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DETERMINING IF TWO-YEAR-OLDS PREFER COMPREHENSIBLE TELEVISION: AN ANALYSIS OF LANGUAGE AND VISUAL SEQUENCING

A Thesis Presented
by
ANNE E. FRANKENFIELD

Submitted to the Graduate School of the University of Massachusetts Amherst in partial fulfillment of the requirements for the degree of

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DETERMINING IF TWO-YEAR-OLDS PREFER COMPREHENSIBLE TELEVISION: AN ANALYSIS OF LANGUAGE AND VISUAL SEQUENCING

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CHAPTER 1
INTRODUCTION

Since the invention of television, parents and experts have argued over the effects that exposure to this medium would have on children. There is special concern regarding very young children. In fact, the American Academy of Pediatrics (AAP) (1999) has made the recommendation that no children under the age of two be exposed to television whatsoever. Despite these concerns, programming for very young children has increased, and “baby videos” have $300 million in annual sales. This programming has been described by its producers as educational, and as focused on developing language and problem-solving skills. One of these shows, Teletubbies, which first aired on British television and was aimed at toddlers and early preschool age children, has found great success all over the world. Parents and experts comment on the “safe environment” the show provides, and how their children watch happily (Lemish & Tidhar, 1999). Many parents reported that their children watch the show attentively, often interacting with it by speaking to the characters, singing, or dancing along (Gotz, 1999). In fact, some research has found that watching Teletubbies motivated children to engage in reading, writing, and other early literacy activities (Marsh, 1999).

With the societal push for more television programming for young children, there is a question as to whether educational shows developed for young children are beneficial. At what age can children actually understand what they are watching? Research on attention to television and comprehension of television programming has supported the theory that attention to television by young children is related to the comprehensibility of the program (Anderson & Lorch, 1983; Anderson, Lorch, Field, &
Sanders, 1981; Lorch, Anderson, & Levin, 1979). Attention is an active process, with viewers using what they have learned about the formal features of television to help guide them in what to watch and when (Alwitt, Anderson, Lorch, & Levin, 1980; Anderson & Lorch, 1983).

Wright, Huston, Ross, Calvert, Rolandelli, Weeks, et al. (1984, as cited in Bickham, Wright, and Huston, 2001) described the developmental process underlying how we “learn” to watch television. They suggest that the attention of very young viewers, who are less experienced with television, is controlled more by a passive process of orienting to salient formal features such as cuts, sounds, and visual changes. Once attending to the television, the viewer begins the process of comprehending show content. Viewers who are a little older and more experienced with television are able to control their attention and attend to the television when something interesting and understandable is on. Formal features are still important, signaling what may be comprehensible material, but more experienced viewers are also able to actively analyze programming and anticipate what content may be useful and interesting to them. Level of content difficulty is an important and controlling factor in this process. If content is too easy, viewers will become quickly bored and pay less attention. Difficult, or incomprehensible material, will also cause a decline in attention.

This thesis will focus on 24-month-old children and serve as the first stage of a larger study examining infants’ attention to Teletubbies. If two-year-olds are found to pay more attention to comprehensible versus incomprehensible versions of the same episode, further work can be done with younger ages in order to determine the youngest age at which this difference in attention may occur. This knowledge would be useful in planning
educational programming for children, particularly in determining what ages will benefit most.

In determining whether or not infants can understand educational programming designed for them, it is important to look at specific cognitive abilities that would be crucial to their understanding. Two of these abilities are understanding language and comprehending a sequence of events. Each of these cognitive abilities has different developmental timelines and involve different processes. Understanding when infants develop each of these abilities is key to determining the age at which television becomes a meaningful medium for these children.

**Infants’ Understanding of Language**

At one time, it was assumed that the age at which children can understand language is the same age as when they begin producing language. This turns out not to be the case. In fact, children have some understanding of linguistic elements and begin to understand words and simple sentences long before they can talk. One model of language comprehension development has been put forth by Hirsh-Pasek and Golinkoff (1996), and describes three main stages of development from birth to 3 years.

The first stage describes infants’ understanding of language from 0-9 months (Hirsh-Pasek & Golinkoff, 1996). During this time, infants begin to acquire information about the sound patterns of their native language, or prosody. By processing the acoustic elements in language, infants are helped to segment nonlinguistic events. They are able to gain information from spoken language, despite their inability to understand. The attention to acoustic elements may occur first for a couple of reasons (Jusczyk, 1997).
One is that the rhythm, pitch, and other acoustic features of language represent the most easily perceived information in the speech signal. Secondly, prenatal experience may prime infants to attend to the acoustics of the human voice.

In the first one to two months, infants are able to discriminate consonant and vowel syllables from different phonemic categories (Jusczyk, 1997). By 6 months of age, they are able to recognize their own name (Hirsh-Pasek & Golinkoff, 1996), and have learned enough about the properties of their native language to allow them to distinguish between words in their native language from words in another language (Jusczyk, 1997). During this stage, infants are also sensitive to the rhythm of language, and some basic grammatical properties. For example, using a habituation paradigm, 6-month-olds were shown to prefer speech in which pauses occurred between two clauses, as opposed to in the middle of a clause (Hirsh-Pasek, Kemler Nelson, Jusczyk, Wright Cassidy, Druss, & Kennedy, 1987). They were also found to be able to do rough segmentation of fluent speech, using strong syllables as a guide to word onset (Jusczyk, 1997). This ability to segment words from a speech string seems to begin between 6 and 7½ months.

Between 9 and 24 months, infants become less dependent on prosodic information, and begin to rely more heavily on semantics (Hirsh-Pasek & Golinkoff, 1996). During this second phase of development of comprehension of language, infants move from acoustical analysis to linguistic mapping. They begin to associate language (words and phrases) with the events, objects, and actions they experience in the world. Early on, this association is confined to single words mapped to objects. By the end of this stage, infants are able to map strings of words onto events or simple actions. This is the time when infants are able to comprehend words and short sentences or phrases.
Around 9 months, infants begin to respond appropriately to words and short phrases (Oviatt, 1980). Parental reports indicate that even at 8 months, infants can comprehend about six common phrases (e.g., “Give me a hug”) and more than 50 words by 11 months (Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994). In a study of recognitory comprehension by Oviatt (1980), infants were presented with a novel live object (rabbit) while their parent and the experimenter named it. When probed for later recognitory comprehension of the object name, infants’ ability to comprehend increased with age and was virtually all-or-none. By 15-17 months, nearly all the infants associated the object with the name that had been given to it earlier. A similar study by Oviatt (1982) of 12- to 20-month-olds, probed recognition of a named, novel, live animal with new representations of the animal (photograph, picture, or 3-D model). She found a substantial increase in preference for the original animal forms between 15 and 18 months. Oviatt (1980) also found that between 15-17 months, infants are also able to understand that simple words (verbs) refer to actions. In general, the average age for word comprehension is between 12 and 14 months (Bloom, 1998; Oviatt, 1980).

During this phase of development, infants also become sensitive to sentence structure. By 10 ½ months, they are using more than just strong syllables to identify the onsets of words (Jusczyk, 1997). Infants also can comprehend word order. Hirsh-Pasek and Golinkoff (1996) showed infants two different videos together with linguistic stimuli (sentences). Each video showed an agent, an action, and an object of the action, and differed depending on the role the characters played. They looked to see whether infants would look more at the video that matched the linguistic stimulus, than the nonmatch. By 13-15 months, infants watched the matching event more than the nonmatching.
By 23 months, Hirsh-Pasek and Golinkoff (1996) found that infants can use phrase-structural information to predict the meaning of verbs. Again, they presented infants with two different videos of an action, along with a linguistic stimulus. This time the videos depicted a causal or a noncausal event and the linguistic stimuli contained either transitive or intransitive sentence frames. Most of the 23-month-old infants showed an ability to use the sentence frameworks (particularly transitives), to help them understand the actions they were seeing. By the end of this developmental stage, infants have become quite good at understanding words and short sentences and phrases, and have even begun to perform rough syntactical analysis of language to aid in comprehension. However, it is important to recognize that comprehension and mapping can only occur at this stage if the infant experiences the linguistic input together with the corresponding event, action, or object.

Finally, in the last stage of language comprehension development, between 24 and 36 months, infants reach a point where they are no longer dependent on contextual support in order to comprehend words, phrases, and even sentences (Hirsh-Pasek & Golinkoff, 1996). They are now able to perform a “complex syntactic analysis” of language (pg. 178). They can understand sentences by analyzing their structure and realizing the grammatical relations within them. These grammatical rules matter and mapping is quite complex. By age two, children understand that simple sentences can be related to each other in meaningful ways (Bloom, 1998). During this time, language production is quickly increasing, with increased comprehension. By the end of the second year, the transition to multi-word speech occurs, along with the understanding of grammar for simple sentences (Bloom, 1998). By the end of the second year and into the
middle of the third, the length of sentences produced increases along with the number of sentence types used (Pinker, 1995).

Despite the regular development of language comprehension, there is quite a lot of variability in when these stages may begin and end, or how long they might last. It is possible for normal children to differ by almost a year or more in the rate at which they develop language understanding and production, although the stages are generally the same (Pinker, 1995). Not only might children differ in the onset and rate of learning, but they may also use different strategies for processing and learning language (Bloom, 1998). Fenson et al. (1994) found several factors that seem to have an effect on language comprehension. On nearly all their measures of language comprehension and production, females scored slightly higher than males. This supports the general belief that females have an advantage in language learning. Fenson and his colleagues also found that SES and birth order had some effect on language learning. In general though, these effects were quite small in comparison with the large effect that age and individual differences have on language learning.

