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# American children's use of electronic media in 1997: A national survey

John C. Wright[a,*], Aletha C. Huston[a], Elizabeth A. Vandewater[a], David S. Bickham[a], Ronda M. Scantlin[b], Jennifer A. Kotler[c], Allison Gilman Caplovitz[a], June H. Lee[a], Sandra Hofferth[d], Jonathan Finkelstein[d]

[a]*Department of Human Ecology, University of Texas at Austin, Austin, TX, 78712-1097 USA*
[b]*Department of Communication, University of Texas at Austin, Austin, TX, USA*
[c]*Department of Psychology, Georgetown University, Washington, DC, USA*
[d]*Institute for Social Research, University of Michigan, Ann Arbor, MI, USA*

**Abstract**

Within a weighted, nationally representative sample of 2902 children, differences in electronic media use by age and sex were examined. The data collected were part of the University of Michigan's Child Development Supplement (CDS) to the Panel Study of Income Dynamics (PSID), and included two 24-h time-use diaries, one from a weekday and one from a weekend day. Children and their parents reported the titles of television programs, videotapes, and electronic games (both computer and platform) that the children used. These titles were coded by genre, and differences in total time and in time spent with specific genres within each medium were examined. Main effects of age and sex on total use and use by genres are reported. Among other results, oldest boys were found to spend more time watching sports programs and playing electronic sports games while the oldest girls spend more time watching relationship dramas and not a large amount of time playing video games. The results indicate the diverging media interests of boys and girls. Use patterns may also suggest a lack of availability of appropriate electronic games for older girls.


*Keywords:* Television; Video games; Children

* Corresponding author. Tel.: +1-512-471-3141; fax: +1-512-471-5844.
*E-mail address*: jwright@mail.utexas.edu (J.C. Wright).

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## 1. Introduction

Over the course of the 20th century, broadcast and electronic media became an increasingly important part of the environments in which children grew up. As the 21st century begins, the variety of options available on television and the range of other media activities available are increasing almost exponentially. In the majority of American homes, children have 50–100 television channels as well as video tape players; many also have video game equipment and computers that support interactive software and that provide access to the Internet (Rideout, Foehr, Roberts, & Brodie, 1999). Children spend an average of about 3 h a day with television (Huston & Wright, 1997; Rideout et al., 1999), and video and computer games are rapidly becoming a frequent activity for many children. Both theory and popular speculation award these media an important role in children's development, but solid information about who uses them and what they use is scarce.

In this article, we describe age and gender differences and similarities in the patterns of electronic media use (television and video/computer games) in a large nationally representative sample of children ages 0 to 12. A core assumption in this research is that the genre and content of media used by children are critical to understanding their role in children's lives. This assumption is supported by a large body of evidence from television research indicating that educational programs can teach academic and prosocial skills, while viewing general entertainment is associated with lower levels of school readiness and academic performance (Anderson, Huston, Schmitt, Linebarger, & Wright, in press; Huston, Anderson, Wright, Linebarger, & Schmitt, in press; Huston & Wright, 1997). Moreover, viewing preferences for particular television genres are quite stable over time (Tangney & Feshbach, 1988).

Computers and video games allow interaction, problem solving, and challenge — all qualities that many people think make them more stimulating than the "passive" processes alleged to be involved in television viewing. Yet, because such games and software range from cognitively simple perceptual–motor activities to highly abstract, complex, and difficult problems, it is important to differentiate them by content. Despite the fact that interactive electronic media surround many American children from birth onward, there is relatively little information about very young children's patterns of use of media other than television, or about age differences in early and middle childhood use. However, the more extensive television literature may provide hints as to what will be learned about interactive media use.

### *1.1. Age differences*

Both cross-sectional and longitudinal studies show that television viewing time increases with age from infancy to around age 6, declines at school entry, then increases again into early adolescence, peaking around 10–12 (Comstock, 1991; Huston, Wright, Marquis, & Green, 1999; Timmer, Eccles, & O'Brien, 1985). In one investigation, 2- and 3-year-olds spent considerable time in "secondary" viewing (that is, viewing that accompanied another activity) of general audience programs, probably because they spent time near adults who were viewing, but such secondary viewing declined with age (Wright & Huston, 1995). Genres of programs viewed also change with age. Educational program viewing peaks around age 4; cartoon viewing increases to about age 5, then levels off (Funk, Germann, &

Buchman, 1997; Huston et al., 1999; Huston, Wright, Rice, Kerkman, & St. Peters, 1990). By the early years of middle childhood, situation comedies are typically the most popular shows (Condry, 1989).

