). Subjects were chosen from the 99 camera-in-home families with usable video tapes on the basis of the following conditions: (a) the subject's age was between nine and 24 months; younger infants were not selected because Lemish (1987) determined that prior to this age attention was driven only by audio characteristics (this eliminated 2 children); (b) the subject was present in the viewing room for a minimum of 2 hours during the 10 day period (eliminated 1 child); (c) the subject was out of camera view less than 50% of the time (eliminated 2 children) and (d) television images were clear enough to rate television formal features (eliminated 2 children).

These subjects will be compared to nine two- to three-year-olds (Mean age = 29 months) whose behaviors

have already been coded in a similar manner to that described below.

Apparatus and Materials

Recording equipment was always placed in the primary television viewing room and any other room in which the five year old watched television. This procedure was effective in recording an average of 89% of television viewing time according to analyses conducted by Anderson et al. (1986) on concurrent viewing diaries. The viewing apparatus consisted of two video cameras, a black and white time-lapse video recorder, control circuitry, a screen splitter and a time/date generator. One camera was equipped with a wide-angle lens and was placed to cover as much of the viewing room as possible. The other camera was equipped with a zoom lens and was focused on the television set. Depending on room characteristics, the cameras were mounted either on a tripod or on a cart.

The equipment was designed such that the videodeck recorded only when the television was on. The image from the wide-angle lens was continuously recorded at a ratio of 1:36 (approximately one videoframe every 1.2 seconds). Every 18 seconds a 6 second image of the TV screen was inserted in the lower right hand corner of

the video tape (hereafter referred to as "inserts"). The time and date were continuously superimposed.

After approximately 26 hours of television viewing time, a light flashed signaling the parent to change the tape. A total of 5 tapes were supplied to each family allowing for approximately 130 hours of viewing over the 10 day period. Each family was also provided with a home viewing diary to record programs being watched and family members in the room.

Coding Procedure and Apparatus

The goal of the coding procedure was to document what features of television infants pay attention to, and what proportion of time infants actually pay attention to television.

Coders worked on one of two different rating stations. Each consisted of a TV monitor, a computer terminal/keyboard, a control box, a time code reader, a computer and a videodeck. The TV monitor is located next to the computer terminal/console and is used to view the videotapes. The time code reader sends the timecode to the computer. The control box serves as a remote controller of the videodeck and as a means of storing data created during rating sessions. The videodeck buttons are in the middle of the control box and allow the rater to move the videotape forwards and

backwards at different rates of speed. The video can be run at 60 frames/second(s), 30 frames/s, six frames/s or one frame/s, which corresponds approximately to real time in this time-lapse format. The blue coding buttons form a vertical row along the left edge of the button box. They are pressed to code TV screen insert characteristics and the subject's behavior. Whenever a coding button is used, the number of that button along with the timecode number of the current videoframe is recorded in a data file.

The videotapes were coded prior to the present study. This prior coding will be referred to here as "first pass". It is necessary to describe the procedure for first pass coding briefly so that the coding for the present study may be better understood. The first pass through the videotapes involved identifying and "marking" those videoframes when the television was turned on and off, and when individuals entered and exited the viewing room. A separate code was used to designate the presence of each family member. For example, when the 1 year old entered the viewing room, the rater pressed and released the rating button assigned to the 1 year old. That same button was pressed and released when the 1 year old exited the room. A unique number for each videoframe was stored in

longitudinal timecode (designed by the Society of Motion Picture and Television Engineers). SMPTE timecode is encoded on an audio track of the videotape and is readable at 30 frames/s or faster speeds. The second type of timecode the tapes contain is called VITC (vertical interval timecode) and is recorded in the vertical interval between frames. VITC is readable at any tape speed including still frames.

First pass data were processed to identify frame numbers of entrances and exits for each subject in the present study. The computer program used in this research advanced the tape at a high rate of speed to the times when the specified child entered the viewing room, as determined by first pass rating. When the frame that a specified child entered the viewing room was encountered, the tape automatically paused and thus allowed the coder to control the videodeck via the control box. The coder then advanced the tape to the last frame of the insert (containing an image of the TV screen). The insert was then coded for a number of TV program characteristics (described below). The next consecutive frame after the insert image disappears was coded for the subject's visual attention to the TV. When the subject exited the room or the television is turned off, a beep sounds. The coder then pressed the

space bar on the computer keyboard which would cause the computer to advance the tape to the next frame at which the child enters. Again, the tape is automatically put into the pause mode when the new entrance is encountered.

The insert rating included thirty-five measures which were divided into ten categories. These categories were chosen to be consistent with prior research conducted on older children and based on research indicating which features would be interesting to young children. The videotape does not contain audio, therefore the coding is based on visual information only. The measures and categories are as follows:

Violence

1. Present - Actual or imminent threat of physical harm to person(s) or property (e.g. a car exploding or a character aiming a firearm).
2. Absent

Action

1. Present - At least one character engaged in purposeful, non-communicative behavior. (e.g. a character driving a car or looking through a microscope. Action present would also be rated when a character is walking since they have a destination). A note was made

if the character(s) was singing.

2. Absent - (An example could be a passenger in a car or a baseball player leaning on a bat).

Movement

1. Present - Movement through space, that is, physical relocation of a character or of the central object of a scene. (e.g. A Sesame Street bit about the number seven which shows that seven shifting about on the screen).

2. Absent (e.g. a person setting down a coffee mug because even though the mug is moving through space, the character, not the mug, is the central focus of the scene. An additional example would be two still characters conversing in the center of the screen with horses running in the background: the horses are not the focus of the scene).

Number of Cuts/Scene Changes

Tally of the total number of changes in camera angle or scene that occur over the course of insert. Range from 0 to 5.

Format

1. Animated - Artificial, drawn images. If there is an animated character in a live scene, it will be coded as animation present because the animated character is the most salient portion of the image.

2. Video - Live images.

3. Video with Text - Text is super-imposed on video or text on a product is shot in such a way that it is clear the viewer is intended to read it.

4. Animated with Text - Text is prominent in animated displays.

Character Type

1. Human - video and animated portrayals of human beings.

2. Nonhuman - this category includes puppets and objects that are made to be animate (e.g. have eyes and/or mouth).

3. Animals

4. Object - this category refers to inanimate things.

5. Mixed - combination of human and nonhuman characters present.

Sex of Characters

1. Male

2. Female

3. Non-specific - this category is used for characters that are not sex-typed or in cases where sex is irrelevant (e.g. flying birds).

4. None - this code is used for objects.

5. Mixed - characters fitting more than one of the three categories (i.e. male, female and non-specific) are present.

Age of Characters

1. Adult - those characters who are clearly eighteen years of age or older, or mature organisms in the case of animals.
2. Teen - those characters who appear to be aged 13 to 17 years.
3. Child - those characters who are 12 years of age or less.
4. Non-specific - this category refers to a case when it is not obvious or is irrelevant whether the character is an adult, child or teen. For example, it is not obvious or relevant whether a pelican is an adult, child or teen.
5. Mixed - characters fitting more than one of the four categories (i.e. adult, child, teen, or non-specific) are present.
6. None - this category is applied to objects and text when humans and nonhumans are not present.

Content Type

1. Program - refers to both typical programs and other segments of the broadcast (e.g. short educational segments) that are not promoting the purchase or consumption of anything.
    a. Aimed at Adults (viewers aged 12 or older).
    b. Aimed at Children (viewers younger than 12).

2. Advertisement

a. Adult Ad - Category refers to an advertisement intended for an audience of viewers aged 12 or older.

b. Child Ad - advertisements intended for viewers younger than 12.

c. Non-specific Age Ad

Advertisement

1. Advertisement intended for males.
2. Advertisement intended for females.
3. Ad intended for both males and females.
4. Irrelevant - used when the broadcast has been coded as a program.

Each category also has an uncertainty code which was used in those instances when it was impossible to determine category membership.

The frame following each insert was judged for visual attention to the TV on the basis of three criteria. A look at the television was defined as the child's eyes being visually oriented toward the television. When the child was not facing the camera and his/her eyes could not be seen, judgement was based on the orientation of the subject's head. Not looking was defined as the child's eyes not being visually oriented toward the television. Finally, an uncertainty

code was reserved for those instances when it was impossible to determine if the subject was looking. For example, this occurred when a child moved out of view of the camera but was positioned in the room such that it was still possible for him/her to be watching TV.

If the subject was looking, the insert was coded. Only every fourth insert was coded when the subject was not looking. Every fourth insert of "attention uncertain" was also coded. All inserts during periods of nonlooking were not coded since it was likely that this age group of children would have quite low levels of attention to TV. This procedure allowed us to get a detailed description of what attributes characterize the programs when infants are present in the room and paying attention and also to get a sample of what was on the TV when they were not attending. In addition, coding "attention uncertainty" inserts enabled us to determine if anything systematically differed during those periods.

Interobserver Reliability

A standard tape for one child was rated by two experienced raters separately at different times. Operational definitions for insert characteristics were provided for raters in order to determine the proper coding for an insert and looking behavior.

The two raters' data files were compared and interobserver agreement for the insert attributes and looking behavior was calculated as percent agreement. The coding and training procedure produced high levels of agreement, ranging from 91.36% for movement to 100% agreement for violence. Agreement for looking at the television was also quite high, 95.06% agreement.

Phi coefficients or Spearman Rho coefficients were also calculated. The resulting coefficients ranged from .70 for movement to a high of 1.00 for violence. See Table 2 for a summary of interobserver reliability.

Data reduction

The raw data stored in the rater's data files was processed by means of an error checking program and a program which combined variables of interest. For example, to look at adult male characters, this program would find all instances where the following were coded: (1) human, (2) video, (3) adult, and (4) male or both male and female characters present. If any of the above were coded as missing, then for that frame, "adult male" was coded as missing.

Next, the raw data was converted to percentages. Two (presence or absence of formal feature) x two (looking or not looking) tables were generated for each child for each formal feature. From these tables, the

percent of time a formal feature was present when the child was looking (A) could be ascertained as well as percent of time the formal feature was present when the child was not looking (B). This information was used to calculate an attention ratio for each formal feature for each child. Attention ratios were calculated as A/(A+B). If attention was not related to the occurrence of an attribute, the attention ratio was a neutral .5.

Percent attention to television was also calculated for each child. This was calculated as total seconds looking at the television over the combined total of seconds looking at and away from the TV. This number represents the percent of time looking occurred when it could be observed without uncertainty. Percentage of time when attention was uncertain was also calculated for each child. This was calculated as total number of uncertain looking rates over the combined total of certain and uncertain looking rates.

Attention uncertainty percentages for the nine infants ranged from a minimum of 5.2% to a maximum of 26.52%. The subject with the highest amount of attention uncertainty spent a considerable amount of time playing in an area of the room out of view of the camera, but from where it was still possible for her to be watching TV. While 26.52% attention uncertainty is a

considerable portion of this child's potential looking time, this child was not in any way considered an outlier for any of the formal feature ratios or for overall percent attention. In addition, the average level of uncertainty for attention to the television was 15.68% for the nine infants and 16.59% for the full sample. While this amount is not trivial, there is still a great deal of data available for each child, as the attention uncertainty data only results in an average loss of 4 minutes/day. Nonetheless, it appears from this and previous research that coding visual attention to the television via time-lapse recording techniques results in times when a viewer's attention is impossible to monitor.

An analysis was conducted to determine whether amount of uncertainty varied with age. The nine two year olds were included in the analysis since this is an issue that could influence age trends. The result was nonsignificant, $F(1, 16) = .011$, $p = .92$.

Table 2

Inter-observer reliability

	Percent Agreement	Phi or Spearman Rho Coefficient
Violence	100.00	1.00
Action	97.53	.922
Movement	91.36	.697
Cuts	97.53	.954
Format	96.30	.915
Character Type	97.53	.936
Character Sex	97.53	.967
Character Age	96.30	.914
Content Type	97.53	.966
Looking	95.06	.884
Mean	96.67	.916

CHAPTER 3

RESULTS

The primary objective of the current study was to determine whether infants pay attention to television and to what characteristics of television programs they do or do not attend. Based on theories of attention to television, it was proposed that infants would attend to novel characteristics of television programs or comprehensible characteristics of TV shows. More detailed predictions have been presented individually (above) and the statistical test(s) of their veracity will be presented below. Basic descriptive information about infant television viewing is presented first.

Analysis of Individual Subjects

Appendix B presents descriptions of each infant's television viewing behavior, as well as results of Chi Square tests of significance[1]. These tests were conducted to determine whether each infant was discriminating his/her attention in the presence of any of the formal features. In summary, all the infants had neutral or positive attention ratios to child and nonhuman TV characters. Infants' attention in the

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[1] Chi square tests may be invalid since different sampling rates were used depending upon looking behavior. These were included to give the reader a rough idea of individual infants' attention to television.

presence of adult TV characters was also consistent. Eight of the nine infants' adult male attention ratios were equal to or lower than neutral. None of the infants differentiated his/her attention in the presence of adult female TV characters. Only two of the infants had positive attention in the presence of human TV characters in general.

Older infants, in particular, differentiated their attention in the presence of children's content. Only one of the infants (a 11 month old) differentiated her attention (as indicated by the Chi square test) in the presence of commercials. Five of the infants' animation attention ratios were greater than neutral.

All but one of the infants looked more when action was present than when action was absent. The Chi Square test was significant for 5 of these infants. Violence occurred so infrequently that there was not enough data to conduct Chi Square tests for each individual subject. Five of the infants' violence attention ratios were above neutral.