**Infants' Sequential Understanding**

The ability to understand temporal relations develops gradually (Piaget, 1954, 1969). From 4-8 months, infants are able to sequence their own actions, but not external events. By 8-12 months, they become able to coordinate a series of actions in order to reach a goal (e.g. lift a blanket to retrieve a hidden toy), but they are still unable to understand temporally-ordered events that they observe. By 18-24 months, infants begin
to appreciate the sequential nature of events, whether experiencing them directly, or through mental representation.

This last age group is one of great interest. It represents the sixth stage of sensorimotor development, and a transition period between the sensorimotor child and the preoperational child (Piaget, 1954, 1969, 1972). Once infants have reached this stage in development, they are able to imagine the consequence of a sequence of events or actions through mental combinations. Infants no longer need to be in the presence of, or involved in, an event sequence, but can represent a sequence of events through the use of mental symbols. They have begun to appreciate both the spatial and temporal aspects of the event sequence separately and in relation to each other (Piaget, 1969).

For some events, it is believed that infants may have an innate understanding of causality and temporal relations. Some researchers believe that infants as early as two months have expectations regarding the motion of objects and physical properties that govern them (Spelke, Breinlinger, Macomber, & Jacobson, 1992). They are surprised when presented with event sequences that are unnatural and unexpected. Cohen and Oakes (1993) had infants watch films of objects colliding with other objects. The result of the collision was either a natural causal result, or a result that was unnatural, or noncausal. They found that even six-month-olds are sensitive to the difference, watching the causal, natural event more than the noncausal. However, even at 10 months, the response was heavily dependent on the type of objects involved in the event. Haith, Wentworth, and Canfield (1993) demonstrated that infants actually formed expectations of novel event sequences. They looked at two- and three-month olds and found that, when exposed to a constant pattern of light presentations, the infants’ visual fixations
showed that they anticipated the next location of a light presentation. The infants were forming expectations based on a now familiar event sequence.

It has also been found that infants are sensitive to sequences in social situations. Rochat, Querido, and Striano (1999) engaged two-, four-, and six-month-olds in either ordered or disordered peekaboo games. They found that two-month-olds responded equally to each game, while the four- and six-month-olds smiled significantly more during the ordered game, and significantly less during the disordered game. This suggests that infants as young as four months have developed expectations regarding the sequence of social interactions.

Although these behaviors indicate that infants do expect particular events to occur in a particular order, they do not quite explain understanding of all temporally-ordered events, including those that are more story-like, like those experienced in daily social interactions, or events that might be seen on television. Friedman (2002) examined whether or not infants are sensitive to the direction of event sequences. To do this, he looked at four- and eight-month-olds’ attention to forward and backward videos of familiar events. The events either showed the effects of gravity on liquids and solid objects, or the separation of whole objects into pieces. Although 4-month-olds only showed a preference for the forward version of liquid pouring from a beaker to a glass, the 8-month-olds looked longer at all forward versions of gravity-related events. Neither group showed a preference for either direction of the separation events. Friedman concluded that at least for familiar gravity-related events, infants seem to be sensitive to the correct direction in which the event should proceed.
Baldwin, Baird, Saylor, and Clark (2001) were interested in infants’ ability to parse continuous action sequences into meaningful parts. These researchers believed that infants learn to parse motion, just as they learn to parse speech. Like Hirsh-Pasek et al.’s (1987) technique for inserting pauses at unnatural and natural locations in grammatical clauses, Baldwin et al. (2001) presented infants with videos in which a pause was inserted just as an action sequence was completed (natural), or in the middle of an ongoing action sequence (unnatural). After a familiarization period to everyday actions, they found that 10- and 11-month-old infants dishabituated to the unnatural, non-completing event sequences. They concluded that infants at this age are able to parse a sequence of events by determining points in the sequence that coincided with boundaries between intentions.

Infants’ understanding of sequence has also been studied via ability to reproduce event sequences. O’Connell and Gerard (1985) looked at when infants may be able to reliably reproduce a modeled event sequence. They found that at 20 months, infants seemed to be sensitive to the fact that events go together, but not how they go together. By 24 months, infants were successful at reproduction, but only in a way consistent with how the event would normally occur. Events that were modeled in a reverse sequence were reproduced by these infants in their normally occurring order. This indicates that infants’ ability to use temporal information in reconstruction of event sequences is dependent on how meaningful or familiar the sequence is to the child and the age of the child.

Gelman, Bullock, and Meck (1980) used another technique to see what information children could glean from an event sequence. They wanted to see if children are able to fill in a missing element in a three step story. 3- and 4-year-olds were shown
two cards each depicting a stage in an event sequence, and were asked to choose the card that completed the sequence (either at the beginning, middle, or end). Children at both ages were good at filling in the missing item, although errors decreased with age and the children found it difficult when the sequential order was reversed. This shows that by three years of age, children have enough knowledge about events to enable them to make inferences about event sequences.

A more interesting approach was taken by McCall, Parke, and Kavanaugh (1977). They conducted a study with infants involving reconstruction of multi-step event sequences. However they wanted to determine if reconstruction would be affected by the mode of presentation. They presented 18-, 24-, and 36-month-olds with a multi-step event sequence either modeled live or on videotape, and tested to see if infants could imitate the modeled sequence immediately after presentation, or after a 24 hour delay. They found that the infants’ ability to imitate the modeled sequence after watching it on videotape was inferior to their ability to imitate the same sequence if presented to them live, even if they were tested immediately after demonstration. However, the difference between the 36-month-olds’ performance after viewing live or videotaped models was one third the difference of the 18- and 24-month-olds, suggesting that the two types of models may be equivalent for older children.

Barr and Hayne (1999) used a similar paradigm to test infants’ ability to imitate event sequences. They also presented infants with multi-step event sequences either live or on videotape. Their findings suggested that at all ages tested (12-, 15-, and 18-months), infants were able to imitate event sequences better if presented by a live model than via video after a 24-hour delay. Only 18-month-olds were able to imitate the sequences when
presented on videotape significantly better than controls. Follow-up studies indicated that the difference persisted even if the delay was eliminated and when close-ups of the target actions were presented in the videotape version. These results suggested that the difference in imitation ability between the 18-month-olds and the younger infants did not seem to be due to differences in memory ability, or in ability to focus on essential information. They then presented 15-month-old infants with new multi-step event sequences with stimuli which were qualitatively simpler than the original. This time, the infants performed equivalently in the live and video conditions.

**Understanding Television**

Experiencing an event on television is much different than experiencing the same event in real-life. On television, an event or plot may be conveyed in a number of short scenes, including relevant and irrelevant information, from different perspectives. Language may be in the form of narration or character dialogue. Viewers must do several things in order to comprehend what they are watching, having to focus on what is occurring both within a shot and across shots. For example, within a shot, viewers must focus on the most relevant parts of the shot, identify any characters, follow their actions, understand any dialogue, and encode and store the information and its meaning. Across shots, viewers must compare character, scene, dialogue, and other important information with the same information from the previous shot. They then must make some judgment about the two shots in relation to each other. Viewers must put the pieces together, integrating information from each scene to construct the “big picture”. In real-life, the
entire experience would have been viewed from the observer’s perspective and in continuous time, without disconnect and requiring less integration and inference.

Since watching an event presented on television is quite different from watching an event live, it is possible that the cognitive processes behind comprehension of an event on television may be different as well. It is important then to explore infants’ language comprehension and understanding of event sequences when the language and events are presented on television.

The Language of Television

In studies of language on television, it has been found that most language found in children’s television shows, particularly educational programs, is similar to child-directed speech that children are exposed to in real-life (Rice, 1984). These shows also usually provide dialogue that is suitable for children’s linguistic abilities. Educational and prime-time shows were found to have more dialogue than other types of shows, and when dialogue is present, there is a reduction in salient, visual production techniques, so as not to overwhelm the dialogue. In general, television for children has been described as analogous to a talking picture book, and found to provide an environment for language learning (Lemish & Rice, 1986).

It is also important to look at whether or not language on television refers directly and immediately to events or objects being presented. As was stated in the discussion of the development of language comprehension, it is important for infants between 9 and 24 months that linguistic input be presented together with the corresponding event, action, or object for successful mapping. It makes sense then that television would be more
comprehensible to young children, especially infants, when the dialogue has its referent immediately and concretely present. Anderson et al. (1981) rated dialogue from “Sesame Street” programs for “immediacy” – whether or not the referent of the dialogue was concretely present both visually and/or auditorily. They then compared preschoolers’ (3- and 5-year-olds) visual attention to the programs when dialogue was present with both immediate and nonimmediate referents, and in the absence of dialogue. They found that preschoolers’ visual attention was greater in the presence of immediate dialogue. They concluded that “immediate TV dialogue is, in general, more concrete and thus more understandable to young children than is nonimmediate dialogue” (pg. 154). Thus, the way that language is presented on television is very important for successful comprehension and therefore attention.