Children's use of computers and video games also changes as they mature. As with television, changes in media-use habits as children grow older appear to result from changes in use opportunities and from cognitive and social developmental changes (Huston et al., 1992). Analyses of longitudinal time-use data for children from ages 2 through 7 showed that video game play increased with age, particularly for boys (Huston et al., 1999). In a cross-sectional analysis of a nationally representative sample, Rideout et al. (1999) reported that 2–7-year-olds spent an average of 40 min a day using computers for games and other purposes; 8–18-year-olds averaged 1 h and 40 min. Buchman and Funk (1996) found that total time playing interactive games decreased as a function of age for fourth through eighth graders.

Unfortunately, most studies do not provide information about the content or type of game or activity. In one study of 4th through 8th graders, younger children were more likely to prefer educational games than were older children (Buchman & Funk, 1996). Among the 8–18-year-olds surveyed by Rideout et al. (1999), only about one-fourth of their computer time was devoted to games; the remainder was spent on Internet uses and work or study tasks.

### *1.2. Gender differences*

Previous research shows small, but fairly consistent gender differences in total television viewing, although these change with age. During the preschool years, boys are more frequent viewers than girls, particularly of cartoons and action adventure programs (Huston et al., 1990; Singer & Singer, 1981; Wright & Huston, 1995). That difference continues at least until late childhood (McKenzie, Sallis, Nader, & Broyles, 1992; Ridley-Johnson, Chance, & Cooper, 1984; Timmer et al., 1985). Patterns of gender differences are less consistent for adolescents (Brown, Childers, Bauman, & Koch, 1990; Timmer et al., 1985). On the whole, however, adolescent boys watch more cartoons, action adventure, and sports programs than girls (Comstock, 1991).

By contrast, there are large and consistent gender differences in computer use that begin as early as ages 3 or 4 (Huston et al., 1999). Boys use computers more than girls do, particularly to play video and computer games (Funk et al., 1997; Greenfield, 1994; Huston et al., 1999; Rideout et al., 1999). Boys also tend to monopolize computer-use time in the classroom, particularly in periods of uncontrolled access (Cassell & Jenkins, 1998; Kinnear, 1995). Many explanations have been proposed, including the characteristics of boys' social networks, advertising, content of games, parental socialization practices, and classroom management strategies by teachers, as well as a growing general cultural expectation of gender-typed usage.

The few studies that have included information about game content demonstrate that boys and girls have different preferences. Gailey (1996) observed game playing in a small sample of urban children ($N=21$) ages 6 to12; boys preferred violent action games, and girls preferred spatial relations games. In a survey of nine hundred 4th through 8th grade children, girls preferred educational games or those containing cartoon fantasy violence, while boys preferred sports games and those containing realistic human violence (Buchman & Funk,

1996; Funk et al., 1997). Gender differences are probably influenced by the pervasive masculine themes of speed and fighting in the vast majority of video games (Johnson & Swoope, 1987; Kinder, 1996; Kubey & Larson, 1990).

### *1.3. The present study*

The goal of the present study was to describe children's patterns of television and interactive game use by age and gender in recently collected data. Despite the volume of literature on television use, available studies generally have one of two weaknesses: poor quality measures of viewing, or small, convenience samples (Huston & Wright, 1997). With the exception of the large-scale survey by Rideout et al. (1999), investigations of computer use suffer from these same weaknesses. The data used for this study suffer from neither of these problems. Our data come from the Child Development Supplement (CDS) to the Panel Study of Income Dynamics (PSID), a large-scale investigation designed to provide a range of assessments of a nationally representative sample of approximately 3000 children ages 0 to 12 years old.

The method in our study was a detailed time-use diary in which respondents reported all of their activities; media were not given special emphasis over other activities, as they are in methods based on media-use diaries or other forms of self-reported media use. Most important for our purposes, respondents recorded titles of television programs and video games when either were used, permitting analyses by program genre and game type.

