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Gender Differences in Visual Attention to Television Form and Content

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Formal features (i.e., rapid action, dialogue, and animation) and content variables (i.e., violence, theme, and sex of characters) were analyzed as possible determinants of gender differences in children's television viewing. Two studies are reported. In Study 1, 5- and 7-year-old boys' and girls' visual attention was observed during four animated programs representing four combinations of high and low action with high and low violence. Boys' visual attention was greater than girls'. Attention was higher to high violence than to low violence. Boys' attention did not vary across treatments, but girls attended more to programs with low action than with high action. In Study 2, nine earlier laboratory studies, each with an independent sample, were subjected to a secondary analysis. The procedures were similar to Study 1; the samples ranged from 3 to 11 years old. Across experiments, boys attended significantly more than girls. The secondary analysis was designed to identify program form and content variables that might account for gender differences. Most content and form attributes failed to account for the pattern of gender differences in attention across or within studies. There was weak support for the notion that violent content and animation appeals more to boys than girls. Boys' greater visual attention was not associated with greater comprehension relative to girls'. It was proposed that girls focus more on the verbal auditory content of television, and boys focus more on the visual content.

A sizable body of evidence supports the proposition that children's attention to television varies as a function of program form and content (see Bryant & Anderson, 1983). Television forms often associated with high levels of attention

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include rapid action, visual special effects, music, sound effects, peculiar voices, children's speech, concrete dialogue, and animation (Anderson & Field, 1983; Rice, Huston, & Wright, 1982).

These studies of visual attention have provided relatively little information about how viewer characteristics may be associated with attention to television in general or attention to particular program attributes, at least partly because the theory guiding them did not lead to predictions about individual differences. Developmental differences have been predicted and investigated (e.g., Anderson & Lorch, 1983; Wright & Huston, 1983), but other viewer attributes have not been explored systematically.

The viewer attribute of interest in the present paper is gender. Before adolescence, boys report liking cartoons better than girls, and they spend more time than girls do watching cartoons and action adventure programs (Comstock, Chaffee, Katzman, McCombs, & Roberts, 1978; Lyle & Hoffman, 1972). Preschool boys were recorded as watching more television than preschool girls in diaries maintained by parents periodically over a one-year period (Singer & Singer, 1981). In adulthood, females report watching more television than males do, but that difference may be partly due to the greater amount of time that females spend at home (Comstock et al., 1978). Filmed recordings of home viewing demonstrated no overall sex differences for child viewers, but adult men attended to television more closely than adult women when they were in the room with a television set (Anderson, Lorch, Field, Collins, & Nathan, 1986).

In laboratory experiments, gender differences in visual attention have appeared inconsistently, but, when they did occur, they were virtually always in the direction of greater visual attention for boys than girls (Anderson, Choi, & Lorch, 1987; Field & Anderson, 1985; Greer, Potts, Wright, & Huston, 1982; Potts, Huston, & Wright, 1986; Rolandelli, Wright, & Huston, 1985; Wright, Calvert, Huston-Stein, & Watkins, 1980; Wright, Huston, Ross, Calvert, Rolandelli, Weeks, Raeissi, & Potts, 1984). Studies in which gender differences did not appear often used procedures that constrain the variance of attention, such as instructions to view or low levels of distraction (Beagles-Roos, & Gat, 1983; Gibbons, Anderson, Smith, Field, & Fischer, 1986; Hayes & Birnbaum, 1980; Pezdek & Hartman, 1983). Our purpose in this paper is to determine whether gender differences in attention are reliable, and, if so, to explore possible reasons for them.

Feminist critics of television have often pointed out a male bias in television content. The majority of major television characters are male, and male characters engage in most of the interesting activity (Sternglanz & Serbin, 1974; Williams, Baron, Phillips, Travis, & Jackson, 1986). Many programs (e.g., cartoons, action adventure series) have plots and content themes that are masculine sex-typed. For instance, aggression, a male sex-typed behavior, occurs frequently in programs designed for children and adults (Signorielli, Gross, &

Morgan, 1982). The formal features of television such as animation, rapid action, sound effects, and frequent cuts might appeal to boys more than to girls because those features are associated with masculine sex-typed content (Welch, Huston-Stein, Wright, & Plehal, 1979) and carry masculine connotations even when used with neutral content (Huston, Greer, Wright, Welch, & Ross, 1984).