The Sequence of Television

The way in which events are presented on television, both within and across shots, adds another element of difficulty to the understanding of event sequences. Events seen on television are not in real-time and are usually not shown in a smooth and temporally continuous fashion. They are often quite disconnected and split into several short bits, often shown from different camera angles, and with some pieces deleted. The assumption is that the watcher is capable of inferring the missing elements and able to integrate the information from different perspectives using their prior social knowledge and experience, and their ability to mentally represent the story as one continuous event. Collins (1983) has found that children in second grade and younger are less capable of this complex cognitive task and therefore may have representations of plots that are less
accurate and even incomplete. They are unable to pay attention to central events, organize the events in proper order, and temporally integrate the events, three cognitive tasks that are central to successful comprehension.

It has also been found that children’s understanding of montage is important in their ability to understand events presented on television. Montage is described as the cinematic techniques that are particular to film and television, such as cuts, pans, and zooms. Smith, Anderson, and Fischer (1985) showed 3- and 5-year-olds stop-animation segments that incorporated basic elements of montage (pans, zooms, and cuts). The children were then asked to reconstruct the scene using the same dolls and settings as were used in the film. They found that these children had no problems with reconstructing the scenes which they had viewed. They then decided to create new segments which incorporated montage that required inferences about character perspective, implied action, sequences, spatial relationships, and simultaneity of different actions. They showed these segments to 4- and 7-year-olds and found that, when averaged across all segment types, 62% of four-year-olds and 88% of seven-year-olds demonstrated a clear understanding of montage. Inferences about implied action sequences were easiest for both ages. The four-year-olds had the most difficulty with inferences about simultaneity, while seven-year-olds had trouble with inferences about character perspectives. In general, it seems that the ability for children to understand cinematic events conveyed through camera techniques and film editing increases substantially with age.

Abelman (1990) looked at children’s understanding of temporal order on television. Four-, six-, and eight-year olds were shown a short segment of "The Cosby
Show" in either canonical sequence (normal time), reversed sequence, or with "time-leaps", which eliminated some actions present in the normal event sequence. The children were tested on their understanding using a picture task that asked them to recreate the sequence of events from the show by ordering seven pictures depicting scenes from the video stimuli. It was found that the children's ability to sequence was strongly related to their ability to be successful in liquid conservation tasks. This ability increased with age, with only 4% of four-year-olds in the study unsuccessful. In general, conservers were better at understanding canonical and reverse order presentations. In addition, the amount of television consumed by the children affected their performance. High consumers were capable of higher levels of comprehension, particularly in the time-leap condition, than low and moderate consumers. This study relates back to the claim that the transition from the sensorimotor stage to preoperational stage in development is extremely important in understanding sequence (Piaget, 1954, 1969, 1972).

In an extension of their studies of live versus videotaped modeling of event sequences, Barr and Hayne (1999) hypothesized that the way target information in event sequences is embedded within a program or program segment, like on television, may affect infants' ability to encode that information. To test this, they presented 15- and 18-month-old infants with two different three-step event sequences using two different stimuli – either presented by a live model or on videotape. The videotape in this study was longer than those presented in their earlier studies, in order to make them more like segments found in a typical children's television program. The segment was three minutes long and preceded with a one minute commercial. In addition, the adult model on the video was different from the experimenter with whom the infant interacted with in
person. They found that 15- and 18-month-olds were able to imitate a video model even when the presentation was more similar to the complex viewing condition found while viewing real television programs, even with a testing delay (24 hours). However, the performance of the infants in the video condition was still inferior to that of infants presented with the live demonstration. The researchers concluded that the “ability to learn from television is undoubtedly constrained by both perceptual factors unique to television and by general cognitive development as well” (pg. 1079).

So, how does our understanding of attention and comprehension of television apply to two-year-olds? How does language understanding and the ability to comprehend event sequences affect infants’ attention to television? Most of the studies on understanding television have been done with children age three and older. In fact, little research has been done to determine how infants may comprehend television, or if they are capable of understanding it at all. One approach that has been tried is the experimental manipulation of program comprehensibility. The present study utilized this approach in an attempt to determine how two-year-olds’ understanding of language and event sequences affects their comprehension of television.

**Overview of Study**

It can be seen that a number of developmental milestones must be reached in order to have a complete understanding of stories presented on television. Language and sequential understanding are two of the most prominent and testable. However, it is important to remember that one is dependent on the other. Language is often very important in understanding and inferring the sequence of events, while understanding the
temporal order of a scene often provides invaluable information in understanding the associated dialogue. This thesis attempted to tease these two elements apart in order to determine if two-year-olds are able to comprehend television, or at least differentially respond to television when it is incomprehensible. Using segments of the popular television show *Teletubbies*, the study tried to determine the extent to which language and sequential understanding affected two-year-olds’ behavioral responses to television.

The study was conducted in collaboration with Dr. John Richards’ lab at the University of South Carolina in Columbia, South Carolina. Dr. Richards recruited and ran all subjects in his lab using his equipment. He also collected heart rate (EKG) data which he will analyze. Videos of the subjects were recorded on CDs and sent to the University of Massachusetts/Amherst where they were coded for looks at the television and interactions. The data were then analyzed and serve as the basis for this thesis.

The stimulus used for the study was prepared at the University of Massachusetts/Amherst. It consisted of two normal 10-minute segments from the television show *Teletubbies*. These segments were then distorted in two different ways, and provided the basis for the two experimental manipulations for the study. In Experiment 1, subjects received the two normal segments without distortion, mixed with the same two segments distorted through dubbing of backward speech. In Experiment 2, subjects received the two normal segments without distortion, mixed with the same two segments distorted through random editing (reorganization of shots). Two-year-olds’ attention to the normal segments was compared to attention to the distorted segments to determine if the infants’ treat the two equally. Attentional differences can be assumed to
result from the distortion and inferences can be made about the effects of language and sequential understanding on comprehension.

Attention to television was the variable of interest in this study and was measured through looks at the television. Based on previous comprehensibility studies (Anderson et al., 1981; Richards and Cronise, 2001), it was expected that infants’ attention to television would be greater when they can comprehend the show’s content. If the infant was shown to pay more attention to the normal segments than the distorted ones, it could be inferred that they can make this distinction and that they prefer comprehensible content. (Verbal and nonverbal interactions in reference to the show should also be more prevalent during comprehensible segments.) If, on the other hand, infants paid the same amount of attention (look equally) to both the normal and distorted portions of the stimulus, it could be inferred that they do not distinguish comprehensible from incomprehensible content.

In either case, it was also assumed that the infants would at least watch parts of the distorted segments, whether they understood them or not. Most of the formal features that are an integral part of television shows were maintained in the distorted segments. These features cause infants to orient to the screen, and for very young viewers, they seem to be the primary force behind attention to television (Wright, Huston, Ross, Calvert, Rolandelli, Weeks et al., 1984, as cited in Bickham, Wright, and Huston, 2001). Therefore, even incomprehensible segments may elicit an orienting response and possibly hold attention because of the formal features. As children age, comprehensibility becomes more important to sustained attention, and formal features serve more as cues for the viewers to analyze programming for comprehensibility. In addition to the
attention-grabbing force of formal features, the distorted segments may still have
contained content that was intriguing or even meaningful to the infant despite the
distortion.

The model for the present study was based on work done by Anderson, Lorch,
Field, and Sanders (1981), which provided the most comprehensive look at the role of
comprehensibility in children’s television. They showed two-, three-and-a-half-, and five-
year-olds one of two different stimuli. Each stimulus was composed of normal bits from
the children’s show “Sesame Street” together with distorted versions of the show.
Distortions were accomplished through backward speech dubbing of dialogue, foreign
language dubbing (Greek), or random editing. They found that attention was greater to
the normal segments than to the distorted segments at all ages, with the difference for
younger children being slightly smaller. More specifically, there was a significant
reduction in attention to the language distorted segments (Greek and backward speech) in
comparison to the normal, and there was a slight reduction in attention to the random
editing compared to the normal segments. Overall attention to all types of stimuli
increased with age. The authors concluded that visual attention to television is heavily
dependent on the degree to which children can understand it – the more they understand,
the more they pay attention. They also determined that dialogue was an extremely
important factor in comprehension, while having a meaningful sequence of scenes was
less important. The lesser effect of random editing may be due to the fact that each short
shot is comprehensible in and of itself, and integration of information across scenes is
difficult for younger children (Collins, 1979).
Richards and Cronise (2000) conducted a study similar to Anderson et al. (1981) with 6-, 12-, 18-, and 24-month olds. Children participated in two separate sessions. In the first session, they watched a segment of a “Sesame Street” movie (“Follow That Bird”). In the second session, they watched a mixed sequence with segments from the same “Sesame Street” movie interspersed with computer-generated audiovisual stimuli. They found that participants looked more, in general, during the first session (“Sesame Street” only) than the second (mixed stimuli). Interestingly, they found an increase in the proportion of time participants spent looking from 6- to 18-months which leveled off from 18- to 24-months. In the second session (mixed stimuli), look duration and proportion of time spent looking at all ages was longer during the “Sesame Street” movie segments than the computer-generated segments. There was, however, no increase in looking time over the four ages during this session. The shape of the log normal distribution of looks changed slightly with increases in age. The number and duration of long looks increased with age, while the number of short looks decreased with increases in age. The researchers concluded that comprehensibility of the stimuli affected the distribution of looks toward the television for older, but not younger children. The 6- and 12-month-olds did not look differently at the television between the two sessions, while the 18- and 24-month-olds did show a difference in attention. Overall, the amount of attention allotted to the stimulus in the first session increased from six months to two years.