Amount of Exposure

Table 3 presents average daily exposure hours by the 9 infants observed in this study. Children were observed with TV an average of 56.98 minutes per day (standard deviation = 28.32 minutes). Exposure for the

lightest viewer (a 11 month-old) averaged 12.73 minutes per day as opposed to 102.89 minutes per day for the heaviest viewer (a 20 month-old). The pattern of means in Table 3 suggests that prior to age two, exposure does not vary with age. The statistical test of this observation verifies the lack of a relationship between time spent with television and subject's age, ($F(1,7) = .204$, $MSE = 890.51$, $p = .67$).

Notwithstanding, previous research including older children has found a developmental trend in exposure. In order to test this hypothesis, the 9 two-year-olds were included in the regression analysis. There was a positive relationship between age and time spent with TV, however, it was only marginally significant ($F(1,16) = 2.69$, $MSE = 2008.18$, $p = .06$, one-tailed). The nine two year olds spent an average of 1 hour and 12.30 minutes with television per day (S.D. = 46.99 minutes). While five of these children were with television for less than one hour per day, the remaining four were with television an average of 2.43 hours per day.

This verifies previous research stating that children younger than two are exposed to a great deal of television. On average, the 9 infants observed were with television 6 hours and 38.88 minutes per week.

This translates to 345 hours and 41 minutes over the course of a year.

Percent Visual Attention to Television (Hypothesis one)

An important goal of this study involves determining how much of the time that infants spend with television is actually spent looking at the TV. In addition, age changes in looking at television were of interest, both in relation to the theories of attention and in order to make comparisons with previous research on older children.

Amount of time spent with television was significantly correlated with attention to television (r = .468, $p < .05$). This result can be attributed to the four two year olds that were spending more than two hours per day with television also having moderately high levels of attention.

Table 4 presents average visual attention for each of the 9 infants observed in this study. Percent attention ranged from a minimum of 5.36 percent to a maximum of 62 percent. Attention to television increased as a function of age ($F(1,7) = 26.89$, M.S.E. = 108.44, $p < .001$; looking = -23.07 b_0 + 3.61 age in months). Attention averaged 31.91% (S.D.= 21.44%) for the infants observed in this study. The four infants younger than 12 months looked at the television an

average of 11.59% of the time they were with television whereas the five infants older than one looked at the TV much more frequently (M = 48.18%).

Anderson and Lorch's theory would predict that attention to television should increase beyond infancy. This was confirmed by regressing attention on age of the infants and toddlers, $F(1,16) = 5.09$, M.S.E. = 349.21, $p = .04$. The regression equation was looking = 7.62 b_o + 1.26 age in months. Attention averaged 39.23% for the two year olds (S.D. = 20.76%). However, there were large individual differences in attention. Three of the two year olds had low levels of attention (less than 20%) whereas the other six had moderately high levels (M = 52.38%). Although some of the toddlers had fairly high levels of attention, infant and toddlers' average attention was still much lower than five year olds' average level of attention (M = 58.5%, Anderson et al, 1986). It is also interesting to note that many of the one year olds paid as much attention to television as some of the two year olds, while the other two year olds seemed to be "pre-viewers". It appears that somewhere between 18 and 36 months, children begin to pay moderately high levels of attention to television, but some children (perhaps those that are more cognitively advanced) begin earlier than others.

This indicates that very young children are paying attention to television a substantial amount of time. On average, the infants were attending to television 2 hours and 22.8 minutes per week. The youngest viewer (a 9-month-old) watched television 26.11 minutes per week and the oldest infant viewer (a 22-month-old) watched television 5 hours and 18 minutes per week. This translates to 275 hours and 43 minutes over the course of a year.

Percent Exposure to Formal Features

Percent exposure to individual formal features was also calculated for each child. This was calculated as the number of samples a formal feature was present over the combined total of samples the formal feature was present and absent. This number represents the percent of time each formal feature was observed without uncertainty. It is important to note that these categories are not mutually exclusive. Percent exposure to each formal feature is presented individually for each child in Table 5. In general, the overall means are not discrepant from the values found for two year olds' exposure to the same categories and probably reflect general programming practices in television.

Tests of Theory-Based Predictions

The remaining analyses deal with infants' attention in the presence and absence of the formal features of

television. The different theories make distinct claims about infants' attention to the individual formal features. For example, based on the theories of Huston, Wright and Singer, Hypothesis 2 asserts that attention should be enhanced in the presence of cuts and scene changes. Based on the claims of Anderson and Lorch, Hypothesis 2 states that infants' attention should be depressed in the presence of cuts. The three predictions were assessed using the same tests. First, since group trends were of interest, a *t* statistic was used to test the hypotheses contrasting the infants' formal feature attention ratios to neutral. When testing directional predictions (i.e. negative or positive attention), one-tailed tests were conducted. All other *t*-tests were two-tailed. Secondly, since age trends are of considerable interest in this study, the formal feature attention ratios were regressed on the infants' and toddlers' ages.

A note about the analyses are in order. In some instances it was deemed appropriate to exclude a child from an analysis because there was only one instance where attention to that particular formal feature could be judged. It was also deemed appropriate to exclude a child from an analysis whose attention ratios were

identified as an outlier by the statistical package (studentized residual was significant, $p < .05$).

Cuts or scene changes (Hypothesis two)

Presence of cuts was defined as one or more cuts or scene changes within the previous 5 frames (approximately 1 s/frame) and absence of cuts was defined as zero cuts or scene changes within the previous 5 frames. More than half of the programming viewed by infants contained at least one cut or scene change (M = 55.06%, see Table 5). This is comparable to the amount of cuts/scene changes that are present in programming viewed by two and five year olds (Schmitt et al, 1993).

Infants' attention to cuts did not significantly differ from neutral, $t(8) = .32$, $p = .76$, two-tailed. The mean was barely above neutral, M = .506 (see Table 6). Furthermore, attention in the presence of cuts did not vary with age ($F(1,16) = .05$, MSE = .003, $p = .82$). The results for infants' attention to cuts/scene changes do not support any of the attentional theories.

Action (Hypothesis three)

Action was defined as purposeful, non-communicative behavior. Instances where action and singing were coded were combined with instances where action alone was coded. Nearly a quarter of the time infants spent with

television was comprised of action segments (M = 22.24%, see table 4). This indicates that a large proportion of the time infants spend in front of television is comprised of segments containing dialogue or narration. As can be seen in Table 5, action and movement are highly correlated. Only 7.84% of the time infants spent with television was comprised of action segments without movement. Examples of action without movement are given in Appendix C.

Infants' attention was higher in the presence of action, however, the relationship was only marginally significant, $t(8) = 1.45$, $p = .09$, one-tailed. The mean ratio was .546, see Table 6 for each infant's action attention ratio. In addition, infants' attention to action without movement was examined. Infants' attention ratios were higher in the presence of action without movement, $t(7) = 3.92$, $p < .01$ (M ratio = .597).

A t-test was also conducted to determine whether infants' attention varied in the presence of singing, a special form of action. The mean ratio was .648, attention was higher in the presence of singing, $t(7) = 2.55$, $p < .05$. All three theories predict higher attention in the presence of action, however both Singer and Huston and Wright would make this prediction based on actions' correlated status with movement. They would

not predict enhanced attention in the presence of action without movement. Thus, these findings are most supportive of Anderson and Lorch's theory, which does predict enhanced attention in the presence of action and action without movement.

Attention in the presence of action did not vary significantly with age ($F(1,16) = .08$, $MSE = .013$, $p = .78$), although the relationship between age and the action attention ratio was positive. Furthermore, attention in the presence of action without movement did not vary with age ($F(1,15) = 2.259$, $M.S.E. = .041$, $p = .15$). The lack of significance supports Singer's theory. Age differences in attention to singing could not be assessed since this formal feature was not coded in the research with two year olds.

Movement (Hypothesis four)

Movement was defined as physical relocation of a character or object. Approximately one-fifth of the infants' viewing segments contained movement through space ($M = 21.19\%$). Only seven percent of the infants' viewing segments contained movement without action (for examples of movement without action, see Appendix C). Again, this implies that a considerable proportion of the time that infants are with television, there is not much happening on the screen.

Infants' movement attention ratios were higher in the presence of movement, $t(8) = 2.99$, $p < .01$, one-tailed. The mean of the movement attention ratios was .552. In addition, infants' attention in the presence of movement without action was enhanced, $t(7) = 2.13$, $p < .05$, one-tailed, M ratio = .596). All three theories predict higher attention in the presence of movement, however Anderson and Lorch would make this prediction based on movements' correlated status with action. They would not predict enhanced attention in the presence of movement without action. Thus, these findings are supportive of Singer and Huston and Wright's theory, which would predict enhanced attention in the presence of movement without action.

Although there was a positive relationship between age and attention to movement, attention in the presence of movement did not vary significantly with age ($F(1,16) = .45$, MSE = .01, $p = .51$). Also, attention in the presence of movement without action did not vary significantly with age ($F(1,16) = 1.44$, $p = .25$). The lack of significance supports Singer's theory.

Violence (Hypothesis five)

Violence, or threat of physical harm to person(s) or property, comprised a very small percentage of the programming infants had the opportunity to view (M =

1.88%). This small amount of violence was also found with the two year old subjects.

Attention to violence did not differ significantly from neutral, $t(8) = -.146$, $p = .89$, two-tailed. The mean was .484, which signifies lower attention in the presence of violence. Attention to violence increased with age, $F(1, 9) = 4.36$, M.S.E. = .05, $p < .05$. However, some of the children did not view any violence or were only able to view one instance during this observation, so this analysis is based on a very small sample. Including the children who viewed only one instance does not change this finding. The results of the violence analyses support Anderson and Lorch's theory.

Human TV Characters (Hypothesis six)

Nearly half of the programming infants had the opportunity to view contained video portrayals of human beings (M = 44.22%).

Attention to human TV characters did not differ significantly from neutral, $t(8) = -1.52$, $p = .17$, two-tailed. Most of the infants had slightly lower attention in the presence of humans, the mean ratio was .478. The results for infants' attention to human TV characters support both the theories of Anderson and Lorch and Huston and Wright. Attention in the presence

of human TV characters did not differ with age ($F(1,15) = 1.52$, $MSE = .002$, $p = .24$). These results support the theory of Anderson and Lorch.

Human Child TV Characters (Hypothesis seven)

Child TV characters, or video portrayals of human characters age 12 or younger, were present in the programming viewed by infants very infrequently. In this sample, child TV characters were pictured less than 3% of the time infants spent with television.

Attention was greater in the presence of human child TV characters, $t(8) = 3.32$, $p < .01$, one-tailed. The mean was .703. This result supports the theory of Singer and is also consistent with Anderson and Levin's (1976) finding that child TV characters enhanced one to four year olds' attention. With age, attention to child TV characters increased, however this relationship was not statistically significant ($F(1,15) = 1.54$, $MSE = .04$, $p = .23$). This result supports the theory of Singer.

Human Adult Male TV Characters (Hypothesis eight)

Video portrayals of adult male TV characters comprised nearly one-third of the time infants were present in the viewing room with the television on ($M = 30.97$).

Attention was lower in the presence of adult male TV characters, $t(8) = -2.34$, $p < .05$, two-tailed. The mean ratio for attention to male characters was .412. This finding does not support any of the attentional theories. Further analyses were conducted on attention to adult male TV characters. Results indicated that while attention was significantly lower to adult male characters in adult programming ($t(8) = -3.208$, $p < .01$, M ratio = .453), attention to adult males in children's programming was not significantly different from neutral ($t(7) = -.289$, $p = .78$, M ratio = .468).

Attention in the presence of adult male TV characters did not vary significantly with age ($F(1,16) = .22$, MSE = .02, $p = .64$). This finding supports Singer's theory. It was only possible to assess age differences in attention to adult male characters by program type with the infants as intended audience of programming was not coded for the two year olds. There were no age differences in attention to either adult males in adult programs ($F(1, 7) = .014$, M.S.E. = .021, $p = .91$) or adult males in child programs ($F(1,6) = .000$, M.S.E. = .116, $p = .99$).

Human Adult Female TV Characters (Hypothesis nine)

Live portrayals of adult female television characters occurred much less frequently than portrayals

of adult male TV characters. On average, females appeared 17.11% of the time infants were present in the viewing room with the television on, approximately half as often as men appear. This is not unusual -- a review of 13 studies of the relative frequencies of adult males and females in TV programs found that adult males appear more than twice as frequently as females (Butler and Paisley, 1980 cited in Durkin, 1985).

Attention in the presence of adult female TV characters was not significantly different from neutral, $t(8) = .744$, $p = .48$, two-tailed. The mean was slightly positive, M = .511. This result supports the theory of Huston and Wright. Attention in the presence of female TV characters did not vary significantly with age ($F(1,15) = 1.58$, MSE = .01, $p = .23$). This result supports Singer's theory.

Nonhuman TV Characters (Hypothesis ten)

Nonhuman television characters were defined as video portrayals of puppets, animals, and other animate characters. Nonhuman TV characters appeared only slightly more often than child TV characters, on average, these characters comprised 3.97% of the infants' television programming.

Attention in the presence of nonhumans was strongly positive, $t(7) = 4.056$, $p = .005$, Mean ratio = .769.

Further examination of the data revealed that infants' attention was enhanced both in the presence of animals ($t(6) = 3.25$, $p < .01$, one-tailed, $M = .758$), and other nonhuman characters ($t(5) = 2.74$, $p < .02$, one-tailed, $M = .708$). These results support Anderson and Lorch's theory as well as Huston and Wright's.

Attention in the presence of nonhuman TV characters decreased slightly with age, however this relationship was only marginally significant ($F(1,14) = 3.81$, $MSE = .11$, $p = .07$). The lack of significance supports the theory of Singer.

Commercials (Hypothesis eleven)

Approximately one sixth of the time infants were present in the viewing room, commercials were aired ($M = 15.45\%$). This is consistent with the amount of commercials found in programming viewed by all ages (Collins, 1992).