Conversely, gender differences might result from differential appeal of alternative activities. Singer and Singer (1981) proposed that girls might spend more time than boys on shopping expeditions and outside activities with their mothers, particularly on Saturday mornings. In some laboratory studies "distractor" play activities, coloring and drawing materials, may have appealed differentially to girls and boys (e.g. Greer et al., 1982). However, boys also showed higher levels of visual attention than girls when additional distractor toys intended to be appealing to boys were provided (Wright et al., 1984) or when slides of interesting content were used as distractors (Anderson et al., 1987).

It is also possible that girls listen to television without looking more often than boys do. A child can directly process the meaningful information in the soundtrack, most of which is verbal, or use it as a cue for when to look. During the preschool and early school years, girls' verbal development is, on the average, slightly more advanced than boys' (Halpern, 1986). In some earlier studies, girls benefitted more from verbal labeling of program themes than boys (Friedrich & Stein, 1975). Some support for this hypothesis arises from the fact that girls often recall the program content as well as or better than boys (Collins, Wellman, Keniston, & Westby, 1978; Field & Anderson, 1985). In a study designed to measure auditory attention, preschooler's latencies in restoring the quality of auditory, visual, or audio-visual components of programs was assessed. Girls reacted about equally quickly to distortions in either modality; boys reacted more quickly to distortions in two modalities than to single modality distortions (Rolandelli, Wright, & Huston, 1982). Hence, girls were not differentially sensitive to auditory information, but appeared to use single modality cues more readily than boys.

The major purpose of the present paper was to determine the consistency of gender differences in attention to television and to identify some of the formal features and content variables that may account for differences when they occur. The issues raised have considerable importance for production of children's television programs. Many producers of programs and advertisements are alleged to believe that both genders will watch programs with male characters, but that boys will not watch programs with a predominance of females. Educational producers often choose content, characters, and formal features that they believe will be appealing to both genders. Systematic information about what appeals to girls and boys could be useful in designing effective television programs.

Two data analyses are reported in this paper. Study 1 is an investigation of girls' and boys' visual attention to programs varying in formal features and

violent content. Formal features such as rapid action, noise, visual tricks, and animation are often associated with violent content (Huston, Wright, Wartella, Rice, Watkins, Campbell, & Potts, 1981).

It is of theoretical and practical interest to establish the independent effects of formal features and violent content because many writers and producers believe it is central to maintaining children's interest. The findings of two earlier studies (Huston-Stein, Fox, Greer, Watkins, & Whitaker, 1981; Potts, Huston, & Wright, 1986), however, indicated that action and associated formal features may be more critical than violent content *per se* for maintaining young children's attention. In both studies, preschool children attended more closely to programs with high action and related visual and auditory formal features than to those with low levels of these features; there were no significant differences as a function of violent content. These studies were, however limited to preschool children, and one (Potts et al., 1986) included only male subjects.

The purpose of Study 1 was to determine whether these findings extended to older children and to both genders. Girls and boys at two age levels, 5 and 7, saw animated television programs selected to represent all four combinations of high and low action with high and low violence.

Because sex differences consistent with previous findings occurred, a secondary analysis of nine earlier laboratory studies conducted in one research center was carried out in order to determine the consistency of gender differences in attention and to identify variables that might account for the occurrence of gender differences, or lack thereof (Study 2). In all nine experiments, each conducted with independent samples, girls' and goys' attention to television was observed in a laboratory setting comparable to that used in Study 1. Studies in which gender differences occurred were compared with those finding no sex differences to determine what types of program form, program content, and environmental variables might account for gender differences in attention.