There are, however, some methodological problems with this study that make it difficult to determine exactly why the 6- and 12-month-olds are not paying the same amount of attention to the stimuli as the 18- and 24-month-olds. One major problem is
that the computer-generated audiovisual display is an inappropriate control. It does not share enough features with the “Sesame Street” movie segment to determine if comprehensibility is the reason for the differential looking. Perhaps children at 18- and 24-months are simply more interested in watching human-like puppets like those in the “Sesame Street” movie segments.

Despite these problems, this study brings up some very interesting questions. Why did the 6- and 12-month olds not attend differently to the two stimuli, while the 18- and 24-month-olds did? Why does overall attention to the “Sesame Street” movie segment increase with age, but not attention to the random sequence? It is possible that the development of cognitive processing underlies these changes. In particular, it is possible that language comprehension and the ability to comprehend visual sequences underlies the greatly increased attention to the normal movie at age 18-months.

The present experiments strove to replicate the results found for 24-month-olds in the Anderson et al. (1981) comprehensibility study and the Richards and Cronise (2000) study of infant attention. Replication of these results is extremely important since attentional differences at younger ages would not be expected if two-year-olds do not show a preference for the more understandable segments. To improve on the methodology of the other two studies, segments from the children’s television show Teletubbies were used for the stimulus. This show was designed for younger children and was more appropriate for the age group in the present study. Also, distortions of the normal Teletubbies segments were used to provide an appropriate control, since most features of the normal show were maintained in the distortions, except those related to
comprehensibility. Therefore, any differences in attention to the two segments could be attributed to differences in comprehensibility.

Coding of children’s interactions with the television show was also an important addition. Interactions could be either verbal or nonverbal but had to be in response to or about the show. Interactions are important since they provide more information about the viewers’ understanding of the show. Crawley et al. (1999) found that interactions with the television increased as children repeatedly watched an episode of Blue’s Clues. With repetition, comprehension of the show increased and children’s ability to participate with the show also increased.

**Expected Results**

**Overall Visual Attention**

Overall attention to television, particularly for the normal segments, is expected to be high at this age due to developing ability to comprehend language, greater experience with television, and developing cognitive abilities. Attention may also be affected by the amount of exposure or experience the children have with television. Barr, Chavez, Fujimoto, Garcia, Muentener, and Strait (2003) compared 12- and 15-month-olds’ attention to either a “Sesame Street” video or a “Baby Mozart” video. They found that those children who had been previously exposed to videos similar to their test video had higher overall percent looking to the test video than those having no exposure to similar videos. It is also possible that the experimental setting may result in higher levels of attention. In this study, children are confined to sitting on their parents’ laps directly in front of the screen with few toys with which to play. This is different from the setting
used by Anderson et al. (1981) in which the children were free to move around with a larger toy choice.

**Experiment 1 - Language Distortion**

In any television program, language is an important source of information, especially information that may not be visually depicted. It can help with temporal integration and with making inferences about plot. However, research has shown that infants are not born comprehending language, although they may be sensitive to the underlying syntax and prosody of their native language (Hirsh-Pasek and Gollinkoff, 1996; Hirsh-Pasek, et al., 1987; Jusczyk, 1997). This sensitivity does not translate to full understanding. It was hypothesized that the ability to comprehend sentences and to map these sentences to objects or actions referred to by the language is central to comprehensibility detection. In regards to television, the child must be able to map the dialogue of the characters or narrator to the objects or actions appearing within or across shots. For this reason, a significant difference in attention between normal and language distorted segments should be found.

Two-year-olds will most likely attend more to the normal segments of *Teletubbies* than to the backward speech version. Children at this age are able to understand most sentences of reasonable length and have a very large vocabulary. Their productive language is also increasing at this stage (Pinker, 1995), so these children may be found to interact verbally with the show. They are beginning to understand more complex sentences, both in and out of the context of an event (Bloom, 1998; Hirsh-Pasek &
Golinkoff, 1996). The language distortion should have a profound effect on these children’s ability to comprehend the television show.

This result would replicate Anderson et al.’s (1981) findings illustrating that two-year-olds’ attention to the show was negatively affected by language distortion. Backward dialogue had a huge negative effect on children’s attention to the Sesame Street segments. The effect size was 0.617, a large effect according to Cohen’s guidelines and yielded a power of 1.000 for that study. Richards and Cronise (2000) also found that comprehensibility of the stimuli affected attention for the 24-month-olds in their study.

It is expected that the two-year-olds will interact more with the show during the normal segments than the incomprehensible segments. The more the children understand, the more they will talk about and behaviorally interact with the show. There will most likely be individual differences in interactions across subjects, with some children interacting regularly with the show, and others not interacting at all. It is also possible that interactions may inadvertently affect attention to the television, causing the children to look away from the screen as they interact with their parent about the show. Therefore, children who interact with the show a great deal may have more short looks at comprehensible segments than would otherwise be expected.

**Experiment 2 - Sequence Distortion**

Random editing, which will affect the normal sequential order of the show, is also expected to have a significant effect on the two-year-olds’ attention. As the research has shown, by age two, children can begin to represent events mentally and make inferences regarding missing elements in event sequences (Gelman et al., 1985; O’Connell &
Gerard, 1985; Piaget, 1969). It is hypothesized that the difference in looking between the normal and distorted segments will be statistically significant, but may not be as powerful of an effect as expected in Experiment 1. Each short segment is itself comprehensible and contains pieces of meaningful information. The “big picture”, or plot-line of the segment may be lost, but the children may find the short shots meaningful in and of themselves. It is generally difficult for children at 24 months to fully comprehend the plot-line of a story presented on television. Due to the difficulty of this cognitive skill, an attentional difference is expected for the two-year-olds, although the effect may not be as strong as expected for the language distortion. This is based on the results from the Anderson et al. (1981) study which had an effect size of 0.255 for the attentional difference between normal and randomly edited segments of Sesame Street. This effect size is a small effect according to Cohen’s guidelines and yielded a power of 0.695 for the Anderson study.

As with Experiment 1, children are expected to interact with the normal segments more than the distorted due to the differences in comprehensibility. However, as mentioned, interacting may have an inadvertent effect on attention to television. Although attention to the normal segments should be greater, interactions may also occur more often causing looks away from the screen.
CHAPTER 2

METHOD

Design

Twenty-five infants viewed one of two 40-minute videos of the children’s show *Teletubbies*. Twelve of the subjects viewed normal and backward speech segments (Experiment 1), while thirteen subjects viewed normal and random shot segments (Experiment 2). Presentation of segments within each 40-minute video were counterbalanced – 10 minutes normal (1\textsuperscript{st} bit), 10 minutes distorted (1\textsuperscript{st} bit), 10 minutes normal (2\textsuperscript{nd} bit), 10 minutes distorted (2\textsuperscript{nd} bit) – with half the subjects getting a normal segment first and half getting a distorted segment first. The stimulus bit shown first was randomly chosen.

Participants

Subjects were twenty-nine, 24-month-old infants with a mean age of 2.008 years ($SD = 0.029$), and ranging from 1.959 years to 2.055 years. Four subjects were not included in the analyses due to problems with stimuli presentation and inability to see the subject on camera for a majority of the session time. Of the 25 subjects with usable data, 14 were males and 11 were females. Seven boys and six girls were analyzed for Experiment 2, while seven boys and five girls made up the subject pool for Experiment 1. Since gender was not expected to be a significant effect, the unequal number of males and females for Experiment 1 is not a concern for the analysis. All participants were recruited and run in the lab of Dr. John Richards at the University of South Carolina in Columbia, South Carolina.
Stimulus Tapes

The two, 10-minute normal segments of Teletubbies were selected and recorded from recent broadcasts. One segment included content with only the puppet characters, while the other included both the puppet characters and live-action human content. All participants viewed these normal sequences. In addition, participants viewed one of two distorted versions of the two normal sequences. Distorted segments were created through either random editing or backward speech dubbing of the normal segments. Each stimulus, with two normal segments, and two distortions of those segments, were 40-minutes long.

The two randomly edited sequences were created by reordering the camera shots within each normal sequence. Professional digital video editing equipment was used, along with a computer video editing program. Each preexisting edit point was marked and randomly rearranged so that no two shots were in canonical order. One segment consisted of 101 shots, while the other consisted of 124 shots. The distorted segments were then downloaded as MPEG files to rewritable CDs for presentation.

The two segments with backward speech were created using a computer video editing program. Each utterance was identified in the audio track, selected, and reversed by assigning it a negative speed. Each utterance remained roughly matched to character lip movement and voice quality was retained. Music and sound effects were not reversed unless they occurred during an utterance. These bits were also downloaded as MPEG files to rewritable CDs for presentation.
Procedure

The children were brought into the lab by their parents. The study was explained and parent and child were brought into the viewing room. The *Teletubbies* segments were shown on a 19” color television monitor in the room. The sound was played from two speakers hidden above the television. Condition and order of segment presentation were randomly determined for each subject. Each child sat on his/her parent’s lap, with a table in front of him/her on which approximately four to five age-appropriate toys was placed within easy reach. The front edge of the table was 27” from the television screen. The children were free to play with the toys, watch the television, or interact with their parent. Parents were asked not to encourage their children to watch television. A camera placed above the television recorded the children’s behavior throughout the session. Heart rate was also recorded. Before the session began, parents were asked to fill out a brief questionnaire concerning their child’s television viewing background and experience with *Teletubbies* (Appendix A). After the questionnaire was completed and the child appeared ready, the stimulus was presented.