Attention in the presence of commercials did not differ significantly from neutral, $t(8) = .98$, $p = .35$, two-tailed. The mean was positive, $M = .56$. Attention in the presence of commercials did not vary significantly with age ($F(1,16) = 1.21$, $MSE = .04$, $p = .29$). These results support Anderson and Lorch's theory.

Child Programs (Hypothesis twelve)

Children's content was defined as programs and advertisements aimed at children. In order to obtain a clear depiction of attention to children's programming in comparison to attention during adult programming, those instances containing non-specific age ads were excluded from this analysis. The amount of time children's programming was broadcast while a given infant was present in the viewing room varied considerably amongst the nine infants. One child was present in the viewing room with children's programming only 8.61% of the time she was with television whereas another child spent almost all of his time with television with children's programming (87.94%). The mean for the group however, was equal to half of the total programming, M = 51.25%. This is consistent with other studies in which two year olds exposure to childrens programming has been examined (Collins, 1992).

Attention in the presence of children's programming was positive, $t(8) = 2.45$, $p < .05$, M = .551. This result supports Anderson and Levin's theory. Age differences in attention to children's programming could only be assessed with the nine infants, as program type was not coded in the previous research with two year olds. Attention in the presence of child programs

increased with age ($F(1,7) = 2.46$, $MSE = .003$, $p = .16$), however this relationship was not statistically significant.

Animation (Hypothesis thirteen)

Animation was defined as artificial drawn images, those instances that contained text were excluded from this analysis. Approximately one-fourth of the programming viewed by infants contained animation ($M = 26.12\%$).

Attention in the presence of animation did not differ significantly from neutral, $t(8) = .327$, $p = .75$, two-tailed. The mean animation attention ratio was slightly positive, .512. Attention in the presence of animation increased with age ($F(1,15) = 3.46$, $MSE = .01$, $p < .05$, one-tailed). These results support Anderson and Lorch's theory.

Supplementary Analyses

Two types of supplementary analyses were conducted. The first supplementary analysis attempted to determine whether amount of time spent with television (controlling for age) would predict attention to television formal features. These analyses did not result in any significant findings.

The second supplementary analysis attempted to determine whether level of attention interacted with age

to predict attention to television formal features. The assumption underlying these analyses was that level of attention to television may be a better index of cognitive level than age of subject. Infants that are more cognitively advanced may pay more attention to television, presumably because they understand more of what is presented. In other infancy studies, attention has been considered definitional to intelligence (Stankov, 1983). In particular, the habituation of attention paradigm is frequently used as a predictor of later childhood intelligence. Since age is correlated with looking at the television, both variables were entered into the regression analysis. In the absence of a measure of television viewing skills, this combined factor was used as a rough index of learning and development.

The supplementary regression analyses were successful in predicting attention to a few of the formal feature attention ratios. The interaction between age and level of attention significantly predicted attention ratios to animation, $t = 1.77$, $p < .05$. Furthermore, the interaction term predicted action ($t = 1.51$, $p < .05$, one-tailed) and movement attention ratios ($t = 1.47$, $p < .05$, one-tailed).

Summary of research findings

Visual attention to television increased with age and analysis of attention ratios indicated that attention was enhanced in the presence of movement, action without movement, child content, singing, children, puppets, and animals. Attention was lower in the presence of adult male TV characters in adult programs. Attention to the formal features of television programs did not vary with age, with a few exceptions. Violence and animation attention ratios increased with age. Furthermore, the infant's overall attention level interacted with age to predict animation, action, and movement attention ratios. See Table 7 for a summary of significant results.

Table 3

Mean exposure to television

Subject	Age (months)	Time with TV / day
MJ	9	47.27 m.
AM	10	1 hr. 33.23 m.
JZ	10	56.46 m.
SA	11	12.73 m.
MW	15	46.39 m.
JC	20	1 hr. 42.89 m.
JT	20	39.32 m.
TK	21	41.21 m.
CB	21	1 hr. 13.35 m.
Mean	15.2	56.98

Table 4

Mean percent attention to television

Subject	Age (months)	Percent Attention
MJ	9	7.90
AM	10	5.36
JZ	10	22.30
SA	11	10.79
MW	15	43.01
JC	20	55.20
JT	20	31.86
TK	21	48.84
CB	21	61.97
Mean	15.2	31.91

Table 5

Percent exposure to form and content features

	Commercials	Violence	Action	Action no move	Singing	Movement no action	Movement	Cuts	Animation	Human	Nonhuman	Child	Adult Male	Adult Female	Child Content
MJ	22.56	.62	27.91	11.80	2.45	8.07	23.46	57.32	8.83	72.48	0.31	1.23	43.96	43.39	8.61
AM	16.5	1.31	28.13	12.20	2.83	11.46	27.09	54.64	42.69	34.21	5.26	2.82	21.92	11.11	73.02
JZ	13.27	4.98	14.58	2.77	2.03	9.96	21.77	60.52	33.33	44.73	6.84	1.68	32.83	12.95	62.02
SA	9.68	1.61	25.00	6.67	0.0	8.33	25.81	56.45	33.93	43.55	0.00	3.23	29.51	9.84	52.54
MW	11.82	3.75	17.42	6.74	2.81	5.24	15.89	63.48	40.53	36.59	6.94	2.49	27 12	7.12	76.49
JC	19.28	1.36	19.85	8.52	3.00	3.19	14.52	50.05	17.49	14.87	3.49	3.23	27.89	19.28	57.27
JT	24.47	1.9	31.33	12.05	0.96	6.27	25.83	47.28	26.61	54.48	0.71	2.14	32 04	21 36	28 95
TK	8.0	.67	18.80	6.99	3.00	5.32	17.14	45.49	23.22	37.27	10.48	4.88	20.74	8.6	87.94
CB	13.5	0.73	17.15	2.80	0.97	4.87	19.22	60.34	8.49	59.81	1.71	2.31	42.68	20.37	14.4
$\bar{X}$	15.45	1.88	22.24	7.84	2.01	6.97	21.19	55.06	26.12	44.22	3.97	2.67	30.97	17.11	51.25

Table 6

Individual infants' attention ratios

	Commercials	Violence	Action	Action no move	Singing	Movement no action	Movement	Cuts	Animation	Human	Non-human	Child	Adult Male	Adult Female	Child Content
MJ	0.52	0 00	0.56	0.67	0.42	0.66	0.56	0.45	0.56	0 50	1 00	0.50	0.45	0.57	0.35
AM	0.48	0 56	0 60	0.60	0.59	0 60	0.60	0 52	0 52	0 45	0.55	0.69	0.35	0 48	0 54
JZ	0.56	0 42	0 58	0 64	0 70	0 52	0.58	0 42	0.34	0 55	0 71	0.63	0.57	0 50	0 49
SA	0.89	0.00	.0 42			0.42	0 42	0.61	0.62	0 42		1 00	0 17	0 57	0 57
MW	0.48	0 66	0.55	0.56	0 57	0 78	0 55	0 51	0 47	0 53	0.53	0 63	0 50	0 47	0.52
JC	0.64	0 71	0 57	0 60	0 63	0 48	0 57	0 53	0 44	0 50	0.85	0 75	0 43	0 53	0 54
JT	0 52	0 47	0 59	0 55	1 00	0 63	0 59	0 49	0.67	0 46	1 00	1 00	0 39	0 54	0 69
TK	0 48	1 00	0 57	0.69	0.67	0 47	0.57	0 46	0.57	0 44	0 63	0 59	0 39	0.47	0 57
CB	0.53	0.55	0.54	0.47	0 63	0.81	0.54	0.56	0.42	0.46	0.87	0.55	0 46	0.47	0 48
$\bar{X}$	0 57	0.48	0 55	0.60	0 58	0.60	0 55	0.51	0 51	0 48	0.77	0.70	0.41	0.51	0 55

Table 7

Summary of results

	Infants	Age trends	Ratio increased (age and looking)
Overall Attention	low to moderate	increase	XXXXX
Cuts	N	none	no
Action	N	none	yes
no movement	enhanced	none	no
Singing	enhanced	none	no
Movement	enhanced	none	yes
no action	enhanced	none	no
Violence	N	increase	no
Humans	N	none	no
Child Characters	enhanced	none	no
Adult Males	depressed	none	no
Adult Females	N	none	no
Nonhumans	enhanced	none	no
Puppets	enhanced	none	no
Animals	enhanced	-none	no
Advertisements	N	none	no
Child Content	enhanced	XXX	XXX
Animation	N	increase	yes

CHAPTER 4

DISCUSSION AND CONCLUSIONS

Previous research indicates that children younger than two are exposed to one or two hours of television per day, yet there has been little study of infant television viewing. In particular, there has been no prior research on how much attention infants ordinarily pay to television at home, or to what they attend. The current study sampled every 24 s of time infants spent with TV at home and examined their looking behavior. If the child was looking at the television, a number of TV formal features were coded. If the child was not looking, every fourth sample was coded. Specifically, infants' attention to the different television formal features was compared to neutral. Developmental trends in attention were assessed by comparing these infants to two- to three- year-olds. Evaluation of the attentional theories with regard to predictions about infant television viewing are presented below (for a summary see Table 8). Evaluation of the research findings in terms of the prior research, learning, and development follows.

Evaluation of theories

Singer's theory

According to this theory, children are powerless to resist the mesmerizing, addictive appeal of television

(Singer, 1980). Moving figures, rapid changes, pans, and other perceptually salient features should capture and maintain a child's attention. Singer's reflexive theory would predict that all children older than three months should have high levels of attention and age trends in attention should be flat.

Supportive evidence was only found for one of these important factors: Infants' movement attention ratios were higher. Most importantly, infants' overall attention was not uniformally high, changed with age, and did not differ from neutral in the presence of cinematic techniques such as scene changes. These results contradict important predictions of Singer's theory.

Singer's theory was accurate in predicting the lack of a relationship between age and attention to many of the formal features. While these findings would seem to provide strong support for his reflexive hypothesis, there are several reasons why the theory is lacking in this regard. First, previous research with older children has shown age differences in attention to many of the formal features studied here (Alwitt et al., 1980; Anderson & Levin, 1976; Calvert et al., 1982; Schmitt et al., 1993). Thus, including older children in the regression analyses would almost certainly result

in age differences. Secondly, the theory was correct in predicting both the direction of attention and the corresponding age change in only two instances. That is, the theory correctly predicted that attention would be greater in the presence of children and movement and that this would not vary with age. Neither of these findings very strongly contradicts the other theories. Infants' enhanced attention to child TV characters is not surprising because these characters are likely to be familiar and interesting to infants and toddlers. Previous research found that child TV characters enhanced attention of one to four year olds equally (Anderson & Levin, 1976), but lowered eight and eleven year olds' attention (Schmitt et al, 1993). Both Anderson and Lorch and Huston and Wright would predict enhanced attention in the presence of movement as well. However, the theory was more accurate than Anderson and Lorch's in predicting enhanced attention in the presence of movement without action. Furthermore, it is not completely accurate to say a relationship does not exist between age and attention to movement. When age was combined with a measure of learning/development (i.e. overall attention), the relationship was significant.

In sum, while Singer's theory was accurate in predicting several of the individual hypotheses, the

theory was rarely correct in predicting both the direction of attention and the corresponding age change. Thus, the theory did not give an accurate depiction of infant and toddler television viewing. This indicates that even infants are not just responding reflexively to television.

Anderson & Lorch's theory

According to this theory, a child attends to the television when something understandable appears on the set and the child's alternative activity momentarily ceases. Factors that signal comprehensible content (e.g. simple actions, movement through space, and nonhuman TV characters) should receive the highest levels of attention. Infants should have low overall levels of attention to television because little TV content is likely to be comprehensible to infants. Attention to television should increase as cognitive capacity increases.

The most important prediction posited by this theory was confirmed: attention to television increased with age. Infants' attention was not as low as predicted (attention averaged 30%), however it was lower than toddlers' and preschoolers' attention. Thus, although much of television content must be difficult for infants to understand, they attended to it

approximately one third of the time they were with television.

The theory accurately predicted the direction of infants' attention to 8 of the 12 formal features studied here.[2] Examination of the four instances where the theory was not accurate indicates that two were incorrect because infants differentiated their attention in the presence of these features earlier than expected. That is, Anderson and Lorch predicted that older infants and toddlers would have depressed attention in the presence of adult male TV characters and enhanced attention in the presence of child TV characters. Yet even the youngest infants varied their attention in the presence of these character types (e.g. 8/9 infants had higher attention in the presence of child TV characters, one child's attention was exactly neutral). The other incorrect predictions were for attention to cuts (predicted slightly negative attention) and adult females (predicted slightly positive attention). In both cases, attention ratios barely differed from neutral (M = .51). Furthermore, while Anderson and Lorch were correct in predicting enhanced attention in

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[2] Attention was enhanced in the presence of action without movement; however, in the presence of action overall the test was only marginally significant. Due to the small sample size, there may not have been enough power to detect this relationship.

the presence of movement, they failed to predict that attention would be enhanced in the presence of movement without action.

Anderson and Lorch's theory accurately predicted the pattern of age changes more than half of the time. As noted above, two of the formal feature predictions were incorrect not because attention was expected to be in a different direction, but because the features were effective earlier than expected. Of the three remaining incorrect age-related predictions (i.e. cuts, nonhuman and female TV characters), the most surprising is that attention was not greater in the presence of adult female TV characters. However, when looked at in the context of their viewing of other features, the only human character type to which attention was enhanced was children. Attention was slightly negative to humans in general and depressed in the presence of adult male TV characters. They may not have suppressed attention to adult female characters as they did with adult male characters because of their interactions with female caregivers.