STUDY 1

Method

Subjects. Participants were 61 girls and 64 boys in two age groups. The mean age of the younger group was 60.4 months, $SD = 2.9$; the mean for the older group was 83.5 months, $SD = 3.5$. Children participated as part of a larger study of television viewing patterns. Virtually all children were Caucasian; their families represented a wide range of education and occupational levels.

Stimuli. Four animated children's television programs were selected to represent the four cells obtained by crossing high and low action with high and low violence of content. Action was defined as physical movement by characters. Programs were classified on the basis of continuous coding in four levels of

action: 1 = stationary with little movement; 2 = stationary, but large movements of arms or legs; 3 = moving through space at the pace of a walk; 4 = moving through space at a pace more rapid than walking (see Huston et al., 1981 for details of definition). Violent content was defined by the frequency of physical attacks on other characters or objects and the frequency of "fortuitous destruction," (e.g., explosions, crashes, and the like). The theme of the low action and low violence animated program involved the humorous mishaps between a "Charlie Chaplin-type" character and his employer while they are engaged in various painting jobs. The low action and high violence program was an episode of *Tweety and Sylvester* where Sylvester the cat unsuccessfully attempts to cook Tweety the bird while a starving mouse in turn attempts to eat Sylvester's tail. The high action and high violence program involved the attempts of a buzzard to kill a worm by devising bombs, and so forth, to destroy the worm only to have such attempts backfire and be physically hurt himself (the program is similar to the *Road Runner and Coyote* series). Finally, the theme of the high action and low violence program was a motor skooter race between cartoon superheroes and various other familiar animated characters (e.g., Jinx the cat and mice).

Because one purpose of the study was to replicate earlier results found for preschool boys (Potts et al., 1986) two programs were identical to the animated programs used in that study, and the other two were from the same series as those used earlier. Slight changes were required because color recordings of some previously used stimuli were not available. Each program was approximately 5 minutes long.

Procedure. Viewing took place in a medium-sized room in a research center where children were brought by parents for participation in several assessments. Children were seated at a small table on which there were drawing materials, coloring books, small plastic jungle animals, and other small toys which would likely provide them with alternative activities available had they been viewing in the home and which would be appealing to young children of both sexes. A television set was placed against a wall containing a one-way mirror. The child's chair was placed at a 90° angle to the set.

A male adult introduced the child to the room and explained that there would be some programs on the television set and that the child was free to draw or play with the toys or watch television as long as he or she stayed seated. He then walked behind the partition containing the one-way mirror, and assured the child that he was near and would return when the programs were over. The four cartoons were shown in color on a 19″ monitor. The order of programs was counterbalanced across subjects.

Children's visual orientation to the television screen was recorded continuously on a Datamyte by a trained observer. Interobserver reliability was assessed by having a second observer code videotapes of five children. Agreement was defined as occurrence of the same code (look at or away from the set) within 2.4

seconds. The observers averaged 95% agreement. The Datamyte records were entered directly into a computer. The measure of attention derived from these records was the proportion of time the child looked at the screen during each program.

Results

The attention scores were negatively skewed; therefore, they were subjected to an arcsin transformation to normalize the distribution (Winer, 1971). This transformation was selected from several because it was most successful in generating a normal distribution. The attention scores were then used in an analysis of variance of gender (2) × age group (2) × TV program action (2) × TV program violence (2) in which the last two variables were repeated measures. Boys attended significantly more than girls, F (1, 121) = 4.54, $p < .04$. There was greater attention to conditions of low action than high action, F (1, 121) = 13.90, $p < .001$. These main effects were modified by a significant interaction of sex × action, F (1, 121) = 12.18, $p < .001$ and a three-way interaction of sex × action × age, F (1, 121) = 4.61, $p < .04$. These interactions are illustrated in Figure 1. Boys attended more than girls to all four cartoons and showed minimal differences across conditions. Girls, especially the 5-year-olds, attended more to programs with low action than to programs with high action, regardless of the level of violence.

Attention was also higher for high violence than for low violence, F (1, 121) = 10 .04, $p < .002$; the means were 2.14 for high violence and 2.01 for low violence. There were no significant interactions associated with violent content.