Coding

Each subject’s recorded session was viewed and scored for looks at and interaction with the television. Although heart rate data was collected, its use is not within the scope of this study and will be analyzed by John Richard’s lab at the University of South Carolina. The onset and offset of each look at the television and all program-related verbal and nonverbal behaviors was coded. Visual attention was coded according to the procedure used by Anderson and Levin (1976) which has been shown to have high interobserver reliability. A look onset was coded as the video frame when the
infant's eyes were oriented towards the television. A look offset was coded at the precise frame when the child looked away from the television. Interactions with the television were coded according to procedures established in Crawley, Anderson, Wilder, Williams, and Santomero (1999). An interaction included pointing at or talking to the television, asking questions about the show, dancing in response to the show, getting excited about the show, and any other verbalizations or actions directed towards or in response to the television program. Coders simply kept a tally of each utterance and behavior that occurred in response to the television show for each trial.

Reliability

Inter-observer reliability (IOR) was calculated for each coder as part of his/her training. In addition, one-fourth of the data was randomly chosen for IOR analysis to assure coder agreement throughout the study. Reliability was calculated for attention to television (number of looks, mean look length, and percent looking) and interactions using a Pearson product-moment correlation. As can be seen from the values in Table 1, all measures had correlations above 0.90, which was the criterion for acceptable IORs.

<table>
<thead>
<tr>
<th></th>
<th>Number of Events</th>
<th>Cumulative Event Times</th>
<th>Mean Event Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looks</td>
<td>.916</td>
<td>1.000</td>
<td>.998</td>
</tr>
<tr>
<td>Interactions</td>
<td>.960</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: All data are expressed as Pearson product-moment correlations, n=6.
CHAPTER 3
RESULTS

Although each session was designed with four trials composed of two normal segments of *Teletubbies* and two distorted versions of those segments, the 24-month-olds in this study completed approximately 2.5 trials, averaging 23.464 ($SD - 5.031$) minutes per session. All subjects must have completed the majority of their first two trials to be included in the study. Sessions were ended when subjects became fussy and unable to remain seated. Data from normal trials were combined and compared with the combined data from distorted trials resulting in two repeated-measures variables.

Visual Attention to Television

A mixed-model ANOVA with two between-subjects variables – sex (2 – male/female) and order (2 – normal $1^{st}$/distortion $1^{st}$) – and one within-subject variable – comprehensibility (2 – normal or distorted) – was performed for both Experiments 1 and 2. Dependent variables included mean number of looks at television, mean longest look, mean look length, and mean percent looking at the television. Mean percent looking was of particular interest since it was the variable used in the Anderson et al. (1981) study. It was defined as the percentage of each segment during which the child was looking. This value was obtained by dividing the cumulative amount of time looking at a segment type (normal or distorted) by the total segment time, and multiplying the result by 100.

Overall looking at the TV was high for this age group, averaging 72.737% ($SD - 14.875$) in Experiment 1 and 58.122% ($SD - 14.875$) in Experiment 2. This is comparable to the percent attention by 12- and 15-month-olds found by Barr et al. (April 2003) to
both Baby Mozart (74% and 53%) and Sesame Street (60% and 48%), and is much higher than the approximately 20-25% looking by 24-month-olds watching Sesame Street previously found by Anderson and Levin (1976). Anderson et al. (1981) also reported lower overall attention than in the present study with 24-month-olds having an average of 28.3% attention to television.

**Experiment 1 – Backward Speech**

**Mean Number of Looks/Mean Longest Look**

Although mean number of looks for the normal segment was greater than the mean number for the distorted segments (Table 2), there was not a significant main effect of comprehensibility. However, there was a significant, two-way comprehensibility by order interaction for number of looks, $F(1,8)=9.639, p=0.015$. Testing the simple effects of comprehensibility for each order (sex as a factor), there was a significant main effect of comprehensibility for those children receiving the normal segment for the first trial, $F(1,4)=27.827, p=0.006$. Children receiving the normal first had 45 looks (SD=17.618) at the normal segment while only having 30.5 (SD=14.082) looks at the distorted segment (Table 3). There was no significant difference in the number of looks at normal and distorted segments for the group that received the distorted segment for their first trial.

Analysis of the mean longest look revealed no significant effects of comprehensibility, although longest looks during normal segments were greater than the longest look for distorted segments. (Table 2). A significant sex by order effect is due to the fact that females watching the normal segment first had longer looks at the television than those who received distorted segments first, $F(1,8)=11.432, p=0.010$. 
Mean Look Length

There were no significant effects for mean look length, despite a slightly greater mean look length for normal segments than distorted (Table 2).

Mean Percent Looking

A marginally significant main effect of comprehensibility for mean percent looking was found in the hypothesized direction, $F(1,8)=3.015, p=0.121$, one-tailed $p=0.060$, with percent looking greater during normal segments than distorted (Table 2). The effect size was a medium effect according to Cohen’s guidelines ($f=0.2897$), but the test only had a power of 0.2405, due to the small number of subjects. This effect for speech is much smaller when compared to the effect for the Anderson et al. (1981) study.

Experiment 2 – Random Edit

Mean Number of Looks/Mean Longest Look

There was a significant main effect of comprehensibility for mean number of looks, $F(1,9)=6.860, p=0.028$, with children having more looks during distorted segments than normal. (Table 2).

As seen in Table 2, the greater mean longest look occurred while children were watching the normal segments. This difference was not significant and no other significant effects were found for this variable.
Mean Look Length

There were several notable effects for mean look length. Overall, mean look length was greater for normal segments than for distorted. (Table 2). There was a significant main effect of order, $F(1,9)=6.952, p=0.027$, as well as a significant main effect for comprehensibility, $F(1,9)=6.518, p=0.031$. The latter had an effect size of 0.480 which is a large effect according to Cohen’s guidelines. There was also a significant comprehensibility by order interaction, $F(1,9)=5.850, p=0.039, f=0.449$.

Due to the order effects, separate 2 (sex) x 2 (comprehensibility) mixed ANOVAs for each order were conducted. For the children who received normal first, there was a significant main effect for comprehensibility, $F(1,4)=7.535, p=0.041$. No significant effects were found for those receiving distorted segments first. The children receiving normal first had a mean look length of 16.697 seconds for the normal segments and 8.350 seconds for distorted. Those seeing a distorted segment first had a mean look lengths of 6.034 seconds for normal and 5.799 for distorted. (Table 4)

Mean Percent Looking

As can be seen in Table 2, mean percent looking at the normal segments was greater than mean percent looking at the distorted segments. The analysis revealed a significant comprehensibility by order interaction with a large effect size of 0.5666, $F(1,9)=8.71, p=0.016$. Separate tests of each order resulted in a significant main effect of comprehensibility for the children receiving the normal segment first, $F(1,5)=7.965, p=0.037$ (Table 4).
First Trial Analysis

Due to the strong order effects, a one factor (order), between-subjects ANOVA of mean look length and mean percent looking were conducted for the first trial only. This was done to try to achieve a pure measure of attentional differences to the normal and distorted stimuli. This was done because it appears that once a child experiences the distorted version of *Teletubbies* attention is low and remains low even when the normal version is presented. The first segment, on the other hand, is uncontaminated by prior immediate experience with the program. For mean look length, there was a significant difference between the two groups, $F(1,11)=12.341, p=0.005$ – subjects viewing the normal segments had longer mean look lengths (19.294 seconds) than those subjects viewing the distorted segments (6.273 seconds) in the first trial. A significant one-tailed effect was found for mean percent looking in the hypothesized direction with subjects watching normal more than distorted – 77.607% and 55.564% respectively, $F(1,11)=3.383, p=0.093$, one-tailed $p=0.047$. This effect is significant with a two-tailed test when combining subjects from both experiments who had watched normal segments in the first trial (13 subjects) and comparing them to the six subjects who watched the randomly edited segment in the first trial, $F(1,17)=4.990, p=0.039$. 
Table 2
Visual Attention to Television – Summary Statistics

<table>
<thead>
<tr>
<th>Experiment</th>
<th>n</th>
<th>Mean # looks</th>
<th>Mean look length (sec)</th>
<th>Mean % looking</th>
<th>Mean long look (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Language</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>12</td>
<td>47.500</td>
<td>14.421</td>
<td>71.835</td>
<td>130.256</td>
</tr>
<tr>
<td>Distorted</td>
<td>12</td>
<td>44.417</td>
<td>13.735</td>
<td>65.463</td>
<td>96.787</td>
</tr>
<tr>
<td><strong>Sequence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>13</td>
<td>40.308</td>
<td>11.921</td>
<td>60.078</td>
<td>89.976</td>
</tr>
<tr>
<td>Distorted</td>
<td>13</td>
<td>54.077</td>
<td>7.173</td>
<td>53.863</td>
<td>55.059</td>
</tr>
</tbody>
</table>

Note. Standard deviations in parentheses.