## 2. Method

### *2.1. The panel study of income dynamics*

Beginning in 1968, the PSID is an ongoing panel study focusing primarily on the transfer of social and economic capital within families. In 1997, additional data concerning on PSID children and their families were collected via the CDS. All families participating in the PSID with children under 12 years old were asked to complete the CDS. A total of 2380 families agreed to participate, yielding a sample of 3562 children (Hofferth & Sandberg, 1999). The subsample used here includes all respondents who completed at least one time-use diary ($n = 2902$). Because the PSID oversamples minorities, lower income groups, and less educated people, data are weighted to achieve national representation. Thus, all analyses presented here were conducted using weighted data (with weights recalibrated for our subsample), thus allowing us to make statements about children's television and video game use in the general population. The weighted subsample were 67.4% white, 15.4% black, 12.3% Hispanic, and 4.9% "Other," with a median income of US$38,000.

The CDS consists of a number of instruments completed by primary and secondary caregivers, teachers, and, occasionally, the older children. Among these instruments are two 24-h time-use diaries that provided all the television and video game data reported in the present analysis. On one weekday and one weekend day, the primary caregiver of each child was asked to report all activities that the child engaged in that day. Older children participated

in the completion of their own diaries. A primary activity and its duration were recorded to account for every minute of each 24-h period, and, if appropriate, a secondary activity was also noted. For example, if a child was eating while watching television, eating would be coded as the primary activity and watching television as the secondary activity. For a more complete discussion of the diary procedure see Hofferth & Sandberg (in press). When "watching television" or "playing a video game" (including computer games on CD-ROM) was the child's primary activity, the title of the program or game was requested. No request for titles was made for media use when it was a secondary activity.

### 2.2. Television subsamples

#### 2.2.1. Total minutes of viewing

The analyses for television viewing were conducted on data from two subsamples of the PSID-CDS participants. The first subsample includes all respondents who returned at least one completed time-use diary ($n = 2902$). Analyses regarding total television viewing were performed on this subsample. For respondents who returned only one diary ($n = 71$), television viewing for the missing day was imputed. Using respondents with two complete diaries, regression equations were created to predict the missing television time from known minutes viewed on the other day. Because gender and age are known to affect television viewing (Huston et al., 1999), different equations were created for boys and girls of each age category (0–2, 3–5, 6–8, and 9–12 years) to impute weekday from weekend viewing and weekend from weekday viewing.

#### 2.2.2. Program viewing by genre

The second subsample ($n = 2263$) consists of participants who completed two time-use diaries, and whose TV entries were at least 70% codeable for program type ($n = 1994$). Participants' diaries that included no television viewing on either day were considered 100% codeable ($n = 269$). Analyses of this sample's viewing were concerned with minutes of viewing by television program genre only.

### 2.3. Television program genre coding system

Based upon viewing in the PSID-CDS sample, we developed a coding system containing nine genre categories: *educational*, *noneducational cartoon*, *comedy*, *action*, *relationship drama*, *fantasy/supernatural*, *reality-based* (e.g., *COPS*, *America's Funniest Home Videos*), *sports*, and *other* (including talk shows, game shows, variety shows, home videos, music videos, and commercials). In this system, educational and noneducational cartoon categories supercede all others. Educational programs were defined as those with an explicit intent to educate and inform children above and beyond entertainment value. Programs with this intent were coded as educational regardless of format (i.e., animated or live-action) and content (e.g., comedy, drama, etc.). Unless already determined to be educational, animated programs (including those containing some live-action footage or characters) were coded as non-educational cartoons.

The diary procedure resulted in 13,659 instances of television viewing consisting of 1174 unique codeable titles and 167 responses determined to be uncodeable (e.g., "a show about a woman," "the midnight program," "don't know"). All television programs were coded by two coders with a Kappa estimate of interrater agreement of .81. Coding disagreements were resolved through discussion.

A number of the program titles (1355) in the time-use diaries were ambiguous. Some were reported as the network or cable channel viewed (e.g., NBC, MTV) at a particular time, and others were titles of which multiple program versions had been produced (e.g., *101 Dalmatians, Batman*). In order to identify ambiguous programs on cable stations, we first ascertained exact time of viewing for participants in different local time zones using postal zip codes. Program title was then determined using television listings from the *New York Times* for the day of the reported viewing. Programs identified only by network or channel number were identified using Library of Congress newspaper files for the main city in the child's zip code, to look up the TV schedule for the day and time of the time-use diary. When all of these methods failed to identify the program watched, the entry was designated as uncodeable.