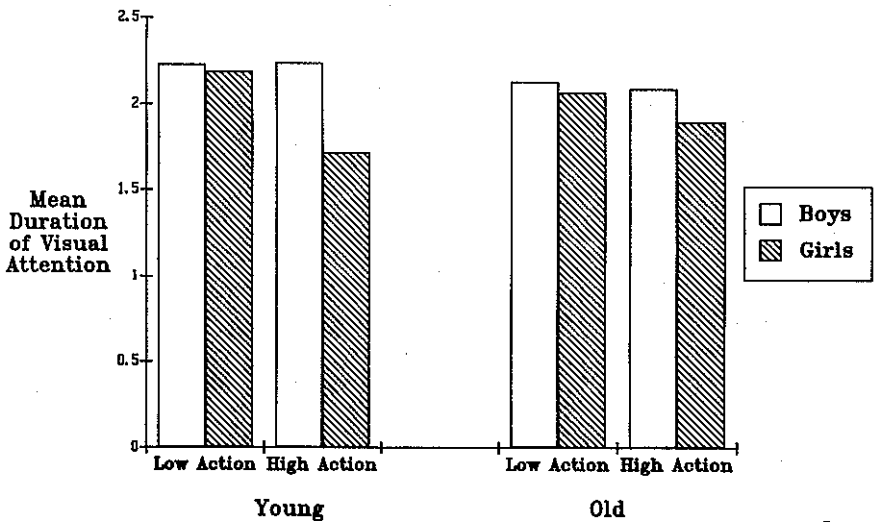

FIG. 1. Mean duration of visual attention to television action.

Discussion

The boys in this study showed patterns of attention that were in some respects like those found earlier for preschool children (Huston-Stein et al., 1981; Potts et al., 1986), but in some respects different. Boys' attention did not vary systematically with program action or violence. One reason may be that all programs were animated. In the Potts et al. (1986) investigation, differences in attention to high and low action were greater for live than for animated shows. Attention levels of 80% or higher, which suggested that all the programs shown were attractive to boys, left little room for additional form or content variations to increase attention. In addition, children viewed alone, and they viewed all four conditions in succession; attention to one program may have carried over to subsequent programs.

Boys did have higher levels of visual attention than girls, regardless of program attributes. Girls attended to low action programs more than to high action programs. Because every study is necessarily limited to relatively few programs, there is always the possibility that content or form attributes other than those used to select programs contribute important variance to children's attentional patterns. One means of dealing with this problem is to combine findings from several studies using different television programs in an effort to determine what program characteristics may most often be associated with sex differences.

STUDY 2

Study 2 is a secondary analysis of nine data sets, all on independent samples of children, using a wide variety of televised materials designed for child audiences. Boys and girls ranged in age from preschool through fourth grade with most children in the preschool-age range. Only one study (Rolandelli, Wright, & Huston, 1985) stated the socioeconomic status of the subjects reporting them to be middle-class. The procedures in all studies were similar in most respects. The purposes of the secondary analysis were (a) to determine whether gender differences in attention occurred consistently, (b) to identify the content and form attributes of programs associated with gender differences, and (c) to determine whether other indices of cognitive processing, such as comprehension, showed patterns of gender differences that were similar to those for visual attention. The content variables examined were character gender, violence, and content themes; the form variables included animation, action, and dialogue. Variations in the viewing situation included presence or absence of other children or of adults, and the types of distractor materials provided.

Method

The data sets analyzed for the present study were collected during the years from 1976 to 1984. In Table 1, a summary of the studies shows the number and ages of subjects, the viewing procedures, the television stimuli shown, and the *F*