Table 3
Visual Attention to Television by Order – Experiment 1 (Backward Speech)

<table>
<thead>
<tr>
<th>Experiment</th>
<th>n</th>
<th>Mean # looks</th>
<th>Mean look length (sec)</th>
<th>Mean % looking</th>
<th>Mean long look (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal 1st</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>6</td>
<td>45.000</td>
<td>18.238</td>
<td>76.358</td>
<td>170.802</td>
</tr>
<tr>
<td>Distorted</td>
<td>6</td>
<td>30.500</td>
<td>17.091</td>
<td>66.364</td>
<td>106.994</td>
</tr>
<tr>
<td><strong>Distorted 1st</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>6</td>
<td>50.000</td>
<td>10.604</td>
<td>67.313</td>
<td>89.711</td>
</tr>
<tr>
<td>Distorted</td>
<td>6</td>
<td>58.333</td>
<td>10.380</td>
<td>64.562</td>
<td>86.580</td>
</tr>
</tbody>
</table>

Note. Standard deviations in parentheses.
Table 4
Visual Attention to Television by Order – Experiment 2 (Random Edit)

<table>
<thead>
<tr>
<th>Experiment</th>
<th>n</th>
<th>Mean # looks</th>
<th>Mean look length (sec)</th>
<th>Mean % looking</th>
<th>Mean long look (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal 1st</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>7</td>
<td>39.429</td>
<td>16.967</td>
<td>72.480</td>
<td>129.625</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(17.624)</td>
<td>(7.632)</td>
<td>(19.625)</td>
<td>(82.618)</td>
</tr>
<tr>
<td>Distorted</td>
<td>7</td>
<td>44.714</td>
<td>8.350</td>
<td>54.481</td>
<td>58.568</td>
</tr>
<tr>
<td></td>
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<td>9.552</td>
<td>(4.799)</td>
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<td>Distorted 1st</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>6</td>
<td>41.333</td>
<td>6.034</td>
<td>45.608</td>
<td>43.720</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.967)</td>
<td>(2.969)</td>
<td>(16.342)</td>
<td>(22.283)</td>
</tr>
<tr>
<td>Distorted</td>
<td>6</td>
<td>65.000</td>
<td>5.799</td>
<td>53.142</td>
<td>50.965</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(23.766)</td>
<td>(2.255)</td>
<td>(16.327)</td>
<td>(13.508)</td>
</tr>
</tbody>
</table>

Note: Standard deviations in parentheses.

Interactions with Television

Interactions per minute were summed over all types of interactions (verbal and nonverbal). Interactions for normal segments were combined and compared to interactions per minute for the distorted segments using the same mixed-model 2 (sex) x 2 (order) x 2 (comprehensibility) ANOVA used for analyzing visual attention to television. Two subjects, one in each experimental condition, were not coded for interactions due to having videos without sound. The final analysis included 23 subjects, 11 for Experiment 1 and 12 for Experiment 2.
Experiment 1 – Backward Speech

Interactions per Minute

There were no significant effects of comprehensibility on interactions per minute. As can be seen in Table 5, subjects interacted equally to normal and distorted segments.

A nearly significant main effect of sex was due to females interacting more than males to both normal (3.043 vs. 1.028) and distorted segments (3.447 vs. 0.898), $F(1,7)=8.360$, $p=0.023$.

Experiment 2 – Random Edit

Interactions per Minute

As illustrated in Table 5, subjects interacted more during the normal segments than during the randomly edited segments of Teletubbies. This difference was significant with a one-tailed test in the hypothesized direction, $F(1,8)=5.020$, $p=0.055$, one-tailed $p=0.028$.

Table 5
Interactions with Television – Mean Interactions per Minute

<table>
<thead>
<tr>
<th>Experiment</th>
<th>n</th>
<th>Interactions per Minute</th>
<th>Normal</th>
<th>Distorted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>11</td>
<td>1.761</td>
<td>(1.632)</td>
<td>1.825</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.766)</td>
<td></td>
</tr>
<tr>
<td>Sequence</td>
<td>12</td>
<td>1.087</td>
<td>(0.945)</td>
<td>0.564</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.541)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Standard deviations in parentheses.
Questionnaire Data - Time Exposed to TV and *Teletubbies*, and Parent Education

Correlations were calculated to determine if children who are exposed to more television and, in particular, those who watch *Teletubbies*, had higher attention to the show than those who did not. Parent education was also correlated with attentional measures to determine its influence.

Before correlations were calculated, difference scores were calculated for mean look length and mean percent looking by subtracting the means for distorted segments from the mean values for normal segments. In this way, those subjects for whom comprehensibility of the stimulus mattered had positive difference scores, while those subjects who did not differentiate between the two stimuli had difference scores equal or less than zero. The difference scores were then ranked to give a relative value of comprehensibility by each subject. These ranked scores were then correlated with the measures of interest.

Experiment 1 – Backward Speech

As can be seen in Table 6, the only significant correlation found for backward speech was that between percent looking and mean look length \((p=0.001)\) which is to be expected. Although no other values were significant, it is important to note the negative correlation between the difference score for percent looking and time watching *Teletubbies* at home. This is a medium-sized correlation according to Cohen’s guidelines and suggests that the more children watch *Teletubbies* at home, the less they distinguish between normal and backward speech versions of the show.
Table 6
Questionnaire Data – Pearson Correlation Matrix for Backward Speech

<table>
<thead>
<tr>
<th></th>
<th>Mean Look Difference</th>
<th>Percent Look Difference</th>
<th>Time Watching Teletubbies</th>
<th>Time Exposed To TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Look Difference</td>
<td>0.818***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Watch Teletubbies</td>
<td>-0.073</td>
<td>-0.318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Exposed To TV</td>
<td>0.487</td>
<td>0.401</td>
<td>-0.121</td>
<td></td>
</tr>
<tr>
<td>Parent Education</td>
<td>0.298</td>
<td>0.170</td>
<td>0.365</td>
<td>-0.183</td>
</tr>
</tbody>
</table>

Note. All data are expressed as Pearson product-moment correlations. ***p<0.01, **p<0.05, and *p<0.10.

Experiment 2 – Random Edit

Table 7 depicts correlations for the random edit subjects. As with Experiment 1, percent looking was positively and significantly correlated with mean look length (p=0.002). In addition, and of more interest, is the significant negative correlation between time watching Teletubbies and mean look length. The correlation between percent looking and time watching Teletubbies was also negative, although not significant. Time watching Teletubbies also had a marginally significant correlation with parent education (p=0.070) indicating that children of more educated parents watch Teletubbies more.
Table 7
Questionnaire Data – Pearson Correlation Matrix for Random Edit

<table>
<thead>
<tr>
<th></th>
<th>Mean Look Difference</th>
<th>Percent Look Difference</th>
<th>Time Watch Teletubbies</th>
<th>Time Exposed to TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Look Difference</td>
<td>0.779***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Watch Teletubbies</td>
<td>-0.567**</td>
<td>-0.433</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Exposed To TV</td>
<td>-0.099</td>
<td>-0.056</td>
<td>-0.086</td>
<td></td>
</tr>
<tr>
<td>Parent Education</td>
<td>-0.293</td>
<td>-0.127</td>
<td>0.518*</td>
<td>-0.202</td>
</tr>
</tbody>
</table>

Note. All data are expressed as Pearson product-moment correlations. ***p<0.01, **p<0.05, and *p<0.10.

Combined Data

Since results of the correlations for Experiment 1 and 2 were exhibiting similar patterns regarding the effects of time watching *Teletubbies* on mean look length and percent looking, the data from the two experiments were combined and the same correlations were calculated. As can be seen in Table 8, the negative relationship between time watching *Teletubbies* and both mean look length and mean percent looking remained. However, only the correlation with mean look length was marginally significant (p=0.060). In addition, parent education was significantly correlated with time watching *Teletubbies* (p= 0.033), and mean look length was significantly correlated with mean percent looking (p<0.001).
Table 8
Questionnaire Data – Pearson Correlation Matrix for Combined Data

<table>
<thead>
<tr>
<th></th>
<th>Mean Look Difference</th>
<th>Percent Look Difference</th>
<th>Time Watch Teletubbies</th>
<th>Time Exposed to TV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent Look Difference</td>
<td>0.768***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Watch Teletubbies</td>
<td>-0.382*</td>
<td>-0.329</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Exposed To TV</td>
<td>0.204</td>
<td>0.124</td>
<td>-0.101</td>
<td></td>
</tr>
<tr>
<td>Parent Education</td>
<td>0.099</td>
<td>0.131</td>
<td>0.427**</td>
<td>-0.190</td>
</tr>
</tbody>
</table>

Note: All data are expressed as Pearson product-moment correlations. ***p<0.01, **p<0.05, and *p<0.10.

Follow-Up Exploratory Analyses

A multiple regression analysis was conducted to further determine the amount of influence that time watching *Teletubbies*, time exposed to television, and parent education have on mean look length and mean percent looking. Backward elimination was used to determine the best predictor of each dependent variable. The three predictors were regressed on the difference scores of both mean look length and mean percent looking. The analysis showed that time spent watching *Teletubbies* at home was the best predictor of mean look length ($b=-2.238$, $t=-2.118$, $p=0.045$, $R^2=0.127$) and mean percent looking ($b=-4.935$, $t=-1.894$, $p=0.071$, $R^2=0.097$).