### *2.4. Video game subsamples*

Analyses of total game play were performed on the subsample of children who reported any video game play ($n = 730$). Total game play was imputed for six children who returned one diary reporting game play using the method described above for television viewing. Game play by type was analyzed for the respondents who returned two complete time-use diaries at least one of which contained some game play ($n = 724$). Accordingly, subsamples used for total game play and type of game play differed slightly.

### *2.5. Video game-type coding system*

Because of the interactive nature of video games, the coding system for game type was designed to reflect the cognitive demands of the game, as well as some content features. A total of 637 unique game titles were coded into one of five types: *educational/ informative, sports, sensorimotor* (action/arcade, fighting/shooting, driving/racing, other vehicular simulations), *strategy* (adventure/role playing, war, strategic simulations, puzzles/games), and *unknown* (other content, unspecified games, platform only). Using manufacturers' World Wide Web sites, published information available in stores, conversation with gaming experts, collaborative assistance from the Entertainment Software Ratings Board, and their own knowledge of the games, two coders classified each game. The Kappa estimate of interrater agreement was .89. All coding disagreements were resolved through discussion.

### *2.6. Calculation of minutes of time use*

All television viewing is reported in two ways: minutes per week, and minutes per day type (weekday or weekend). Because games available for play do not change on weekends, only

minutes per week are reported for game play. Minutes per week is a composite value comprising reported weekday and weekend minutes of television viewing or video game play loaded in the following manner: minutes per week = 5 × (weekday minutes) + 2 × (weekend minutes). Thus, minutes reported in the one weekday time-use diary are assumed to be representative of that subject's weekday viewing or game play habits. The same is true for weekend use.

## 3. Results

### *3.1. Total minutes of primary television viewing*

Because of the large sample size, an alpha level of .01 was used for all statistical tests. An alpha level of .05 was considered marginally significant.

#### *3.1.1. Age effects*

An analysis of variance revealed a main effect of age on total minutes of television viewed per week, $F(3,2378) = 13.67$, $P < .01$. The youngest children (age 0–2) watched significantly less television ($M = 644.56$, S.D. = 528.19) than the three older groups of children, who watched functionally equivalent amounts of television (age 3–5: $M = 828.63$, S.D. = 562.34; age 6–8: $M = 811.30$, S.D. = 526.80; age 9–12: $M = 846.72$, S.D. = 592.40).

#### *3.1.2. Day type effects*

A mixed-model ANOVA revealed a main effect of day type on the amount of television watched, $F(1,2663) = 269.37$, $P < .01$. Children watched more television on a weekend day ($M = 130.61$, S.D. = 119.14) than on a weekday ($M = 91.62$, S.D. = 91.54).

There was a also significant Age × Day Type interaction, $F(3,2663) = 45.67$, $P < .01$. Weekend viewing increased as a function of age between the 0 to 2-year-olds ($M = 67.60$, S.D. = 86.89), the 3–5-year-olds ($M = 131.57$, S.D. = 101.43), and the 6–8-year-olds ($M = 160.69$, S.D. = 117.26). The 9–12-year-olds ($M = 157.01$, S.D. = 134.76) did not differ from 6–8-year-olds in the amount of time spent viewing television on the weekend. Thus, weekend television viewing peaked among the 6–8-year-olds and then leveled off. In contrast, weekday viewing's relationship with age is best described as an inverted "U" pattern, with weekday viewing peaking among the 3–5-year-olds ($M = 111.32$, S.D. = 97.97). Children ages 0–2 viewed the smallest amount of weekday television ($M = 64.63$, S.D. = 83.36), followed by children in the oldest two age groups who watched approximately equal amounts (6–8-year-olds: $M = 92.16$, S.D. = 86.27; 9–12-year-olds: $M = 98.12$, S.D. = 91.91).