TABLE 1
Summary of Laboratory Studies of Attention Used in Secondary Analyses*

Sample	Viewing Procedure	Stimulus Conditions	Main Effects or Interactions with Sex
		Study A. Wright, Calvert, Huston-Stein, & Watkins (1980)	
N = 48 Preschool: 14 b; 10 g Grades 3–4: 12 b; 12 g	Peer; No adult	Both ages: 4 animated shows varying action & pace (*Bugs Bunny, Road Runner, Popeye, Adventures of Gilligan*). Grades 3–4 only: 4 segments of *Electric Co.* varying action and pace. *Ss* saw all programs.	Both ages: Main effect of sex, $F(1,20) = 3.96$, $p < .10$. Action × Sex, $F(1,20) = 4.28$, $p < .10$. Grade 3–4 only: Main effect of Sex, $F(1,10) = 31.50$, $p < .001$ Boys > Girls Boys less variable across conditions than girls.
		Study B. Greer, Potts, Wright, & Huston (1982)	
N = 64 Preschool: 32 b; 32 g	Peer; No adult	Commercials. Set 1: 5 min High salience; Set 2: 5 min Low salience. *Ss* saw all stimuli in one set.	Main effect of sex, $F(1,24) = 12.55$, $p < .01$. Boys > Girls. Sex × intervals, $F(5,120) = 5.84$, $p < .01$. Boys' attention stable across intervals; girls' attention dropped after first 5–10 secs.
		Study C. Potts (1983)	
N = 86 Preschool: 48 b; 36 g	No peer; Adult	One animated program *Captain Kangaroo. Ss* had previously seen emotion inducing episode of *Thunder* with happy, sad, or neutral ending; low or high action commercials.	Main effect of sex, $F(1,59) = 10.46$, $p < .002$ Boys > Girls Interaction of sex × affect treatment × action, $F(2,59) = 5,57$, $p < .006$ Boys: No difference across treatment; Girls: attention varied with program attributes of previously viewed shows.
		Study D. Rolandelli, Wright, & Huston (1985)	
N = 117 5 yrs: 27 b, 28 g 7 yrs.: 36 b, 26 g	No peer; No adult	Two animated shows from *Pinwheel.* *Ss* saw both programs.	Main effect of sex, $F(1,107) = 6.84$, $p < .01$. Boys > Girls No significant interactions with sex.

TABLE 1 (*Continued*)

Sample	Viewing Procedure	Stimulus Conditions	Main Effects on Interactions with Sex
Study E. Wright, Huston, Ross, Calvert, Rolandelli, Weeks, Raeissi, & Potts (1984)			
$N = 160$ Grades K & 1: 40 b; 40 g. Grades 3 & 4: 40 b; 40 g.	Peer; No adult.	16 programs: 8 animated, 8 live. High and low pace & continuity varied.	Main effect or sex, $F(1,64) = 5.43$, $p < .05$. Boys > Girls. Interaction of Sex × Animation, $F(1,64) = 3.69$, $p < .10$.
		Ss saw two programs (one animated and one live).	Boys > Girls for animated shows; no sex difference for live shows.
Study F. Huston-Stein, Fox, Greer, Watkins, & Whitaker (1981)			
$N = 66$ Preschool: Boys and Girls	Peer; No adult.	3 animated shows: Speed Buggy (2 versions), *Oddball Couple.* *Ss* saw one program.	Main effect of sex: $F(1,18) = 1.72$, NS. Boys > Girls.
Study G. Campbell, Wright, & Huston (1987)			
$N = 120$ Grade K: 60 b; 60 g	No peer, No adult	Public service announcements. *Ss* saw stimuli in live or animated versions.	Main effect of sex, $F(1,108) < 1.0$, NS.
Study H. Calvert, Huston, & Wright (1987)			
$N = 160$ Grades 1–4: Boys and Girls	Peer; No adult	1 animated show, *Fat Albert*	Main effect of sex, $F(1,40) < 1.0$, NS.
Study I. Watkins, Calvert, Huston-Stein, & Wright (1980)			
$N = 160$ Preschool and K: 40 b; 40 g. Grades 3 & 4: 40 b; 40 g.	Peer; Adult	1 animated show. *Fat Albert.*	Main effect of sex, $F(1,64) = 2.19$, NS. Boys > Girls.

*In those cases where the effects due to gender were not reported, original computer print-outs were referred to for the relevant *F* ratios. Where gender was not examined, the data were analyzed to check for main effects or interactions with sex.