To further grasp the relationship between previous exposure to *Teletubbies* and comprehensibility, separate analyses of attention were conducted for subjects whose parents reported them as having no prior experience with *Teletubbies* and those who had
had any prior experience with the show. This analysis collapsed over type of distortion. Table 9 shows the values of mean look length and mean percent looking for both watchers and non-watchers for normal and distorted segments. A 2 (order) x 2 (comprehensibility) mixed-model ANOVA was conducted for both non-watchers and watchers. Sex was dropped as a factor since no significant sex effects had been found in previous analyses, and in order to deal with small subject numbers within cells. For non-watchers, both mean look length and mean percent looking were greater for normal segments than distorted. This main effect of comprehensibility for percent looking was significant, $F(1,9)=5.629$, $p=0.042$, and that for mean look length was significant by a one-tailed test in the expected direction, $F(1,9)=3.829$, $p=0.082$, one-tailed $p=0.041$.

When looking at the results for subjects who have had prior experience with *Teletubbies*, the only notable result is a significant comprehensibility by order interaction for mean percent looking, $F(1,12)=4.845$, $p=0.048$. It is difficult to determine which order contributed more to the effect due to there being only five subjects who watched the show and received distorted first, and nine who watched and received normal first. *Teletubbies* watchers who received a normal segment first actually watched normal less than distorted, however a t-test of the difference (-5.362) was not significant, $t(8)=-1.532$, $p=0.164$. The difference for the watchers who received distorted first was larger (8.621), but even less significant, most likely due to the small number of subjects, $t(4)=1.484$, $p=0.212$.

Separate 2 (watch TT) x 2 (comprehensibility) mixed-model ANOVA were conducted for Experiment 1 and Experiment 2 taking into account the effect of exposure to *Teletubbies*. There were no significant effects found for mean look lengths or mean
percent looking in the speech condition, but this may be due to the small number of non-watchers (4) compared to watchers (8) in this experiment. Since it was never expected that exposure to *Teletubbies* would have an effect on comprehensibility, an effort was not made to equalize subjects based on this factor. Significant main effects of watching *Teletubbies* \( (F(1, 11) = 11.430, p=0.006) \) and comprehensibility \( (F(1, 11) = 7.983, p=0.017) \), as well as a significant two-way interaction \( (F(1, 11) = 7.494, p=0.019) \) were found for mean look length for the random edit experiment. Only the interaction effect was significant for mean percent looking, \( F(1, 11) = 7.463, p=0.020 \).

Finally, to try to determine if the effects of order and watching *Teletubbies* were independent of one another, a 2 (order) x 2 (watch TT) x 2 (comprehensibility) mixed-model ANOVA was conducted on the combined data from Experiment 1 and 2. A significant main effect of comprehensibility was found with subjects having higher percent looking at normal segments (65.721%) than distorted (59.431%), \( F(1, 21) = 5.742, p=0.026 \). The watching *Teletubbies* by comprehensibility interaction was marginally significant, \( F(1, 21) = 3.353, p=0.081 \), and the order by comprehensibility interaction was significant, \( F(1, 21) = 4.822, p=0.039 \). Since the three-way interaction was not significant, it suggests that watching *Teletubbies* and order of stimulus presentation are both influencing how subjects are allotting attention to normal and distorted segments.
Table 9
Visual Attention to Television – *Teletubbies* Watchers and Non-watchers

<table>
<thead>
<tr>
<th>Experience with <em>Teletubbies</em></th>
<th>n</th>
<th>Visual Attention</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Look Length (sec)</td>
<td>Mean Percent Looking</td>
<td></td>
</tr>
<tr>
<td>Non-watchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>11</td>
<td>18.385</td>
<td>74.820</td>
<td>(8.876)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(8.876)</td>
<td>(16.527)</td>
<td></td>
</tr>
<tr>
<td>Distorted</td>
<td>11</td>
<td>11.614</td>
<td>60.055</td>
<td>(10.295)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.295)</td>
<td>(21.365)</td>
<td></td>
</tr>
<tr>
<td>Watchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>14</td>
<td>9.147</td>
<td>58.572</td>
<td>(6.562)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(6.562)</td>
<td>(22.800)</td>
<td></td>
</tr>
<tr>
<td>Distorted</td>
<td>14</td>
<td>9.308</td>
<td>58.940</td>
<td>(7.376)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.376)</td>
<td>(25.019)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Standard deviations in parentheses.

Comparing Across Experiments 1 and 2

A 2(sex) x 2(order) x 2(experimental condition) between subjects ANOVA was used to compare data across the two experimental conditions. Data from normal segments from Experiment 1 were compared to the normal segments from Experiment 2 to determine if the two groups had equivalent attention to these segments. In addition, language-distorted segments from Experiment 1 were compared to the sequence-distorted segments from Experiment 2 to determine whether one type of distortion was more detrimental to attention than the other.

In the comparison of the percent looking at normal segments across experiments, a significant effect of order was found with subjects watching normal segments more when seeing them first ($F(1,17)=4.924, p=0.040$). When viewing the normal segments first, subjects had a percent attention of 74.155 compared to 55.793 percent attention of those who did not watch a normal segment first. A significant main effect of order was
found for mean look length as well ($F(1,17)=9.642, p=0.006$). Mean look length for normal segments when viewed first were 17.538 seconds, but were only 7.680 seconds when viewed after a distorted segment. These results further support the order effects found in the analyses of data from the random edit experiment.

No significant effects were found in the comparison of percent looking at distorted segments across experiments. The analysis of mean look length revealed that mean look length at distorted segments for speech (13.213 seconds) was greater than that for the random edit condition (6.973 seconds). The difference was marginally significant ($F(1,17)=3.587, p=0.075$).
CHAPTER 4

DISCUSSION

The purpose of this study was to replicate the results found by Anderson et al. (1981) for 24-month-olds. In the Anderson study, 24-month-olds had higher attention to normal segments of *Sesame Street* than to segments of the show that had been distorted via backwards speech dubbing, foreign language dubbing, and random rearrangement of shots. For this study, the show *Teletubbies* was used since it is designed for very young children and if replication were successful, it would be an appropriate stimulus to determine whether even younger children could also distinguish between comprehensible and incomprehensible television.

The high levels of overall attention to the show indicate that it is programming that is of interest to the children. The high levels of interaction also demonstrate that children were comfortable with the show and were responsive to particular segments, characters, or other elements.

**Effects of Comprehensibility on Visual Attention to *Teletubbies***

**Experiment 1 – Backward Speech**

As noted, two-year-olds are able to understand language well and are also becoming very good at talking themselves (Bloom, 1998; Hirsch-Pasek & Golinkoff, 1996; Pinker, 1995). Consequently, and based on the results from the Anderson et al. (1981) study, as well as similar attentional patterns found by Richards and Cronise (2000), it was predicted that the two-year-olds would easily discriminate between normal and backward speech versions of *Teletubbies*, allotting more attention to the normal
segments than to the distorted. Despite a large significant effect of backward speech in the Anderson et al. (1981) study (f=0.617), the medium effect (f=0.2897) found in this study only resulted in a marginally significant effect in the predicted direction for mean percent looking. In other words, the subjects paid more attention on average to normal segments as compared to backward speech segments, but the difference is not large enough to either support or dismiss the hypothesis.

Subjects did not interact any differently to the two types of stimuli. The gender effect, with girls interacting more than boys, may be due to the tendency of females to develop language earlier than males (Fenson et al., 1994). They may therefore be more verbal about what they see and understand on the show.

In general, the results suggest that backward speech seems to have had a small effect on attention in the predicted direction. Comprehensibility seems to matter as subjects tended to pay more attention to normal segments than backward speech.

Experiment 2 – Random Edit

Although subjects were predicted to watch the normal segments of Teletubbies more than the randomly edited segments, the effect was not expected to be as large as that for speech. This was not the case, however, as the random rearrangement of shots had a larger effect than backward speech. There was a significant difference in mean look length, but the results were complicated by strong order effects. Order effects were also significant for mean percent looking. Subjects had greater attention to normal segments they watched initially than those they viewed following a distorted segment. These effects will be discussed in more detail in the following section.
Interactions per minute followed the predicted pattern of results. Subjects had more interactions during normal segments than during randomly edited segments. The better the subjects understood *Teletubbies*, the more likely they were to talk about, react to, or behave in response to the show.

In summary, subjects seem to prefer normal, comprehensible segments of *Teletubbies* to segments that are not in sequential order. The two-year-olds’ ability to integrate information across cuts and construct a meaningful story was disrupted by the random editing. This was evident from the attention and interaction data.

**Effects of Order of Stimulus Presentation**

There were strong order effects apparent in almost every analysis, particularly for the random edit experiment. The subjects who watched a normal segment of *Teletubbies* first had greater attention to the normal segment than those who received a distorted segment first. Following the normal segment, attention dropped substantially for the distorted segment. If subjects saw a random segment first, however, their attention was low and remained low even for the following normal segment. The children seemed so uninterested in the distorted segment that their lack of attention carried over to the subsequent normal piece. In effect, once their attention was lost by distortion, it could not be regained even when the distortion was removed.

The analysis of first trial mean look length and mean percent looking for subjects in the random edit experiment eliminated the order effect and provided a pure look at the attentional difference between normal and distorted segments. Since this was a between-subjects analysis, the number of subjects was significantly reduced and therefore power
was lost. Despite this, there was still an effect of comprehensibility – normal segments were preferred over randomly edited segments.