In summary, Anderson and Lorch's theory was somewhat accurate in predicting infant and toddler television viewing. This theory is useful as a general guideline about what one might predict about infant

television viewing, however it does not explain the complete picture.

Huston and Wright's theory

According to this theory, a major developmental shift in attention follows a progression such that very young infants' attention should be controlled by salient features and with age attention should shift toward features with meaning. Perceptually salient forms (e.g. movement, change, novelty, and intense auditory stimulation) should have their greatest influence on the attention of young or inexperienced TV viewers and the effects of salience should decline gradually with age and exposure to television.

This theory was accurate in predicting the direction of infants' attention to 4/12 formal features. One of the most important predictions pertaining to perceptual salience was confirmed (i.e. attention was enhanced in the presence of movement); however, the others were not (i.e. attention did not differ from neutral in the presence of cuts, violence, or advertisements). Furthermore, the theory was never accurate in predicting age changes in attention (there were four instances where it was not clear what the theory would predict about age changes, so the theory may not be completely inaccurate in this sense). Thus,

it appears that this theory is underspecified and therefore does not help to explain this data.

Summary

None of the attentional theories were written specifically about infant television viewing. Therefore, it is not surprising that none of the theories were completely accurate at predicting infants' attention to television. There are limitations to each of the theories; nonetheless these theories do give us guidelines for interpreting the findings of the present study. In the context of Singer's theory, it appears that infant television viewing is not reflexive in nature. In the context of Anderson and Lorch's framework, it is surprising that infants attend to television so early. In terms of Huston and Wright's theory, the age trends described do not appear to exist within this age group.

A note about the theories is in order. For the purposes of this thesis, the theories were summarized to be more simplistic than they actually are. The theories discuss audio characteristics which might maintain or capture attention; however, since the videotapes did not contain audio, these aspects of the theories were not discussed here. Also, the different theories are not completely distinct. For example, perceptually salient

features may capture attention to television while comprehensible features maintain attention. Unfortunately, attention getting and holding aspects could not be examined in this research. Nonetheless, it is important to note that the theories of attention to television are not mutually exclusive.

Evaluation of Attention Findings

Although this study was written as a test of theory-based predictions, the primary value of the present study is its descriptive nature. This study represents a first step in systematically documenting infant and toddler attention to television at home. The present study documents infants' exposure to TV, attention to TV, and information about to what formal features infants attend.

Infants' attention to television was moderately low (M = 31.91%). The five children older than one year paid much more attention to television and at levels similar to that of the two year olds. This offers preliminary evidence that systematic television viewing may begin earlier than 30 months as claimed by Anderson and Levin (1976). However, the data from the two year olds was collected at a less frequent rate than the data collected on the infants (once every 5 minutes compared to every 24 seconds) and the sample size is rather

small. Thus, generalizations based on this finding should be generated with care.

An age main effect was found for attention to television (see Figure 5) such that older children attended more than younger children. This is consistent with Anderson and Levin's (1976) finding that attention to television increases with age and also verifies prior research which notes a linear increase in attention from low levels in infancy to a maximum during the late elementary school years (Anderson et al, 1986). The increase of overall attention to TV with age may reflect an increase in the comprehension of program content.

Cuts/scene changes

Infants' attention was neutral in the presence of cuts/scene changes and did not vary with age. This finding is consistent with other work including one and two year olds. Anderson and Levin (1976) found that attention was neutral in the presence of cuts/scene changes until 30 months of age, at which time attention was enhanced. After 30 months, attention to cuts/scene changes increased with age.

Attention in the presence of cuts/scene changes has also been studied with a wider age range of children. Schmitt, Collins and Anderson (1993) examined two, five,

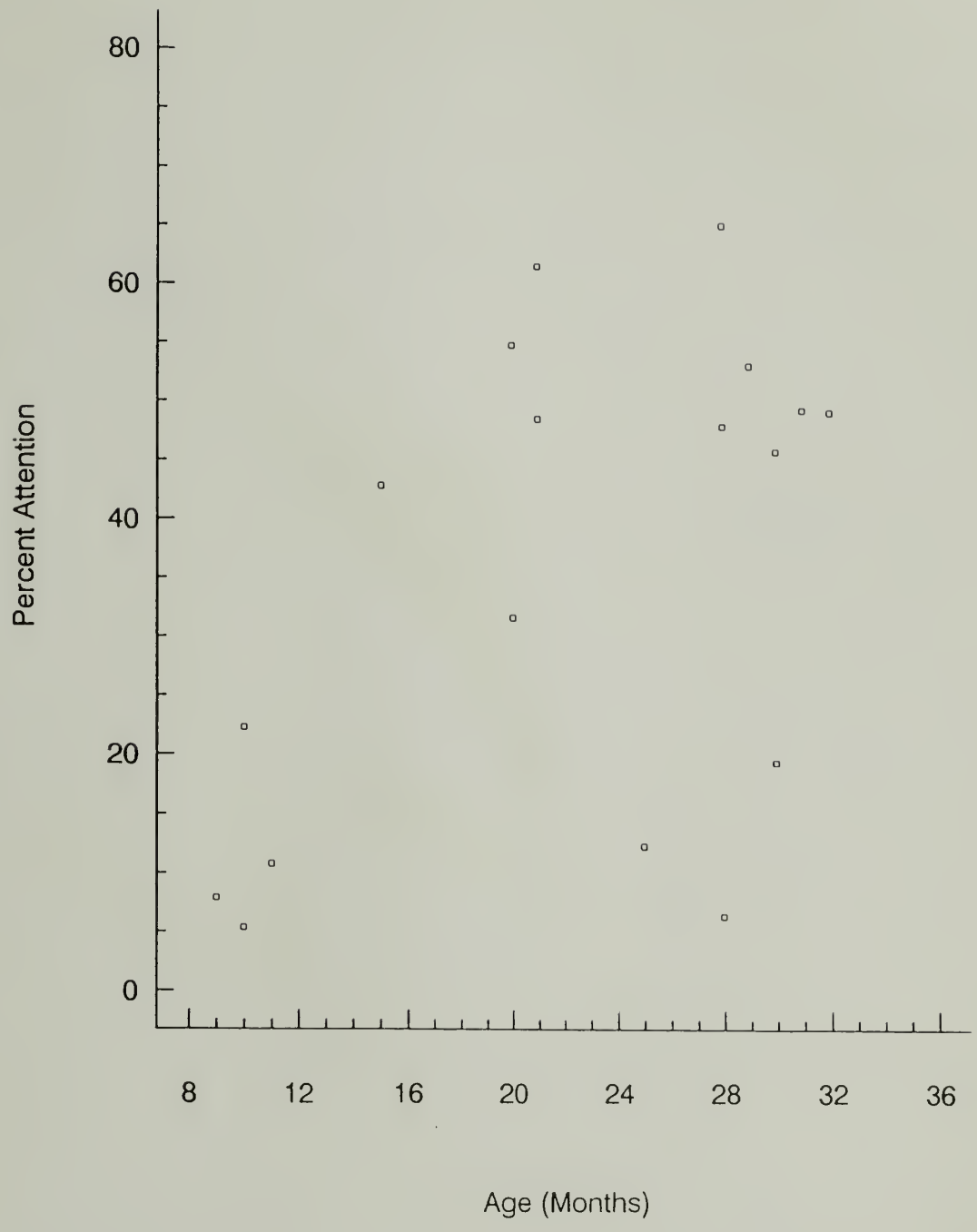

Figure 5 Percent visual attention to television as a function of age.

eight, and eleven year olds' attention to many of the formal features studied here while viewing TV at home. Eight and eleven year olds' attention was significantly higher in the presence (relative to the absence) of cuts/ scene changes. Since the ability to understand cinematic events conveyed through camera techniques and film editing substantially increases with age (Smith, Anderson, & Fischer, 1985) this pattern of results is not surprising when interpreted in terms of the comprehensibility theory. Presumably, much of what is televised is difficult for infants to understand, especially segments containing many cuts/scene changes. What is most surprising is that attention was not even lower in the presence of cuts/scene changes. However, cuts was examined as a dichotomous variable (did or did not occur during the last six seconds), so one cut could have occurred five seconds prior to the onset of a look. Examining the number of cuts that occurred during the insert would be a better measure of how much of what the infants were attending to was understandable. Segments that contain many cuts/scene changes are certainly more difficult to understand than segments that contain only one cut or scene change.

Action

Infants' action (purposeful overt character behavior) attention ratios were positive and attention was enhanced in the presence of actions without movement. Attention to action increased with age, however this relationship was not significant. These results are consistent with those of the one prior study that examined attention in the presence of action. Schmitt et al (1993) found significant enhanced attention to action by two to eleven year olds. Attention in the presence of this content-related feature did not vary with age. Many of the actions portrayed on television are likely to be comprehensible to infants (cf, Anderson & Smith, 1984) and even older children's comprehension benefits from TV portrayals which present messages through overt character actions (Hayes & Birnbaum, 1980). So while older children benefit from attending to both action and non-action segments (i.e. character speech), very young childrens' comprehension should benefit primarily by attending to purposeful behavior.

Movement

Attention was enhanced in the presence of movement overall and movement without action. In addition, while age alone did not predict attention to movement, a

measure of learning and development (i.e. overall attention and age) predicted attention to movement. Prior research with one to four year olds found that attention was greater in the presence of movement (Anderson & Levin, 1976). In addition, attention to movement increased with age.

Infants' enhanced attention in the presence of movement may be explained by the theory of perception developed by Eleanor Gibson (1987). This theory asserts that movement provides the most important information for perception and that attention is therefore drawn to movement from birth on. However, this interpretation does not explain why attention to movement would increase with age and overall attention.

Violence

Infants' attention was neutral in the presence of violence and was progressively more positive with age. Prior research examining attention in the presence of violence (Schmitt et al, 1993) found that two to eleven year olds' attention was enhanced and that attention in the presence of violence did not interact with age. Perhaps young infants do not understand violence and therefore do not pay attention to it, but once they understand violence they attend to it.

Human Characters

Attention in the presence of human characters was neutral and did not vary with age. Attention in the presence of human TV characters has not been studied with older children; this character type was only of interest in the context of Singer's theory.

Child TV Characters

Attention was enhanced in the presence of child TV characters and looking at this character type did not vary with subject's age. These results are consistent with Anderson and Levin's (1976) finding that child TV characters equally enhance attention of one to four year olds. Schmitt et al (1993) also found that two and five year olds' attention was enhanced to child TV characters, however eight and eleven year olds had lower attention in their presence. It is likely that attention decreases to child characters at these older ages because older children are becoming more interested in adults and adult programming.

Adult Male TV Characters

Infants' attention was depressed in the presence of adult male TV characters. This did not vary with age. Anderson and Levin (1976) found progressively larger negative attention to adult male characters with age. However, the older children in that study were four year

olds. The lack of an age main effect in the present study may be due to the small age range studied.

Attention in the presence of adult male TV characters has also been studied with children up to twelve years of age (Schmitt et al., 1993). At the oldest age studied, attention was neutral in the presence of adult males whereas at all the younger ages attention was depressed. Since attention to adult male characters was associated with program type (attention was depressed to adult males in adult programs), this seems to be a logical finding. Infants depress their attention to this character type in the context of adult programming. With age, attention becomes more neutral to adult males as children shift toward adult programming. However, Anderson and Levin (1976) and Alwitt et al. (1980) found depressed attention to men even in the context of children's programs.

Another aspect of this finding is not consistent with prior research. Alwitt and colleagues (1980) interpreted childrens' depressed attention in the presence of adult male TV characters as something that is learned from experience viewing television. In the present study, however, 8/9 infants had lower attention in the presence of adult male TV characters. Thus it appears from the present research that depressed

attention to this character type is not something learned from experience with television. In fact, differential speech preferences have been found with newborns. Infants ranging in age from 2 days to 9 months old looked at a TV monitor more frequently when infant-directed speech ("motherese") was spoken than adult-directed speech (Cooper & Aslin, 1990), especially when delivered by a female speaker (Werker & McLeod, 1989). While motherese is rarely spoken on television, the language on children's television shows is more understandable than language on adult programs (Rice, 1979). Even infants may be sensitive to this difference.

Adult Female TV characters

Attention was neutral in the presence of adult female TV characters and did not vary with age. The children in Anderson and Levin's 1976 study showed progressively larger positive attention to adult female voices with age. Since attention was not positive until age three, this may explain the lack of age differences in the present study.

Nonhuman TV characters

Attention was enhanced in the presence of puppets, animals, and other nonhuman characters. Anderson and Levin (1976) also found enhanced attention in the

presence of these character types. Puppets were equally effective for increasing one to four year olds' attention, whereas attention to animals was enhanced until 30 months, at which time attention was depressed and continued to decline steadily thereafter.

Advertisements

Attention was neutral in the presence of advertisements. Collins (1993) examined two to twelve year olds attention in the presence of commercials versus program content. The youngest group to show a significant difference to advertisements compared to program content was the seven and eight year olds -- they preferred program content. This effect was even more significant in the eleven and twelve year olds. Thus, the extent to which attention was depressed in the presence of advertising increased linearly as a function of age. Hence, it is not surprising that infants, who can not understand the intent of commercials, were not depressing their attention to this content type. Both programs and commercials should be difficult for infants to understand, so it is not unexpected to find that they did not differentiate their attention between these content types.

These findings are not consistent with parents' anecdotal reports that their toddlers attend to

commercials before they begin to attend to programs. Since adults pay more attention to TV during programs than during commercials, they may fail to observe their child's looking behavior during programs. The present study's finding that one and two year olds did not differentiate their attention in the presence of commercials and programs is also inconsistent with Alwitt and colleagues' (1980) finding that three year olds had enhanced attention in the presence of commercials. An explanation for this finding may lie in the particular commercials selected for inclusion in their study.