#### *3.1.3. Gender effects*

Although there were no significant effects for gender or Gender × Age interactions, there was a marginally significant three-way interaction of Age × Gender × Day Type, $F(3,2087) = 3.46$, $P < .05$). Post hoc analyses revealed that 9–12-year-old girls ($M = 106.68$, S.D. = 91.63) watched more weekday television than 6–8-year-old girls

Table 1
Number of minutes viewed per week in each program type by age and gender

| | 0- to 2-year-olds ($n=598$) | | 3- to 5-year-olds ($n=524$) | | 6- to 8-year-olds ($n=465$) | | 9- to 12-year-olds ($n=676$) | | All ages ($n=2263$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *M* | S.D. | *M* | S.D. | *M* | S.D. | *M* | S.D. | *M* | S.D. |
| *Educational programs* | | | | | | | | | | |
| All children | 199.17[abc] | 298.70 | 240.44[ac] | 281.42 | 113.70[bc] | 181.63 | 96.42[a] | 162.68 | 158.48 | 243.17 |
| Boys | 189.17 | 309.35 | 236.35 | 285.41 | 98.23 | 176.15 | 91.57 | 166.05 | 151.87 | 248.28 |
| Girls | 208.78 | 288.33 | 245.59 | 276.93 | 133.13 | 186.90 | 100.71 | 159.76 | 165.45 | 237.59 |
| *Noneducational cartoons* | | | | | | | | | | |
| All children | 126.94[a] | 230.33 | 320.05[ab] | 339.54 | 260.95[ab] | 301.11 | 162.33[b] | 223.48 | 209.74 | 282.36 |
| Boys | 114.09 | 201.87 | 330.68 | 340.57 | 306.19 | 348.57 | 187.00 | 236.46 | 231.96 | 299.37 |
| Girls | 139.27 | 254.45 | 306.67 | 338.60 | 204.17 | 215.78 | 140.53 | 209.28 | 186.31 | 261.35 |
| *Action programs* | | | | | | | | | | |
| All children | 14.68[a] | 77.77 | 23.46[b] | 89.46 | 34.51[c] | 108.55 | 61.58[abc] | 200.94 | 35.14 | 135.79 |
| Boys | 15.32 | 66.09 | 17.09 | 70.48 | 29.94 | 84.60 | 57.55 | 162.93 | 30.89 | 107.59 |
| Girls | 14.06 | 87.64 | 31.49 | 108.41 | 40.25 | 132.64 | 65.13 | 229.54 | 39.62 | 160.15 |
| *Comedy programs* | | | | | | | | | | |
| All children | 26.39[a] | 104.97 | 67.42[a] | 141.87 | 131.68[a] | 208.90 | 199.83[a] | 264.45 | 110.98 | 206.61 |
| Boys | 33.66 | 128.08 | 71.47 | 145.21 | 118.71 | 200.71 | 141.60 | 208.48 | 92.81 | 179.99 |
| Girls | 19.41 | 76.09 | 62.32 | 137.74 | 147.95 | 218.15 | 251.29 | 296.42 | 130.13 | 229.91 |
| *Reality-based programs* | | | | | | | | | | |
| All children | 2.58[a] | 18.71 | 4.45[b] | 26.66 | 7.60 | 34.21 | 11.89[ab] | 52.43 | 6.91 | 36.70 |
| Boys | 2.54 | 20.73 | 4.26 | 26.21 | 10.30 | 40.88 | 15.23 | 59.00 | 8.31 | 40.65 |
| Girls | 2.61 | 16.58 | 4.69 | 27.28 | 4.22 | 22.93 | 8.95 | 45.73 | 5.44 | 31.97 |
| *Relationship drama programs* | | | | | | | | | | |
| All children | 18.59[ab] | 84.58 | 25.92[cd] | 88.10 | 44.81[ac] | 116.97 | 49.16[bd] | 127.23 | 35.20 | 107.72 |
| Boys | 25.44 | 107.50 | 28.28 | 91.75 | 47.77 | 125.78 | 34.97 | 111.22 | 34.07 | 109.91 |
| Girls | 12.02 | 53.53 | 22.95 | 83.42 | 41.10 | 105.06 | 61.70 | 138.82 | 36.40 | 105.41 |
| *Fantasy programs* | | | | | | | | | | |
| All children | 7.43[abc] | 30.71 | 43.25[a] | 130.52 | 61.68[b] | 153.19 | 51.97[c] | 122.15 | 40.72 | 118.61 |
| Boys | 8.58 | 33.99 | 57.07 | 153.87 | 72.24 | 163.31 | 54.22 | 123.52 | 46.99 | 130.53 |
| Girls | 6.33 | 27.21 | 25.85 | 90.59 | 48.42 | 138.71 | 49.99 | 121.08 | 33.05 | 104.11 |
| *Sports programs* | | | | | | | | | | |
| All children | 7.88[a] | 44.90 | 23.11[b] | 94.45 | 33.51[a] | 121.81 | 63.03[ab] | 187.69 | 33.54 | 129.72 |
| Boys | 12.59 | 60.08 | 33.78 | 119.66 | 54.05 | 154.60 | 110.91 | 254.18 | 54.71 | 170.90 |
| Girls | 3.36 | 21.26 | 9.67 | 42.90 | 7.75 | 48.27 | 20.71 | 74.45 | 11.22 | 53.16 |
| *Other programs* | | | | | | | | | | |
| All children | 6.82[a] | 35.89 | 14.05[b] | 62.55 | 25.53[a] | 74.27 | 50.91[ab] | 133.24 | 25.85 | 89.86 |
| Boys | 7.22 | 39.84 | 15.59 | 64.34 | 12.73 | 42.84 | 43.42 | 140.79 | 20.54 | 86.53 |
| Girls | 6.44 | 31.70 | 12.11 | 60.33 | 41.59 | 98.49 | 57.53 | 126.02 | 31.44 | 92.96 |