Note. All co-viewing peers were of the same sex as the subject.

ratios for main effects and interactions involving gender. A total of 981 children participated in the nine studies.

All studies were conducted in preschools, schools, or a research center. The television viewing situation was identical to that described in Study 1, except that, in some investigations, there was an adult present, there were different distractor materials, or children viewed with another child of the same sex. When children viewed with another child, pairs of children were the unit of analysis. Both educational and commercial programs were included, but all programs were designed for a child audience.

The stimulus programs used in all studies were coded for the following variables: sex of characters, content themes, violence, animation, action, and dialogue. *Sex of program characters* was coded as (1) mostly male characters, or (2) at least one female in a major role. *Violence* was coded using the same system as Study 1. For some analyses, programs were grouped as high or low violence; for others, the amount of physical aggression was used as a continuous variable. The *themes* of the program content were coded into eight nominal categories that were not mutually exclusive:

1. Prosocial–specifically dealt with instances of helping behavior
2. Affective–examined the expression of feelings; dealing with one's emotions (emphasizing the control or expression of feelings)
3. Educational–attempted to teach a lesson either about academic concepts (e.g., letter or word recognition) or about people (e.g., how to accept differences in others)
4. Magic
5. Humor
6. Patriotic–nationalistic
7. Moral–specifically, the theme focused on the opposition between "good" and "bad" characters
8. General Entertainment–no particular message.

As many categories as applied were coded when they were central to the theme of the program.

Animation was coded as (1) live, (2) a mix of live and animated segments within a show, or (3) fully animated. Program *action* was coded as either (1) low or (2) high using criteria like those in Study 1. For some analyses, programs were ordered according to the amount (duration) of high action they contained. *Dialogue* was separated into no speech, adult, child, nonhuman, or nonspeech sounds. In addition, narration and singing by males or females were coded.

Most of the television stimuli used in these studies had been previously coded for moment-to-moment occurrence of formal features (animation, action, and dialogue) and for violence. For the few programs without such coding, action and nonverbal violence were coded by two coders. Interrater reliability was 0.86

for the coding of action and 0.99 for the coding of nonverbal violence. Animation and dialogue for each program were coded by one coder. In addition, for all studies character gender and program theme were coded by one person (MMA). Formal reliability for these categories was not calculated, but a second coder (ACH) who was familiar with the programs examined the categories assigned to identify any disagreements. Disagreements were resolved by discussion, and a consensus rating was used.

Results

Gender Differences in Attention. There were significant main effects of gender in five of the nine studies, and there were trends in two others (see Table 1). In all cases, boys were more visually attentive than girls. The data were analyzed using a procedure suggested by Winer (1971, p. 49f.) for combining several experiments. The absolute values of logarithms of each probability associated with the main effect of gender were summed and multiplied by 2 to compute a χ^2 (18) = 56.44 $p < .01$. The overall sex difference was very reliable. There were significant interactions of gender with program attributes or prior treatments in four studies, but in no subgroup was there a reversal of the basic finding that boys were more visually attentive than girls.

Correlates of Gender Differences. Two approaches were used to identify variables that might account for gender differences in visual attention. Studies with significant sex differences were compared to those without. Then a more refined analysis of 16 programs shown in one study was carried out.

Associations among program attributes. Initial analyses were conducted to determine what program attributes co-occurred. Programs were compared for levels of action, sex of character ratios, theme, violent content, animation, and dialogue. Violent content was significantly associated with high action. For all 32 program units, χ^2 (1) = 14.40, $p < .001$. A more refined analysis was possible for a subset of 16 programs in Study E because action and violence were coded continuously. The rank order correlation of action with violence was r (14) = 0.71, $p < .01$. Correlations among other attributes were low and nonsignificant.