Children's Programming

Attention was enhanced in the presence of children's programs. The two year olds' attention in the presence of TV programs was not categorized according to intended audience, therefore age trends could only be examined with the nine infants. There was a positive relationship between age and attention to children's programming, however this finding was not significant.

Collins (1993) also examined attention in the presence of children's programming compared to adult programming. Two to eleven year olds' attention was enhanced in the presence of children's programming.

This is consistent with the comprehensibility hypothesis, with the exception of the eleven year olds. Unexpectedly, even eleven year olds were interested in content intended for younger audiences.

Animation

Attention was neutral in the presence of animation and increased with age. Anderson and Levin (1976) also found an interaction between age and attention to animation. Research with older children (Schmitt et al, 1993) also found progressively larger effects with age. Very young infants do not attend more in the presence of animation, perhaps they begin to watch more as they begin to learn that it signals content for children.

Conclusions

The findings from the present study are surprisingly contiguous with research that has been conducted on older children. As soon as children begin to pay any substantial amount of attention to television, they are attending to the same things older children are. Thus, attention to many of the formal features does not appear to be learned from watching TV. Furthermore, not all of infant and toddlers' viewing can be explained in the context of the comprehensibility hypothesis since much of television should be difficult for infants to understand.

One limitation of the present study is that social influences on television viewing were not examined. All of the infants and toddlers in this study had at least one older sibling. It is very likely that much of the time these children were in the viewing room they were with a sibling or parent, which may have influenced their looking behavior. This would be an interesting topic to examine in future studies.

This study has raised a number of interesting questions for future research. First, it is not entirely clear why attention to television's formal features is so contiguous across infants and preschoolers. It is likely that the youngest children in this study were beginning to learn words and were attending to many of the things on television that they probably attend to in picture books (i.e. animals, puppets, children). Since this was a small sample and many of the youngest infants did not show the effects that the older children did (see Appendix B), studying younger "pre TV viewers" may help to clarify patterns of attention to TV's formal features.

Furthermore, there appear to be large individual differences in when very young children begin to attend to television and when they attend to different formal features of television. Conducting a longitudinal study

with home observations of individual children between 6 and 36 months would clarify these questions. Furthermore, the indications from this study that a cognitive factor may play a role in the development of attention to TV suggests that it would be interesting to look at individual differences in cognitive ability or program preferences.

Approximately half of the time infants were with television, adult programming was being broadcast. Accordingly, a large portion of infants' television viewing environment is incomprehensible. Most of the infants attended more in the presence of child content than in the presence of adult content. Nonetheless, exposure to large amounts of adult entertainment has been shown to be related to lower reading skills and fewer prosocial behaviors (Rice, Huston, Truglio & Wright, 1990). It is likely that the adults whose children spend a large proportion of time with adult programming are engrossed in these programs and are not attentive to their young child's needs. If more programming was designed for infants and more parents were aware of possible deleterious effects on their infants, this would not be a concern. A longitudinal study could also attempt to ascertain deleterious

effects of infants' viewing large amounts of adult programming.

These findings have important implications about the role of television in infants' lives. While researchers have only begun to learn about this important topic, programmers have also largely ignored this age group. In Japan, a program exists for infants to watch with their mothers. Perhaps it is time for some creative programming efforts which take into account the fact that very young children pay attention to television.

Clearly, television is an ecologically significant factor in the lives of today's infants. They are with television approximately one hour a day and they are paying some attention to television. The increase of overall attention to TV with age may reflect an increase in the comprehension of program content.

Table 8

Accurate theory based predictions[a]

	Singer		Anderson & Lorch		Huston & Wright	
	infants	age trends	infants	age trends	infants	age trends
Overall Attention			*	*	XX[e]	XX
Cuts		*				
Action		*	*[b]	*[c]		XX
Movement	*	*	*[d]	*[c]	*	
Violence			*	*		
Human Characters		*	*	*	*	
Child Characters	*	*				
Adult Males		*	*			
Adult Females		*			*	
Nonhuman Character		*	*		*	
Ads		*	*	*		
Child Content		n.t.[f]	*	n.t.		n.t.
Animation			*	*		XX

[a]Indicated by an asterisk sign, $p < .05$.
[b]Significant enhanced attention in the presence of action without movement and singing (a special form of action), but action overall was only marginally significant.
[c]Attention was accurately predicted by age and looking, $p < .05$.
[d]Significant enhanced attention in the presence of movement, however Anderson and Lorch failed to predict enhanced attention in the presence of movement without action.
[e]Not tested because it was not clear what the theory would predict.
[f]This formal feature was not tested because this data was not available for two year old subjects.

APPENDIX A

DESCRIPTION OF THE HOME VIEWING STUDY FAMILIES

Estimates of Young Children's Time with Television: A Methodological Comparison of Parent Reports with Time-Lapse Video Home Observation

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ANDERSON, DANIEL R.; FIELD, DIANE E.; COLLINS, PATRICIA A.; LORCH, ELIZABETH PUGZLES; and NATHAN, JOHN G. *Estimates of Young Children's Time with Television: A Methodological Comparison of Parent Reports with Time-Lapse Video Home Observation.* CHILD DEVELOPMENT, 1985, 56, 1345–1357. Accurate information on behavior of young children at home is crucial to the study of child development. The present study compared parent diaries of 5-year-old children's time spent with television to concurrent automated time-lapse video observations. In addition, a number of control groups were employed to assess the effects of observational equipment in the homes. The sample consisted of 334 mostly white middle-class families, of whom 106 had observational equipment installed. Results indicated no systematic subject selection of families who were willing to have observational equipment as compared to the controls. In addition, there were no differences in reported viewing behavior between the observed families and controls. Of 3 types of parent estimates of 5-year-old TV viewing, concurrent diaries correlated best with video observation ($r = .84$) and produced a very small absolute mean time error. Direct parent estimates of typical time spent viewing produced smaller correlations and large overestimates as compared with diaries.

The large amount of time young children apparently spend with television (about one-third of their waking lives) has engendered varying kinds of public concern. Books widely read by parents have suggested that television viewing may be addictive, may cause physical problems, or may create cognitive deficits (e.g., Moody, 1980; Winn, 1977). More moderate research-based reviews have also implicated television viewing as related to violent behavior (e.g., Huesmann, 1982) and as complexly related to academic achievement (Morgan & Gross, 1982). With respect to young children, theorists have expressed concern that watching television may displace valuable cognitive and social activity, thus producing negative indirect consequences regardless of television's direct effects (e.g., Himmelweit, Oppenheim, & Vince, 1958; Singer & Singer, 1983; Williams, in press). In the television industry, estimates of large amounts of TV viewing by young children have had considerable influence on the economics of commercial children's programming and on proposals for educational alternatives (e.g., Lesser, 1974; Melody, 1973).

Despite the importance of parent reports in drawing conclusions about the amount of young children's TV viewing, these reports, particularly viewing diaries, have been criticized (e.g., Lieberl, Sprafkin, & Davidson, 1982; Waters, Cohen, & Harper, 1977). The primary criticism is that their accuracy has not been satisfactorily determined.

Only two studies have attempted to systematically observe family TV viewing behav-

ior in relation to viewing diary reports. In a pioneering study, Allen (1965) installed time-lapse film cameras in the homes of 95 families in Oklahoma during 1961, 1962, and 1963. The cameras filmed the area in front of the TV set and the TV set itself at a rate of four frames per minute. Allen provided little methodological detail or quantitative description of his findings, apparently because the data were used for proprietary commercial purposes. Allen's sole comment on the accuracy of viewing diaries was: "Differences between the programs the family actually selected as compared with what they marked on the diary were great in some cases, in others very small" (Allen, 1965, p. 8).

The second major home-observation study was reported by Bechtel, Achelpohl, and Akers (1972), who installed video cameras in the homes of 20 families in Kansas City, Missouri, during 1970. The video equipment recorded at real time speed and was present in the homes for 6 days. Bechtel et al. (1972) reported most of their results in a qualitative manner. They noted, however, that family viewing diaries overestimated actual time viewing by about 25%. Bechtel et al. (1972) apparently defined TV viewing as being visually oriented toward the screen; they did not report whether viewing diaries correctly reported time in the viewing room or whether there was a high positive ordinal relationship between reported and actual viewing.

In sum, the two studies directly observing young children's TV viewing at home have noted that the viewing diaries kept by parents may be inaccurate. These pioneering studies provide little quantitative or methodological detail to support their conclusions. In addition, they did not attempt to systematically estimate the effects of their automated observational technology on viewing behavior.

The present paper describes a new observational study of home television viewing by young children. The study involved placement of time-lapse video cameras in the homes of 5-year-olds from middle-class families for a 10-day period. The video equipment began automatically recording activity in the viewing room when the TV set was turned on and stopped recording when the TV set was turned off. Families maintained TV viewing diaries both before and concurrent with presence of the equipment. Control groups of families were employed to assess the impact of observational equipment in the homes.

This report, which focuses on the 5-year-olds from these families, has two goals. The first is to assess the effects of observational equipment in the home on subject selection and on viewer behavior. This assessment is crucial to the interpretation of the present as well as future studies employing field observation in homes. The second goal is to relate observations of the 5-year-olds' time with TV to various estimates of TV viewing made by the parents. This study is the first to quantitatively assess the accuracy of parent-kept TV viewing diaries.

Method

Design

Four groups of families participated in the four-phase, 2-month procedure. The groups were distinguished by the manner in which the families were recruited and by whether or not they agreed to have and did have observational equipment in their homes. All the families had a child near the fifth birthday (hereafter referred to as the "focus child").

Group C-NE (Control, No Equipment mentioned) was a control group of 102 families that was recruited with no mention of in-home observational equipment. These families went through the four-phase procedure and did not have observational equipment installed in their homes.

Group C-EP (Control, Equipment Possible) was a control group of 42 families that was recruited with mention of in-home equipment and who agreed to have such equipment installed in their homes should we request it. These families, however, did *not* have equipment installed in their homes, and went through the same four-phase procedure as Group C-NE.

Group E-E (Experimental Equipment installed) was recruited with mention of in-home equipment and was the only group to actually have observational equipment installed in their homes. This group of 106 families otherwise went through the same four-phase procedure as the other groups.

Group C-ER (Control–Equipment Refused) was originally recruited to be part of Group E-E. These 85 families, however, later withdrew their agreement to have observational equipment installed in their homes. They remained in the study, however, and went through the same four-phase procedure as the other control groups.

The four phases of the procedure were (1) an initial visit by a parent and the focus child to the research center. During this visit, the child was observed viewing television and was given a number of tests of cognitive status. The parent filled out an extensive questionnaire concerning family demographics and television viewing activities. (2) After the Phase 1 visit, the family maintained a 10-day TV Viewing Diary. (3) One month after completion of the Phase 2 Viewing Diary, a second 10-day TV Viewing Diary was filled out. Group E-E had observational equipment installed in their homes concurrent with this diary period. (4) Following the completion of Phase 3, the parent and focus child returned to the research center for additional testing and to fill out a debriefing questionnaire.

Subjects

Families who had a child near the fifth birthday and who owned a television set were eligible to participate in the study. Names and addresses were compiled based on birth records for the Springfield, Massachusetts, metropolitan area. One of two different letters describing the research and requesting participation was sent, followed by a telephone call a week later. During the telephone contact, the focus child's birthdate and the presence of a television set were verified, questions about the research were answered, and participation in the study was requested.

Three hundred thirty-four families from metropolitan Springfield, Massachusetts, completed the 2-month research participation. The families consisted of 859 children (including the focus children, of whom there were 169 girls and 165 boys) aged 17 years and under, and 692 adults. As measured by the Hollingshead Four Factor-Index of Social Status (Hollingshead, 1975), 29% of the families were at level I, described as major business or professional occupations; 39% were at level II, comprising medium business, minor professional, and technical occupations; 23% were at level III, which includes skilled craftsmen, clerical, and salesworkers; 8% were at level IV, comprised of machine operators and semiskilled workers; and 1% were at level V, which consisted of unskilled laborers and menial service workers. The fathers averaged 34.8 years of age (SD = 5.0 years) and had completed an average of 15.0 years of schooling (SD = 2.8 years), including vocational training. Ninety-eight percent of the fathers were employed full-time; 2% were unemployed. Mothers were an average of 32.8 years of age (SD = 4.4 years) and had completed 14.2 years of schooling (SD = 2.4 years). Sixty-three percent of the mothers were homemakers, while 4% were employed full-time and 33% had part-time jobs outside the home. The families' homes ranged from four to 14 rooms (M = 6.8). Families owned from one to five television sets (M = 1.83); 90% of the families had at least one color TV set. Further descriptions of the subjects and analyses of subject selection may be found in the results section of this paper.

Apparatus and Materials

Two laboratory sessions were conducted at the University of Massachusetts Child Study Center in Springfield. These sessions involved observation of the focus child's TV viewing behavior and collection of test and questionnaire data from the child and parent. All families also completed two diaries of their family home viewing.

Questionnaires.—A Demographic Questionnaire was employed to identify family members by age and sex, to assess parent education and employment, and to assess the focus child's daily activities and television viewing habits. In particular, two items pertained to total amount of viewing by the focus child. One item was a Daily Activity Chart on which the parent indicated the child's typical schedule, including TV viewing in the context of all other daily activities. The other item, the Direct Estimate, asked the number of hours of viewing for each day of the week during the morning, afternoon, and evening at that time of year. A Home Environment Interview obtained information about the home and the television environment, including the number of television sets, their location in the home, quality of reception, subscription to cable programming, and so on.