**Effects of Previous Experience with *Teletubbies***

The most interesting and surprising effect found in this study was that of prior exposure to *Teletubbies*. The correlation results were the first suggestion that children who have experience with *Teletubbies* do not seem to differentiate between the normal and distorted segments of the show. Regression analysis and analyses comparing non-viewers to viewers further supported the effect. Those children who are reported to have never before seen *Teletubbies* demonstrate the expected difference in attention to normal and distorted segments. It seems that if you have never seen the show before, it matters whether or not you can understand it. However, if you are familiar with the show, you may not care whether the language makes sense or if the scenes are in random order.

This effect seems to be present in both the speech and random edit experiments. However, it was not significant for backward speech, most likely because there were twice as many *Teletubbies* viewers than non-viewers in the speech experiment. If the effect is real, backward speech may be just as effective as random edit in affecting comprehensibility, but any comprehensibility effect may be hidden by the negligible attentional difference of the viewers with prior exposure.

This effect is the opposite of the effect found by Barr et al. (2003) who found that 12- and 15-month olds who had prior exposure to *Baby Mozart* and/or *Sesame Street* had higher attention to the same show compared to those who had no previous exposure. This would be comparable to the children’s attention to the normal segment in this study. In
this study, children who had no previous experience with *Teletubbies* had a mean percent attention of 74.820 to the normal segments, while those who had exposure previously had a mean percent attention of 58.572. So why do children who have seen *Teletubbies* before pay less attention to the show than non-viewers, and why do they not seem to care whether they are watching normal or distorted segments? It is possible that those who have seen the show before are already familiar with the characters, know what to expect from the show, and are simply happy to watch it no matter what – even if it has unintelligible speech and mixed-up shots. Those who have never seen the show before do not know what to expect, know nothing about the characters or the show, and therefore need the language and order to make sense of it.

*Teletubbies* as the Stimulus and the Experimental Setting

It is important to discuss aspects of the study that may have led to smaller effects of comprehensibility than those found by Anderson et al. (1981). One is the appropriateness of the show *Teletubbies* as the stimulus. There is very little language in the show, and the majority of it is voiceover narrative. There are few instances of character dialogue which is in sharp contrast to mostly character dialogue found on *Sesame Street*. Could the lack of character dialogue provide a different language experience for the two-year-olds? It may be that narrative is less meaningful to the children and therefore the normal, narrative-heavy segments are virtually as incomprehensible as the backward speech.

One may also question the difficulty of understanding the *Teletubbies*’s storyline. The story is quite repetitive and there are random cuts to scenes (such as the baby in the
sun) that do not contribute to the storyline at all. In fact, these scenes often appear in the middle of a continuing story. So, while young viewers may be able to get the gist of the show’s story even when it is jumbled up and out of order, perhaps there is simply no real story to understand.

A final point of concern is the experimental setting. Subjects were required to sit on their parents’ laps, or sometimes alone on a chair, for the extent of the session. They also had EKG electrodes with leads attached to their chest in order to record heart rate data. Although they had toys on the table in front of them, they were unable to move around freely and often became fussy. Aside from any fussiness due to lack of interest in *Teletubbies*, this may have contributed to most subjects’ inability to make it through the entire 40-minute session. In the Anderson et al. (1981) study, subjects were free to move around the room and play with a variety of toys. The more naturalistic setting may have led to larger effects of comprehensibility.

**Developmental Implications**

The results from this study should also lead us to look more closely at the cognitive state of 24-month-olds. Children at this age are going through many developmental changes. Among other important changes, social skills are emerging, language skills are exploding, and problem solving abilities are increasing. Is it possible that these changes make this age group a very different television audience than originally thought? This is an important question when looking at the effect of previous exposure to *Teletubbies* on attention to the show. As discussed previously, one would expect children who are familiar with the show to watch the normal segments more than
the distorted ones. If an adult has experience with a television show, and presumably enjoys it, then they should pay more attention to it overall, and particularly to the understandable version. One would expect two-year-olds, with their lesser cognitive abilities for understanding, to differentiate between segments even more so. However, in this study, the children who had seen the show before did not seem to care whether the show was normal, had backward speech, or had mixed-up scenes. For some reason, their experience with the show allows them to sustain attention despite distortion. Perhaps comprehensibility is not the driving force behind attention for this age group, but familiarity and enjoyability are. Only when the show is completely new does comprehensibility matter. It will be important to look more closely at this issue in future research.

There is also a question as to whether 24-month-olds’ viewing behaviors have changed since the Anderson et al. (1981) study. Parents have reported anecdotally that children under one year are watching television attentively and many more shows for younger children are on television than in 1981. In addition, the size and audio/visual capabilities of televisions have increased over time, changing the viewing environment. Could it be that children have developed new viewing behaviors to adapt to these changes? Do two-year-olds know much more about how to watch TV and have particular goals for watching that are different than they were twenty years ago? How do larger, sharper images, affect younger viewers’ attention? It may be necessary to explore in more depth what is the most important element of a children’s television program for the greatest sustained attention.
Future Research

One important question is whether or not to continue this study with younger age groups. Because the effect sizes were moderate and there was a trend in the hypothesized direction, it may be worth investigating whether any effects hold true with a younger age group. However, if comprehension of the show is tied to understanding of language and sequence, and if two-year-olds have greater cognitive abilities, younger children may not make distinctions between the normal and distorted segments. On the other hand, if the language in Teletubbies was so simple for the two-year-olds so as not to add to the comprehensibility of the show, then a younger age group’s attention (such as 18-month-olds), may be adversely affected by the language distorted segments due to their less developed language skills and a stronger dependence on understandable language for comprehension. If the study is continued, it will be important to keep track of subjects’ prior exposure to Teletubbies and, if possible, to equalize the number of watchers and non-watchers so that a meaningful test of the effect can be done.

There are several possibilities for new research as well. Based on the concerns about experimental setting, it may be worthwhile to run a study with the same set-up as used by Anderson et al. (1981). Teletubbies should still be used as the stimulus, but subjects should be free to move about and have a wider selection of age-appropriate toys. Heart rate data may not be able to be collected, although wireless monitors might be considered. If the children have more options for when they are not watching the television, they may be more likely to last through the entire session and through the incomprehensible segments.
As for the appropriateness of *Teletubbies* as a stimulus, there does not seem to be a viable answer. *Teletubbies* was chosen because it was one of the only programs created for very young children that they are reported to watch attentively at home. If another program designed for younger children with more language opportunities and character dialogue were to be released, it would be worth replicating this study using the new show. It would also be interesting to compare attention to the new show with attention to *Teletubbies*.
APPENDIX

CAREGIVER QUESTIONNAIRE

Personal Information
1. Which best describes the highest level of education you and your child’s other parent have completed?

<table>
<thead>
<tr>
<th>You:</th>
<th>High School</th>
<th>Some College</th>
<th>College</th>
<th>Graduate School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other:</td>
<td>High School</td>
<td>Some College</td>
<td>College</td>
<td>Graduate School</td>
</tr>
</tbody>
</table>

2. What is your current occupation? Other parent?

3. What is your child’s ethnicity? Circle all that apply.

White/Caucasian  Black  Hispanic  Asian
American Indian  Cape Verdean
Other (please specify) ____________________________

4. How many siblings does your child have in the home? ______________

5. Does your child have any vision or hearing difficulties? YES  NO

If yes, please describe ______________________________________

Television viewing information

1. Does your child ever ask to see a particular TV program? YES  NO

2. What TV programs (if any) does your child watch on a regular basis?

3. When your child watches a TV program, how often does your child watch attentively?

A LITTLE  SOMETIMES  MOST OF THE TIME  ALWAYS

4. Do you sometimes encourage your child to watch television or videos? YES  NO

5. In a typical day, how many hours does your child watch videos on the VCR? ____________________
6. When your child watches videos on the VCR, how often does your child watch attentively?

| A LITTLE | SOMETIMES | MOST OF THE TIME | ALWAYS |

7. What videos (if any) does your child watch on a regular basis?

8. Has your child ever seen “Teletubbies”?  
   YES  NO

9. If your child has seen “Teletubbies”, how frequently does he/she see the program?

| ONCE OR TWICE | ONCE EVERY COUPLE WEEKS | ONCE A WEEK | SEVERAL TIMES A WEEK | EVERY TIME IT’S ON |

10. If your child watches “Teletubbies”, how often does your child watch attentively?

| A LITTLE | SOMETIMES | MOST OF THE TIME | ALWAYS |

11. When your child watches “Teletubbies”, how frequently does your child react to the program other than paying attention (for example – laugh, dance, point, talk about it, get excited, etc.)?

| NEVER | A LITTLE | SOMETIMES | MOST OF THE TIME | ALWAYS |

12. Does your child have any “Teletubbies” products?  
   YES  NO
   (for example – clothing, toys, etc.)

13. Do you own or have rented or borrowed “Teletubbies” videos?  
   YES  NO
On this grid, please mark when your child is home during a typical weekday (Monday through Friday), by placing an X in the box marked home. On the same grid, please mark when your child is exposed to television, (meaning that he or she is in the room when the TV or VCR is on) by placing an X in the box marked “child exposed to TV.” This would include times when someone else is the primary person watching.

<table>
<thead>
<tr>
<th>Time</th>
<th>Home</th>
<th>Child exposed to TV</th>
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</table>

Please indicate the same as above for a typical weekend day (Saturday or Sunday).

<table>
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<tr>
<th>Time</th>
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REFERENCES