Comparison of studies with and without sex differences. There were significant gender differences in Studies A–E in Table 1 (N = 21 programs). There were no significant gender differences in Studies F–I in Table 1 (N = 7 programs). In Studies A–E, because some groups of subjects saw more than one set of programs, the 21 programs represent 14 independent groups of subjects. In Studies F–I, all 7 programs or program sets were viewed by independent groups of subjects. When programs or bits were combined for analysis, the average of

TABLE 2
Content Attributes and Formal Features in Program Sets Used in Studies With and Without Sex Differences

	Significant Gender Differences in Visual Attention				
	Yes	No		Yes	No
Content Attribute			**Formal Feature**		
Sex of Characters (major female characters)			**Animation**		
In none of program	9	3	Live	6	1
In part of program	6	0	Mixed	4	2
In total program	6	4	Animated	11	4
Violence			**Action**		
Low	14	6	Low	11	5
Mixed	5	0	Mixed	4	0
High	2	1	High	6	2
Theme[a]			**Dialogue**[a]		
Prosocial	5	2	None	4	0
Affective	5	2	Adult	21	3
Educational	14	3	Child	8	2
Magic	2	0	Nonhuman	10	2
Humor	11	4	NonSpeech Sounds	2	0
Patriotic	1	0	Narrator/Singer:		
Moral (Good vs. Bad)	3	0	Male	25	3
General Entertainment	2	0	Female	6	1

[a]Programs were coded in as many Theme and Dialogue categories as applied; therefore, classes are not mutually exclusive.

each program attribute for that group was computed. The results are shown in Table 2. Because the expected frequencies were too small for chi-square and not all entries were statistically independent, no statistical tests were performed. There is some tendency for programs with high violence and action to occur in conjunction with sex differences, but it is not a strong trend. No trend is apparent for the other attributes.

These analyses have low power, however, for several reasons. The separation of programs by studies was a very gross means of classification. There are relatively few units in the "negative" group of studies (F–I), and the trends toward gender differences in Studies F and I suggest that the programs in those studies may not have been free of whatever attributes might have contributed to gender differences. Second, in Study E, gender differences occurred primarily for the animated programs, but live programs were also included in the "positive" count. When the live programs in Study E were grouped with those programs counted in the "no sex differences" count, the results did not change substantially.

Viewing conditions, including whether peers and/or adults were present and

the types of play materials available, were also examined as possible correlates of sex differences (see Table 1). Sex differences were equally likely to occur when peers or adults were present or absent, and the types of distractors available did not distinguish studies with and without sex differences.

Study E. More refined analysis of Study E was possible because it included 16 different programs, 8 animated and 8 live, that were precisely scored for several of the content and form attributes of interest. Each of the 160 children in that study saw one 15-minute animated and one 15-minute live program. The programs were rank ordered according to boys' mean attention durations and according to girls' mean attention durations. They were also rank ordered on two content variables—sex of characters (male = 1; female = 2) and violence, and on three form variables—animation, action, and presence of human dialogue. Rank order correlations of attention with each program attribute were computed for boys and for girls. For boys, the correlations were: character gender, 0.18, n.s.; physical violence, 0.47, $p < .10$; animation, 0.62, $p < .02$; action, 0.28, n.s.; dialogue, −0.25, n.s. For girls, they were: character gender, 0.26, n.s.; physical violence, −0.03, n.s.; animation, 0.12, n.s.; action, 0.53, $p < .05$; dialogue, −0.18, n.s. Animation and violent content predicted boys' attention best; high action predicted girls' attention best.

Auditory Attention and Comprehension. Two measures were examined to determine whether sex differences occurred for auditory processing and comprehension as well as visual attention. In Study D, auditory attention was measured by the speed with which children restored sound quality when it deteriorated at predetermined points in the program. Although boys had higher levels of visual attention than girls in this study, girls had nonsignificantly higher levels of auditory attention.

Six of the studies (C, D, E, G, H, and I) included measures of content comprehension administered after viewing, another index of how much program content was processed. The comprehension measures included free and cued recall, recognition of correct alternatives in a multiple-choice format, and sequencing pictures taken from the program viewed. In four of these studies (C, E, H and I), there were no significant gender differences in comprehension. In Study D, three comprehension subtests consisting of cued recall and recognition items were designed to measure information presented only in the visual modality, information presented only in the auditory modality, and information requiring inferences from both modalities. A multivariate analysis of variance in which the three comprehension scores were dependent variables produced a significant main effect of gender, $F(3,107) = 2.88$, $p < .05$. Boys performed better on the subtests measuring visual and inferential information; girls performed better on the subtest of auditory information (Rolandelli, 1985). In Study G, males performed significantly better than females for one of three stimuli.