Home TV viewing diaries.—One ten-day diary was assigned to each television set owned by the family. The professionally printed diary divided each day into 15-min blocks between 6 A.M. and 2 A.M. the following morning. For each block, the parent was asked to indicate whether the TV was on, and if so, to what channel it was tuned, the program name, who was in the TV viewing room, and reasons why the focus child began or terminated a viewing session. Any viewing by the child away from home was recorded on the last page. A stamped envelope was provided for returning the completed diaries.

Home observations.—Group E-E families had the following equipment placed in their homes: a 61.0 × 66.0 × 76.2-cm cart housed a black-and-white time-lapse video

cassette deck (NEC model VC7505), control circuitry, a time/date generator (RCA model TC 1440B), a screen splitter (TEL SS-221), and battery backup equipment. One camera (RCA model TC1005) equipped with a zoom lens (KOWA) recorded programs on the families' television while a second camera (RCA model TC1025) filmed the room area from which individuals were most likely to watch the TV. This camera was equipped with an 8.5-mm wide-angle lens with auto-servo iris, which enabled it to both maximally cover the viewing room and adjust to changing light conditions. Depending on room characteristics, the cameras were mounted either on a tripod or on the cart.

The control circuitry activated the time-lapse video deck only when the TV set was on. The video deck recorded at a ratio of 1:36 (one video frame every 1.2 sec). Every 18 sec a 6-sec image of the TV screen was inserted on a portion of the videotape. In addition, the time and date were continuously superimposed. A small light mounted on the cart flashed after 26 hours of video recording, signaling the parent to change the tape. Five tapes were supplied with each device, allowing up to 130 hours of family viewing during the 10 days. Two families were each supplied with an additional tape when they anticipated exceeding the capacity of the five tapes.

Procedure

All groups of families participated in two laboratory sessions and filled out two 10-day diaries. This treatment involved the initial letter, telephone calls to schedule lab visits, and calls to verify the progress of diaries. Occasionally additional calls were needed to remind the parent to mail in a diary or to reschedule a missed appointment. The amount of contact with the families was equivalent across groups, except for arrangements needed to install and remove equipment from the homes of Group E-E.

First laboratory session.—At the first laboratory session, a research assistant reviewed for the parent the phases of the study. If this family had received an initial contact letter mentioning observation equipment in the home, the home-observation procedure was fully explained. The parent and child were then escorted to the TV viewing room, where the mother completed the Demographic Questionnaire and the child was administered the Peabody Picture Vocabulary Test. A 40-min "Sesame Street" program was then screened, while the child's television viewing behavior and play with toys were observed. During the remainder of the visit, the parent participated in the Home Environment Interview and the child was administered a number of measures related to other aspects of the study not reported here. At this time, the parent was instructed on how to fill out the Home TV Viewing Diary. The mother was given one diary for each TV, and, if a potential Group E-E family, a consent form to be signed by each family member. Finally, the child received a prize and the parent received $10.

First diary period.—A phone call was made to the mother 3 days later to ensure that the diary was being filled out and to clear up any questions. The completed diary and consent form allowing equipment in the home were mailed back to the Child Study Center.

Second diary and home observation.—After the first laboratory session, those families who had signed the consent form were randomly assigned either to become Group E-E or Group C-EP families. Those chosen to receive cameras were called and asked to schedule a placement date for the following week. If they objected to home observation at this time, they were mailed diaries for the second diary period and were assigned to Group C-ER. All other families not receiving equipment were telephoned and reminded that diaries were being mailed for the second diary period. Thus, approximately 1 month after the first laboratory session, each family received either diaries and observation equipment or diaries only.

The equipment installation typically took an hour and a half to 2 hours to complete and required two installers per unit. Of the 106 families in Group E-E, 63 (59%) had more than one TV set. Of these families, 15 had multiple observation units installed. In all cases, the TV room that was primarily used by the focus child had an observation unit installed. The parent was asked to indicate the focus child's usual viewing spot. The wide-angle camera was placed to cover this area and encompass as much of the rest of the viewing room as possible. The zoom-lens camera was directed at the television set, and the cart that housed the video deck was placed where it would be accessible to the parents. The installers demonstrated how to change the videotapes when the signal light flashed. In case problems should arise, service telephone numbers were supplied. Diaries were provided to be filled out simultaneously with the videotaping. Removal of the equipment was arranged for about 12 days later, allowing a full 10 days' taping.

The videotapes from seven families were technically unusable due to a variety of equipment malfunctions. The remaining 99 families provided 4,672 hours of usable recordings.

Two days into the second diary period, parents were called to ensure that the diary completion and video recording (if appropriate) were going smoothly. One week later, diary Follow-up Questionnaires were mailed. The next day, an appointment for the second laboratory session was scheduled. Diaries and Follow-up Questionnaires were brought to the second laboratory session, except in the case of camera families, whose materials were returned at the time of equipment removal.

Second laboratory session.—The second laboratory session took about 45 min. The child completed several tasks relevant to aspects of the study not discussed here, while the parent filled out several questionnaires, including the Impact Questionnaire. At the conclusion of this visit, the parent was thanked and was given $15.

Summary of Measures

Gathered from questionnaires, Home Viewing Diaries, and videotaped home viewing, several measures were obtained concerning the amount of time and visual attention the focus children devoted to television. The number of observed hours with television was obtained by time sampling the 10 days of videotaped observation. An observer played each videotape on a Sony BVU 200 professional quality video deck with a high-resolution black-and-white monitor. After each 55 min of TV-on time, the observer put the deck in still-frame mode and noted the presence of each person in the viewing room. The observer also noted whether or not each person was visually oriented toward the TV. Fifty-five-minute time samples were used to avoid obvious periodicity in sampling. Estimates of hours in the viewing room are based on these time samples, such that hours = (no. of samples viewer is present) × (55/60). Visual attention was not estimated for a given subject if that subject was observed in the viewing room during fewer than three time samples. Interobserver reliability for presence in the viewing room was $r(12) = .98$ (based on 14 viewers rated by two observers), and interobserver reliability for visual attention was $r(7) = .90$ (based on nine viewers rated by two observers).

The number of hours parents estimated the focus child spent with televison was summed from the two 10-day TV Viewing Diaries. This record was subject to uncertainty: sometimes the parent indicated that she was uncertain whether the child was present, and at other times the diary was improperly filled out, making unambiguous interpretation impossible. Therefore, hours of viewing from each of the two diaries were computed both with and without this uncertainty factor. When the uncertainty factor was included, all periods of uncertainty were treated as if the focus child were in the viewing room.

The number of hours the focus child spent with television was also reported by the parent in a Daily Activities Chart. The question was: "In a typical week, what is your child's daily schedule? Please include things like: wakes up; eats meal or snack; plays outdoors . . . takes nap; watches TV; takes lessons; bathes; goes to bed." One-hour intervals Monday through Sunday were to be filled out. The number of hours per week with TV was summed from this chart. In addition, the number of hours the focus child spent with television was estimated by the parent in a chart of hours of viewing for each day of the week, during various times of the day (the Direct Estimate). The question was: "How many hours would you estimate your child watches TV during the following times at this time of year?" Divisions were provided for Monday through Sunday; morning (6 A.M. to 12 noon), afternoon (12 noon to 6 P.M.), evening (6 P.M. to midnight).

Results

Analyses of Subject Selection

Sample definition.—The families participating in the study underrepresented black, urban, and single-parent families. Although nine black families completed the study (2.7% of our sample), 1980 census figures for the Springfield metropolitan area indicate that blacks comprised 9.4% of households with preschool children. While 51.2% of our families were city dwellers, census figures indicated that 72% of all households with preschoolers resided in urban areas. Furthermore, our sample consisted almost entirely of nuclear families (98% had both parents present), whereas the census figures showed that only 75% of households with children age 17 or younger had both parents present.

Participation rate.—Comparisons were made among the groups on rate of participation in the study. Parents received one of two different initial contact letters. Group ONE received a letter describing the laboratory and

viewing diary phases of the study, but made no mention of direct in-home observation with video equipment. The other letter, received by Groups C-EP, E-E, and C-ER, additionally described the direct in-home observation procedure and indicated that the family might be chosen to have equipment installed in the home.

Group C-NE families constituted a control for the effects of the observation technology on subject selection and retention, as well as viewing behavior. Of 255 families who were contacted by phone after receipt of the Group C-NE initial contact letter, 143 (56.1%) declined to participate, and an additional 10 families (3.9%) withdrew from the project after the first laboratory session. The remaining 102 families (40.0%) completed the entire 2-month control procedure.

This acceptance rate may be contrasted with that of families who received the letter that mentioned the in-home observation equipment. Telephone contact was made with 899 families who received this letter. Of these families, 630 (70.1%) declined to participate in the research, and an additional 36 families (4.0%) withdrew from the project after the first laboratory session. Thus, 74.1% of families contacted with the in-home observation letter did not participate (compared to 60% in Group C-NE). The remaining 233 families agreed to have observational equipment installed in their homes. Of these, 42 were randomly chosen *not* to have equipment installed as a partial control for the effects of in-home observation (Group C-EP). Of the 191 families who were thus ultimately asked to have equipment actually installed in their homes, 85 families who initially agreed then refused to have the equipment installed at the time the research design required (Group C-ER). The remaining 106 families actually had equipment installed in their homes and completed the entire procedure (Group E-E). Excluding Group C-EP, the final completion rate was 12.4% for families receiving the letter mentioning the home observation and actually having the equipment installed.

The possibility of having observational equipment installed in the home obviously lowered the participation rate. A major question, therefore, is whether those who agreed to the home observation were an unusual or unrepresentative group of families as compared to the control groups. This issue was evaluated in several ways. The first was to analyze the reasons given in the initial telephone contact for choosing not to participate in the study. The most frequent reasons are listed in Table 1 for those receiving each form of the letter (equipment mentioned or not mentioned). The profile of reasons for not participating is similar for each letter and typically concerns practical reasons or time constraints.

Questionnaire variables.—The second method of evaluating subject selection was to compare the four groups on several dimensions assembled from 56 questionnaire measures of family demographics, home environment, life stress, parent attitudes toward television, parents' encouragement or discouragement of their children's TV viewing, and parents' estimates of the focus child's TV viewing behavior. Table 2 indicates the mean value or frequency of response of each mea-

TABLE 1

MOST FREQUENT REASONS FOR NOT PARTICIPATING IN THE STUDY

REASONS	TYPE OF LETTER	
	Equipment Mentioned	Equipment Not Mentioned
Research too time consuming	14.1	12.2
Not interested in general	12.4	12.2
Mother working during research hours	10.0	7.8
Pregnant, or new baby	5.9	3.1
Does not speak English	3.5	3.5
Does not want equipment	3.4	.0
Will call if interested (did not call)	3.1	4.3
Child in school during research hours	2.0	2.4
Family traveling	1.8	.0
Illness in family	1.2	.0
Husband says no	1.2	1.6

NOTE.—The values represent percentage of nonparticipants giving each reason for declining.

TABLE 2

VALUES OF 56 MEASURES FOR EACH CONDITION

VARIABLE	GROUP				
	C-NE	C-EP	E-E	C-ER	All
Demographics:					
Father's age (years)	34.51	35.98	34.82	34.39	34.76
Father's education (years)	14.86	15.0	15.32	14.76	15.0
Father's employment status:[a]					
(0) Unemployed	1	0	3	1	2
(1) Part-time	0	0	0	0	0
(2) Full-time	99	100	97	99	98
Mother's age (years)	32.72	33.46	32.47	32.84	32.76
Mother's education (years)	14.07	14.15	14.55	13.98	14.21
Mother's employment status:[a]					
(0) Unemployed	64	63	57	69	63
(1) Part-time	31	32	39	29	33
(2) Full-time	5	5	4	2	4
Socioeconomic status:[a]					
(1) Level I	29	25	33	27	29
(2) Level II	42	42	38	36	39
(3) Level III	20	25	20	29	23
(4) Level IV	8	5	8	7	8
(5) Level V	1	2	1	1	1
Child has special needs:[a]					
Yes	15	17	9	16	14
Environment:					
No. of families in dwelling	1.12	1.07	1.08	1.18	1.12
No. rooms in household	6.85	7.07	6.99	6.46	6.82
No. rooms child uses	5.68	5.51	5.70	5.35	5.58
No. rooms where toys available	4.09	3.51	4.12	3.74	3.94
No. areas for play without adult present	2.09	2.0	2.16	2.1	2.11
Toys (no. available)	106.48	93.98	114.01	105.44	107.07
No. of TVs	1.78	2.05	1.77	1.85	1.83
There is a "TV room"[a]	1	5	3	4	3
TV in child's bedroom:[a]					
Yes	2	2	7	6	4
No	98	98	91	94	95
Sometimes	0	0	2	0	1
Color TV available[a]	91	90	88	91	90
Cable is received[a]	27	29	28	29	28
Video casette recorder available[a]	1	0	2	1	1
Video game system available[a]	15	17	12	19	15
Hours spent at home by:					
Focus child, Monday–Friday	21.24	21.68	21.55	21.28	21.41
Focus child, weekends	22.47	22.38	22.35	22.33	22.38
Mother, Monday–Friday	21.55	21.51	22.28	21.85	21.85
Mother, weekends	21.34	21.76	22.08	21.95	21.78
Father, Monday–Friday	13.97	12.56	13.90	13.91	13.75
Father, weekends	20.05	19.15	19.93	20.69	20.05
Child and mother, Monday–Friday	20.22	20.63	20.63	20.19	20.40
Child and mother, weekends	20.88	21.65	21.66	21.41	21.36
Child and father, Monday–Friday	13.58	12.46	13.63	13.56	13.45
Child and father, weekends	19.83	19.05	19.70	20.19	19.78
Stressful life events (total points, 47 items; 1 = no stress, 7 = extreme)	13.47	12.98	13.24	12.71	13.14
Child's activities:					
Outings per week	6.41	6.56	6.02	6.41	6.31
Movies, hours per month	.79	1.21	1.09	.85	.95
Reading to child, min per day	26.47	21.90	29.10	26.02	26.62
Reading to him/herself, min per day	27.63	32.34	31.26	29.19	29.76
Child's TV viewing:					
Is "Sesame Street" a favorite program?[a]					
Yes	52	54	60	53	55

TABLE 2 (*Continued*)

Variable	Group				
	C-NE	C-EP	E-E	C-ER	All
Is "Sesame Street" encouraged? [a]					
Yes	60	66	66	71	66
Percent attention to TV, parent estimate	61	56	60	63	61
Involvement with TV (0 = almost never, 4 = almost always)	2.27	2.07	2.39	2.13	2.25
Frequency TV is encouraged: [a]					
(0) Never	15	12	20	25	19
(1) Once a month	6	7	10	2	6
(2) Once a week	30	27	18	17	22
(3) Once a day	41	37	40	46	42
(4) More than once a day	8	17	12	10	11
Frequency TV is discouraged: [a]					
(0) Never	31	20	33	28	29
(1) Once a month	6	5	8	9	7
(2) Once a week	22	22	19	13	19
(3) Once a day	35	32	25	33	31
(4) More than once a day	6	22	15	17	14
Total encouragement score	10.90	12.10	11.42	11.68	11.41
Total discouragement score	9.48	11.22	10.04	9.33	9.83
Allowed to turn on TV: [a]					
(0) Never	4	0	3	1	2
(1) Rarely	8	7	9	2	7
(2) Sometimes	46	39	45	36	42
(3) Most of the time	27	41	30	45	34
(4) Whenever he/she wants	16	12	13	15	15
Allowed to change channels: [a]					
(0) Never	8	13	14	10	11
(1) Rarely	22	18	20	10	18
(2) Sometimes	37	44	31	42	37
(3) Most of the time	23	18	28	30	25
(4) Whenever he/she wants	12	8	7	7	9
Parental attitudes toward TV (0 = disagree strongly, 3 = strongly agree):					
TV is good influence	1.80	1.66	1.76	1.92	1.80
TV is entertaining	1.97	2.05	2.15	2.09	2.07
TV teaches bad habits	1.65	1.63	1.37	1.59	1.54 [b]
TV enables parent to get work done	1.18	1.37	1.42	1.39	1.33
TV is too time consuming	.99	.78	.85	.88	.89
TV is too violent	2.11	2.34	1.87	2.02	2.04 [b]
TV offers quality programs	1.69	1.71	1.72	1.67	1.70
TV keeps child company	1.30	1.38	1.42	1.45	1.39
TV teaches bad language	1.27	1.38	1.24	1.41	1.31
TV is educational	2.0	1.90	1.95	1.96	1.96

[a] Percent of families in that group.
[b] (E-E) < (C-ER) = (C-EP) = (C-NE), $p < .01$.

sure for each of the four groups. A one-way analysis of variance (or chi-square if the variable was nominal) across the four groups was performed for each measure (alpha = .05). Given this number of analyses, if there are no true differences between the groups, the expected number of significant effects by chance is 2.80; in fact, only two analyses were significant (see Table 2). There is thus no basis in our data to conclude *systematic* subject selection effects due to the observational equipment.

Parent estimates of child's viewing. In order to further examine possible group differences, parents' estimates of the focus child's hours of TV viewing per week were examined. The estimates included the two questionnaire measures obtained during the first laboratory session, and those of the two TV Viewing Diaries. In the following analyses, the unequal numbers of cases in the cells due to the unequal number of families in the four groups could lead to a biased estimate of population means if analyzed as if the

design were orthogonal. The model parameters are not statistically independent, so the magnitude of any effects would be affected by the cell means. In order to obtain an unbiased estimate, the nonorthogonal design requires comparing possible models using a procedure of first testing the interactions, eliminating any confounding main effects. Only if the interaction is nonsignificant can each main effect be tested, again eliminating the possible contribution of other factors (Applebaum & Cramer, 1974).

The Direct Estimate and the Daily Activities Chart were compared in a nonorthogonal repeated-measures design mixed model analysis of variance (group × sex × estimate). A significant main effect of estimate, $F(1,323) = 70.34$, $p < .001$, was found due to a substantially greater amount of viewing reported in the Direct Estimate (a mean 22.0 hours vs. 17.7 hours per week). These two "global" estimates of TV viewing correlated moderately, $r(329) = .62$, $p < .001$. It is important to note that there were no significant differences as a function of group.

To determine whether the groups differed in the care with which they filled out their diaries, the uncertainty component in the diaries (number of hours parents indicated uncertainty plus hours of undecipherable entries) was analyzed in a nonorthogonal mixed analysis of variance with repeated measures (group × diary period). A significant group × diary period interaction, $F(3,326) = 3.67$, $p < .013$, was found, due to Group E-E having significantly less uncertainty on Diary 1 than Diary 2, $t(103) = -3.25$, $p < .002$ (a mean 0.4 hours vs. 1.4 hours per week). No other contrasts were significant. This difference in Group E-E is not easily interpretable, since one might expect that the presence of observation equipment would cause the parents to be more careful in filling out the second viewing diary rather than the first. No tests of main effects are appropriate.

A similar nonorthogonal analysis of variance (group × sex × diary period) was performed on diary estimates of total viewing by the focus child, treating uncertainty as child viewing time. Table 3 contains the mean number of hours of viewing per week as recorded in the diaries. No significant interactions or main effects of group, sex, or diary period were found. When uncertainty was not treated as viewing time, there was no significant interaction, but there was a significant main effect of diary period: Diary 1 recorded about 49 min more viewing per week than Diary 2, $F(1,322) = 7.42$, $p < .01$. Again, no significant group or sex effects were found.

In summary, Group E-E did not systematically differ from the control groups according to a variety of demographic, attitudinal, and TV viewing variables. The Group E-E

TABLE 3

FOCUS CHILD'S MEAN NUMBER OF HOURS PER WEEK WITH TELEVISION, RECORDED ON DIARIES WITH AND WITHOUT HOURS OF UNCERTAINTY

DIARY	GROUP				
	C-NE	C-EP	E-E	C-ER	All
With uncertainty:					
1	16.6	17.3	16.3	16.9	16.6
SD	9.8	9.2	8.7	10.0	9.4
N	102	41	104	85	330*
2	16.4	14.4	16.6	16.1	16.1
SD	10.0	7.3	9.0	10.2	9.4
N	100	41	105	85	330
Without uncertainty:					
1	15.4	15.8	15.9	15.9	15.6
SD	9.4	8.4	8.8	9.8	9.1
N	102	41	104	85	330
2	15.2	12.9	14.2	14.8	14.8
SD	9.1	6.9	8.0	9.5	8.6
N	100	41	105	85	330

NOTE.—C-NE = Control–No Equipment mentioned, C-EP = Control–Equipment Possible, E-E = Experimental–Equipment installed, C-ER = Control–Equipment Refused.

* Four families had missing data for one or both diaries.

focus children, furthermore, did not differ from the control focus children on any of several parent estimates of time spent with television, including the diary estimates. Group E-E focus children, therefore, appeared to be representative of the focus children from the research sample as a whole.

Accuracy of the Viewing Diary

A central goal of this paper is to assess the accuracy of the diary estimates of focus child TV viewing using the time-lapse videotapes as a standard. The comparisons were made between reported viewing and observed viewing of TV sets monitored by the observation equipment only. Additional viewing by the focus child on nonmonitored sets or outside the home is not included in these analyses.

The focus children were observed spending an average of 13.4 hours (SD = 8.0) per week with television. When diary uncertainty was treated as if the focus child were present, the correlation was $r(95) = .86$, $p < .001$, but the difference between Diary 2 and videotaped hours present was significant: 16.6 hours per week versus 13.4 hours per week, $t(96) = -4.68$, $p < .001$. Diary 2 estimates (not including uncertainty) and tape observations were significantly correlated, $r(95) = .84$, $p < .001$, and the average amounts of viewing differed only slightly: 14.2 hours per week from the diaries versus 13.4 hours per week observed, $t(96) = -1.89$, $p < .10$. The diaries thus reasonably accurately recorded the focus child's presence in the viewing room, and diary uncertainty is best interpreted as the child not present.

One-Month Reliability of the Diary Estimates

The correlation between Diary 1 estimates of total viewing by the focus child and Diary 2 estimates was $r(328) = .72$, $p < .001$. Thus individual differences in time spent with television were moderately reliable over a 1-month period. Similar 1-month reliability estimates ($r = .75$) were obtained by Huesmann, Lagerspetz, and Eron (1984) when children in first through fifth grades were asked to indicate their frequency of watching favorite programs.

Comparisons between Diaries and Global Viewing Estimates

The preceding analyses indicate that parent-maintained diaries are a reasonably valid measure of preschoolers' time spent with televison. Using Diary 1 as a criterion measure, comparisons were made with the other global parental estimates of the focus children's viewing. These comparisons utilized the first diary period only since it was closest in time (within a few days) to these parent global estimates. The correlation of Diary 1 with estimates taken from the Daily Activity Chart was $r(329) = .48$, $p < .001$. The activity chart indicated slightly more time spent with television than did the diary: 17.7 hours per week versus 16.7 hours per week, $t(331) = -1.99$, $p < .05$. The Direct Estimate of hours spent with TV (not estimated in the context of other activities) had a higher correlation with the Diary 1 estimate, $r(327) = .60$, $p < .001$, but the Direct Estimate was considerably higher than the diary: 22.0 versus 16.7 hours per week, $t(328) = 10.62$, $p < .001$.

Comparisons with Time Looking at TV

The focus children were observed looking at television an average of 9.3 hours per week, or 67% of the time they were with TV. While time spent with TV is correlated with cumulative time looking, $r(92) = .79$, $p < .001$, it should be noted that there is no significant correlation between time with TV and *percent* of that time spent looking at TV, $r(92) = -.097$, $p = .176$.

Comparing the observed hours spent looking at the TV with Diary 2 amount, the correlation without uncertainty was $r(91) = .67$, $p < .001$. It should be noted that diaries instructed parents to record the focus child's presence in the viewing room, not looking behavior. The lower correlation was, therefore, expected.

Parents were directly asked to estimate their children's percent visual attention to television. They estimated an average of 60%, as compared to 67% actually observed, $t(93) = -3.06$, $p < .05$. The correlation of the parent estimates with observed attention was significant but low, $r(92) = .27$, $p < .01$.

Discussion

The findings of this paper concern methodological issues of subject selection in intensive home-observation research and the accuracy of parents' estimates of the amount of time young children spend with television. The subject selection results are reasonably straightforward. The families who chose to participate in this research were typically white, middle class, with both parents present. As such, they represent a socially and commercially significant subset of American society. Nevertheless, this group of families cannot be considered representative of American families as a whole, and they especially do not represent subgroups such as racial

minorities and single-parent families, about which there is currently considerable social concern. It should be noted that the national television rating services have also had difficulty obtaining minority participation in research (Anderson, 1979; Coates, 1978).

Given the white, middle-class, two-parent families who participated in the study as a whole, there were additional potential selection pressures on the families who were asked to have observational equipment installed in their homes. Indeed, there was a lower initial participation rate in this condition, and a number of families declined to have equipment installed after giving their initial agreement (all of these families wanted to and did remain in the study). Despite the reduced participation rate in the home-observation group, there was no evidence that the families in this group were different from the control families in any way. The major systematic subject-selection pressures appear to affect willingness to participate in an extensive research study rather than observation in homes, per se.

The major concern of this paper is the accuracy of a variety of parent estimates of young children's amount of time spent with television. The most salient finding is that the viewing diary accurately reflected the actual time 5-year-olds spent with TV. Not only did the diaries correlate well with videotaped observations of the 5-year-olds, but the absolute cumulative times from the diaries agreed with the observed cumulative times. It might be argued that the conditions of the study represent a best case for assessing diary accuracy, since the parents knew their diary records could be verified from the time-lapse videotapes. If so, one would also expect the experimental group parents to be more conscientious about keeping the diaries than the control families. There were, however, no differences in the amount of diary ambiguity and uncertainty between the experimental and control groups in the second diary period (during which the experimental families had the observation equipment present).

Given the validity of the parent-kept diaries, the accuracy of other more global parent estimates was examined using the diary as a criterion. Two global measures of TV viewing used in the present study were estimates of time with television recorded on a Daily Activity Chart for a "typical" week, as well as a Direct Estimate of time with TV during each day of a typical week. These two global measures correlated moderately well with each other, but differed significantly such that parents reported more weekly viewing using the Direct Estimate. The magnitude of the correlation and the time discrepancy is similar to that reported earlier for two global measures of young children's TV viewing taken from parents of 3-, 4-, and 5-year-olds (Anderson, Alwitt, Lorch, & Levin, 1979). One measure in that study was the Direct Estimate used in the present study; the other measure involved checking off in a *TV Guide* the programs usually watched by the child and indicating how often they were watched. The Direct Estimate indicated viewing of 24.3 hours per week (as compared to 22.0 hours per week using the Direct Estimate in the present study), and the program check-off method indicated 32.7 hours per week (r = .77). The present study thus replicates the earlier work in showing that two different global questionnaire methods administered at the same time lead to moderate correlation agreement but substantial discrepancies in amount of viewing.

Both global estimates in the present study correlated only moderately with the diary estimate (.46 for the Activity Chart and .60 for the Direct Estimate). Both global measures also overestimated time with TV as compared to the diary (an overestimate of 1.1 hours per week for the Activity Chart and 5.3 hours for the Direct Estimate). The viewing diary is, therefore, a considerably more accurate measure of the time young children spend with TV.