Overall, these findings indicate few gender differences in comprehension. Even when girls were less visually oriented to the television screen, they acquired information, possibly by listening to the speech and sound effects presented.

Discussion

Gender differences in visual attention to television occur in laboratory studies and in assessments of home viewing across a wide age range and in a variety of viewing situations. When differences occur, boys are consistently more visually attentive than girls. In fact, gender differences appear to be more pronounced than age differences in the studies examined.

The reasons for gender differences are less easily identified than theory or social criticism might lead one to expect. Our first set of hypotheses were that sex differences in attention are a product of sex-typed content and/or form. There was no support for the hypothesis that gender effects were due to differences in the sex of characters represented in the programs analyzed. Girls and boys were just as likely to attend to programs that were virtually all male as they were to attend to programs with at least some central female characters. There were almost no programs, however, with a predominance of female characters, so the range of this variable was restricted by the realities of existing programming. Nevertheless, the complete absence of a trend raises questions about the widespread belief that children attend to same sex characters. Differences in program theme were not associated with gender differences, although programs varied considerably with respect to theme.

Violence was somewhat more likely to elicit attention from boys than from girls. This finding may underestimate the importance of violence because the programs used probably did not represent the variations available on children's home sets. In most laboratory studies, relatively nonviolent programs were chosen for ethical reasons.

Formal features—animation, action, and dialogue—were also expected to be related to gender differences, at least partly because masculine and feminine content are frequently embedded in different types of formal features (Welch et al., 1979). One analysis indicated that boys attended more to animated than live programs, but animation was unrelated to variations in girls' attention. Girls' attention also varied as a function of action, but the direction of effects varied across studies, suggesting that some other variables either account for the effect or serve as powerful moderators of it.

In short, several likely candidates failed to account for the consistent pattern of gender differences observed. There was weak support for the notion that violent content and animated form may appeal to boys more than girls.

The results were consistent with the hypothesis that there are gender differences in preference for visual or verbal auditory processing. Some writers have advanced the hypothesis that boys are more visually oriented than girls, and that girls are more likely to orient to auditory, verbal stimuli than boys (Halpern,

1986). Gender differences in visual attention were not typically associated with differences in comprehension. Girls recalled as much as boys did, even when they spent less time looking at the television set. Girls' levels of auditory attention were at least as high as those of boys, even when visual attention differences occurred. Hence, girls may obtain information from the verbal auditory content of the television program without looking more often than boys do.

In summary, the evidence for gender differences in visual attention is strong. Boys are often more visually attentive to television than girls; we know of no study in which girls' levels of attention have consistently exceeded those of boys. Girls auditory attention, however, may be higher than that of boys. The basis for the sex difference is less clear. Program attributes such as violence and animation are probably more appealing to boys than to girls and may account for a small part of the difference. Males' greater visual attention does not typically lead to greater recall of content. The difference in patterns of visual attention appear more likely to occur in "informal" viewing contexts in which children are told the television is one of several options they may choose than in highly constrained contexts in which children are asked to attend and given no alternative activities. As the informal setting approximates home viewing conditions more closely than the constrained setting, the results obtained from it may represent patterns that occur in children's everyday viewing experiences.

There are several implications for the production of children's television programs suggested by our findings. If the goal of television production is to maximize the acquisition of central information by both genders, the information should be presented in both the visual and auditory modalities. While both genders attend to the visual and auditory components, boys and girls might profit differentially from information presented in the two modalities. Girls might benefit more from the verbal auditory content and boys more from the visual content. The sex of program characters may be a less important cue for visual attention than we thought, however more information is needed about programs portraying female characters in important roles. Animation and violence may appeal more to male and less to female audiences, whereas other production styles appeal to both genders and would probably draw a larger viewing audience.

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