There is an apparent discrepancy between the diary estimates of time spent with TV by the children in the present study and the figures reported by the national TV rating services. Averaging reports over the two diaries, the children in the present study spent 13.4 hours per week with TV, whereas national Nielsen figures for the same time period indicate that viewers aged 2–5 years averaged 27.8 hours per week (Nielsen Television Index, 1981). A similar difference between ratings and research estimates, however, has also been found for a longitudinal study of preschoolers in the New Haven, Connecticut, area (personal communication, Dorothy and Jerome Singer, May [illegible]). If the national rating services use diaries nearly the same as the ones used in the present study, the difference cannot be readily attributed to a difference in measurement instruments. Possible reasons for the discrepancy are threefold: (1) The subjects in the present study overrepresent white middle-class children, who are generally reported to be lighter TV viewers than other subgroups of chil-

dren (e.g., Comstock, Chaffee, Katzman, McCombs, & Roberts, 1978). (2) It is possible that families who participate in university-sponsored research are lighter viewers than families who respond to corporate-sponsored research. (3) The ratings systems themselves may overestimate typical TV viewing insofar as the announced fixed rating periods induce television networks and local stations to provide many attractive special offerings during these so-called sweeps periods ("Two Points of View on Network Stunting" [*Broadcasting*; 1977, vol. 92, p. 24]).

Validity of Parent Reports

The present findings bear on the crucial issue of parents as observers of their own children. Some studies have found low correlations between parent reports and those of independent observers on factors such as infant temperament and preschoolers' personality traits (e.g., Bates, Freeland, & Lounsbury, 1979; Moskowitz & Schwartz, 1982; Thomas, Chess, Birch, Hertzig, & Korn, 1963). Other studies have found moderate correlations; for example, Stevens, Kupst, Suran, and Schulman (1978) reported a correlation of .63 between parents' ratings of children's activity levels and measurement taken from wrist and ankle actometer devices. Across these studies it appears that the more specific the observation required of the parent, the more accurate is the observation. In the present study, the diaries required specific time and place information, and the parents were quite accurate. When the questions were more general, asking about "typical" viewing, answers were apparently less accurate. All parent estimates, however, yielded significant correlations with observed behavior; the lowest correlation was .27 between estimated and observed visual attention to television. Parents can be good observers; the more specific the behavior and time of report required, the better the observation.

Finally, the results of the present paper have implications for theories concerning the impact of television on children. It is a common assumption that time with television directly displaces time with other activities. As such, "heavy" viewers of TV are often thought to be at some risk. Two of the present results, however, provide an important qualification: (1) visual attention to the TV averaged 67%; (2) percent visual attention to television was uncorrelated with time spent with television. Taken together, these results indicate that children may spend considerable amounts of time with television doing things other than looking at the TV, and "heavy" viewers in terms of time spent with TV are not *necessarily* heavy viewers in terms of time spent paying attention to TV. One must be careful, therefore, in assessing the impact of television on individual children based on their time spent with TV. To illustrate this point, the heaviest viewer in the present study, using time spent with TV as a criterion, spent 39.8 hours per week with TV. But using time spent looking at TV as a criterion, this child viewed only 3.4 hours per week, ranking among the lightest viewers. When not looking at TV, this boy played with toys, slept, and interacted with his siblings and parents. In future work, therefore, it is essential that descriptions of TV viewing go beyond time spent with TV and time spent looking at TV. Further analyses of the present time-lapse videotapes will provide such descriptions in later reports.

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APPENDIX B

DESCRIPTION OF INDIVIDUAL SUBJECTS

Subject MJ - 9 months, 3 weeks old

MJ was present in the viewing room 12.73 hours over the 9 day period (one day of data was lost because the equipment was removed a day early). However, she was only able to view the television during 7.09 of these hours, the rest of the time she was located in a crib in a position where it would not be possible to view the television. The 7.09 hours she was present in the viewing room with the television on resulted in 1101 instances whereupon looking was assessed. During this time, she was looking at the television 6.9% of the time. It was uncertain whether she was attending to the television 12.6% of the time she was present in the viewing room.

MJ was exposed to almost entirely adult programming (M = 91%, e.g. soap operas). This may partially explain MJ's low attention to television. Looking at the television typically occurred when MJ was drinking a bottle or being held on her parent's lap.

Although MJ had low attention to television, she was interested in her television environment. She frequently touched the television and occasionally tried

to change channels. This is similar to the type of behaviors observed by Lemish (1987).

Chi Square tests of significance were conducted to determine whether MJ was differentiating her attention in the presence of any of the formal features coded. None of the X^2 tests were significant. Thus, MJ does not appear to be differentiating her attention to anything in particular, at least in the presence of the formal features coded in this study.

Subject AM - 10 months, 3 weeks old

AM was present in the viewing room 15.5 hours over the 10 day period, resulting in 2,459 instances whereupon looking behavior was assessed. AM looked at the television during 5.08% of this time and the rater could not be certain of her looking behavior during 5.2% of the rated frames.

AM was present in the viewing room with her 5 year old brother quite often, which may account for children's programming being aired 73% of the time she was in the viewing room. Also, this infant had the highest level of exposure to animation, 42.69%. She appeared to be interested in Daffy Duck and Captain Kangaroo, but not Sesame Street.

Chi Square tests were conducted to determine whether AM was differentiating her attention in the

presence of any of the formal features coded. The test of action was significant, $X^2 = 8.303$, $p < .005$, with AM looking more when action occurred than when action did not occur. AM also looked more when movement occurred than when there was no movement, ($X^2 = 7.72$, $p = .005$). Interestingly, AM also looked more at children's television programs than at adult programming, $X^2 = 6.494$, $p = .011$. Perhaps related to this finding is the fact that AM looked less when adult males were present than when they were absent from the screen ($X^2 = 6.982$, $p < .01$).

Subject JZ - 10 months 3 weeks old

JZ was present in the viewing room 9.4 hours over the 10 day period, resulting in 1,417 frames being assessed for looking behavior. During those frames, JZ looked 17.93% of the time. The rater could not be certain of her looking behavior 19.62% of the time. Individual nonparametric Chi Square tests of significance were conducted to determine whether this child was differentiating her attention on the basis of any of the formal features studied. JZ had enhanced attention to action ($X^2 = 5.027$, $p < .05$), human TV characters ($X^2 = 4.260$, $p < .05$), and nonhuman TV characters ($X^2 = 6.503$, $p = .011$). JZ had depressed attention to animation ($X^2 = 21.736$, $p = .000$).

Presumably infants this young should not have learned that animation is typical content for children. In addition, JZ had depressed attention in the presence of cuts/scene changes ($X^2 = 19.499$, $p = .000$); it is likely that such cinematic techniques are difficult for an infant to comprehend. In addition, this was the only child to have enhanced attention to male TV characters ($X^2 = 4.945$, $p < .05$), which may be accounted for by her interest in males that appear in both children's programming (i.e. Willie Whistle) and adult programming (i.e. the Three Stooges).

Subject SA - 11 months old

SA was present in the viewing room 2.12 hours over the 10 day observation period, resulting in 328 samples of her looking behavior. During the frames that were rated for attention, SA was looking 7.93% of the time and the rater was uncertain whether SA was looking 26.52% of the time.

Since SA was only in the viewing room for a total of two hours and given that there was a fair amount of uncertainty about her looking behavior, there was only a small amount of data available on SA's attention to television. Since the X^2 distribution may take on different values than those presented in the X^2 frequency table if an expected frequency is less than

five (Spence, Cotton, Underwood & Duncan, 1983), Yate's corrected Chi Square was used in those instances (denoted as $X^{2\prime}$).

Two of the Chi Square tests approached significance. SA looked less when adult male TV characters were present ($X^2 = 3.98$, $p < .05$; $X^{2\prime} = 2.682$, $p = .10$). Also, SA looked more when commercials were present than when programs were broadcast ($X^2 = 5.07$, $p < .05$; $X^{2\prime} = 2.77$, $p = .09$).

Subject MW - 15 months 2 weeks

MW was present in the viewing room 7 hours and 43.8 minutes over the 10 day observation period. This resulted in 1,103 assessments of looking behavior. During this time, MW was looking at the TV 33.45% of the time. It was uncertain whether she was looking 22.21% of the time she was present in the viewing room. Chi Square tests were conducted to determine whether MW was differentiating her attention in the presence of any of the formal features coded. One of the tests approached significance. MW looked more when child content was broadcast than when adult content was broadcast ($X^2 = 2.56$, $p = .10$). Although MW paid a moderate amount of attention to television, it seems that she is just beginning to differentiate her attention to television, by making the basic distinction between programming

aimed at children verses adults.

Subject JC - 20 months

JC was present in the viewing room 12 hours over the 7 day observation period (3 days of data were lost due to an equipment malfunction). During the 7 observation days, JC's looking behavior was assessed 1,875 times. She looked at the television during 41% of this time and the coder could not be certain of her looking behavior during 25.6% of the coded frames.

The only character JC showed great interest in watching was Elizabeth Taylor. She was not particularly interested in Sesame Street.

Chi Square tests of significance were conducted to determine whether JC differentiated her attention on the basis of any formal features. She had enhanced attention to action ($X^2 = 3.828$, $p = .05$) and nonhuman TV characters ($X^2 = 3.683$, $p = .05$, $X^{2\prime} = 2.767$, $p = .096$). Presumably simple action sequences, puppets and animals should be comprehensible to infants. In addition, JC's attention was lower in the presence of adult male TV characters ($X^2 = 4.756$, $p < .05$).

Subject JT - 20 months 1 week

JT was present in the television viewing room for 5.24 hours over the 8 day observational period (2 days of data were lost due to an equipment malfunction).

This resulted in 1,256 instances whereupon looking behavior was assessed. She looked at the television during 29.6% of this time and the coder could not be certain of her looking behavior during 7.1% of the coded frames.

JT liked to watch family sitcoms, in particular *The Brady Bunch*, *Happy Days*, and *The Jeffersons*. She also seemed to enjoy *Tom and Jerry*.

JT had significant enhanced attention to action (X^2 = 3.773, p = .05), movement (X^2 = 3.830, p = .05), animation (X^2 = 10.395, $p < .01$), and child TV characters (X^2 = 4.810, $p < .05$, $X^{2\prime}$ = 3.379, p = .066). In addition, she looked at the television more often during children's programming than during adult programming (X^2 = 12.336, p = .000). In addition, her attention was lower in the presence of adult male TV characters (X^2 = 9.693, $p < .01$). This fits in well with what an older infant should understand about television. We would also expect JT to have enhanced attention to nonhuman TV characters, but since she was only exposed to 3 instances of nonhuman TV characters, a significant difference was not detected.

Subject TK - 21 months

TK was present in the viewing room 6.87 hours over the 10 day observation period, resulting in 1,075

assessments of looking behavior. During this time, TK looked at the television 42.98% of the time and it was uncertain whether he was attending 12% of the time. TK was exposed to almost entirely children's programming (M = 87.94%). This accounts for TK having the highest exposure to child TV characters (M = 4.88%) and nonhuman TV characters (M = 10.88%).

TK had significant enhanced attention to action (X^2 = 5.115, $p < .05$) and children's programming (X^2 = 42.729, $p = .000$), both of which should be understandable to infants. In addition, TK had depressed attention in the presence of human TV characters (X^2 = 3.932, $p < .05$) and adult male TV characters (X^2 = 5.94, $p < .05$).

Subject CB - 21 months 3 weeks

CB was present in the viewing room 12 hours and 13.5 minutes over the 10 day observation period. This resulted in 842 assessments of his looking behavior. During this time CB was looking at the television 57.48% of the time and it was impossible for the coder to be certain of his looking behavior 7.24% of the time. CB liked to watch bowling and cartoons, although animation was only aired 8.49% of the time he was in the viewing room. CB was exposed to almost entirely adult programming (85.6%). Thus, it is likely that much of

the programming CB viewed was difficult to understand. Nonetheless, CB differentiated his attention in the presence of a few formal features. He looked more when scene changes/cuts occurred than when they did not (X^2 = 15.752, p = .000) and when nonhuman TV characters were present (X^2 = 4.535, p < .05; $X^{2\prime}$ = 3.348, p = .067). In addition, CB had depressed attention in the presence of human TV characters (X^2 = 5.706, p = .017).

Appendix C

EXAMPLES OF SEVERAL FORMAL FEATURES

Action without movement

Action was defined as purposeful behavior by a character and movement was defined as the physical relocation of a character or object. Therefore, action without movement could occur when the central character was eating something. The character may move in order to eat (e.g. the character picks up a sandwich), but this is not considered movement because the movement involved is not whole body movement. An additional example of action without movement involves a magician pointing a magic wand - the character is doing something purposeful, but the movement is not whole body movement. A doctor leaning over a patient to inspect his leg would also be considered action without movement. Additional examples of action without movement are a character pouring tea or reading the newspaper.

Movement without action

Movement without action could occur whenever movement occurred but a character could not be seen. For example, a commercial with a car crossing the screen where no driver can be seen would fit into this category. Also, an animated segment in which the cover comes off a box, but no one is removing the cover is

movement without action. Rolling credits or animated segments with numbers moving on the screen are additional examples.

Action and movement

There are many televised instances where both action and movement occur. For example, whenever a central character is walking, this is considered both action and movement. Action is present because the character presumably has a destination and is therefore engaged in goal directed behavior. Movement is also present since the character is moving from one destination to another.

An additional example of action and movement is a character bowling. When the character is standing in his stance with the ball in his hand preparing to bowl, action is present but movement is not. When the character is swinging his arm to throw the ball, this is coded as both action and movement. If the camera zooms to that same character sitting and watching the game, neither action nor movement would be coded. In this case, the central character is simply observing others engage in purposeful behavior.

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