($M = 82.24$, S.D. = 70.15). This pattern was reversed for boys, with 9–12-year-olds ($M = 87.89$, S.D. = 91.31) watching less weekday television than 6–8-year-olds ($M = 100.49$, S.D. = 97.09).

### 3.2. Total minutes of secondary television viewing

Analysis of variance was employed to determine if secondary television viewing varied as a function of age, gender, and day type. A main effect of age was found, $F(3,2663) = 7.46$, $P < .01$; and post hoc analyses revealed that differences in secondary viewing occurred between the oldest and the two youngest age groups. Children ages 9–12 years old spent fewer minutes per week viewing television as a secondary activity ($M = 98.06$, S.D. = 176.55) than did children ages 0–2 ($M = 132.31$, S.D. = 267.95) and 3–5 ($M = 152.61$, S.D. = 249.07).

The main effect for gender approached significance, $F(1,2663) = 4.24$, $P < .05$), with boys ($M = 130.16$, S.D. = 245.68) watching more television as a secondary activity than girls ($M = 113.80$, S.D. = 207.91). The Age × Gender interaction was also significant, $F(3,2663) = 4.32$, $P < .01$. Boys showed an inverted "U"-shaped pattern of secondary television usage with a peak among boys ages 3–5-year-olds and a large decline in use among 9–12-year-old boys. Girls, on the other hand, displayed a steady amount of secondary viewing across three age groups with a slight dip in the 6–8-year-old group.

A main effect of day type was found, $F(1,2663) = 7.64$, $P < .01$. Children used television as a secondary activity more during a weekend day ($M = 19.30$, S.D. = 41.82) than a weekday ($M = 16.68$, S.D. = 37.87). There were no significant interactions for secondary television viewing.

### 3.3. Minutes of television viewing by program genre

An Age × Gender (4 × 2) MANOVA was conducted to examine minutes spent watching programs in each of the nine genre categories, using the subsample comprised by children whose reported program titles were at least 70% codeable ($n = 2263$). Table 1 shows the weighted means and standard deviations for number of minutes viewed per week in each genre category by age and gender.

#### 3.3.1. Age effects

The MANOVA revealed a significant main effect for age, Pillais' $F(27,6243) = 29.93$, $P < .001$, with age groups differing in every genre category [*educational*, $F = 43.54$; *noneducational cartoon*, $F = 51.75$; *action*, $F = 13.09$; *comedy*, $F = 85.91$; *reality-based*, $F = 7.45$; *relationship drama*, $F = 9.80$; *fantasy/supernatural*, $F = 20.87$; *other*, $F = 27.78$; for all $F$ values, $df = 3, 2087$, $P < .001$]. The two most watched categories were educational programs and noneducational cartoons (see Fig. 1). Both showed an inverted "U" pattern

Gender group $n$'s within age for all program types: ages 0–2 (boys: $n = 297$, girls: $n = 301$); ages 3–5 (boys: $n = 300$, girls: $n = 301$); ages 6–8 (boys: $n = 247$, girls: $n = 218$); ages 9–12 (boys: $n = 335$, girls: $n = 341$). For age group main effects, values marked with the same superscript in the same row significantly differ at $P < .05$. Means and standard deviations for all ages are included for descriptive purposes.

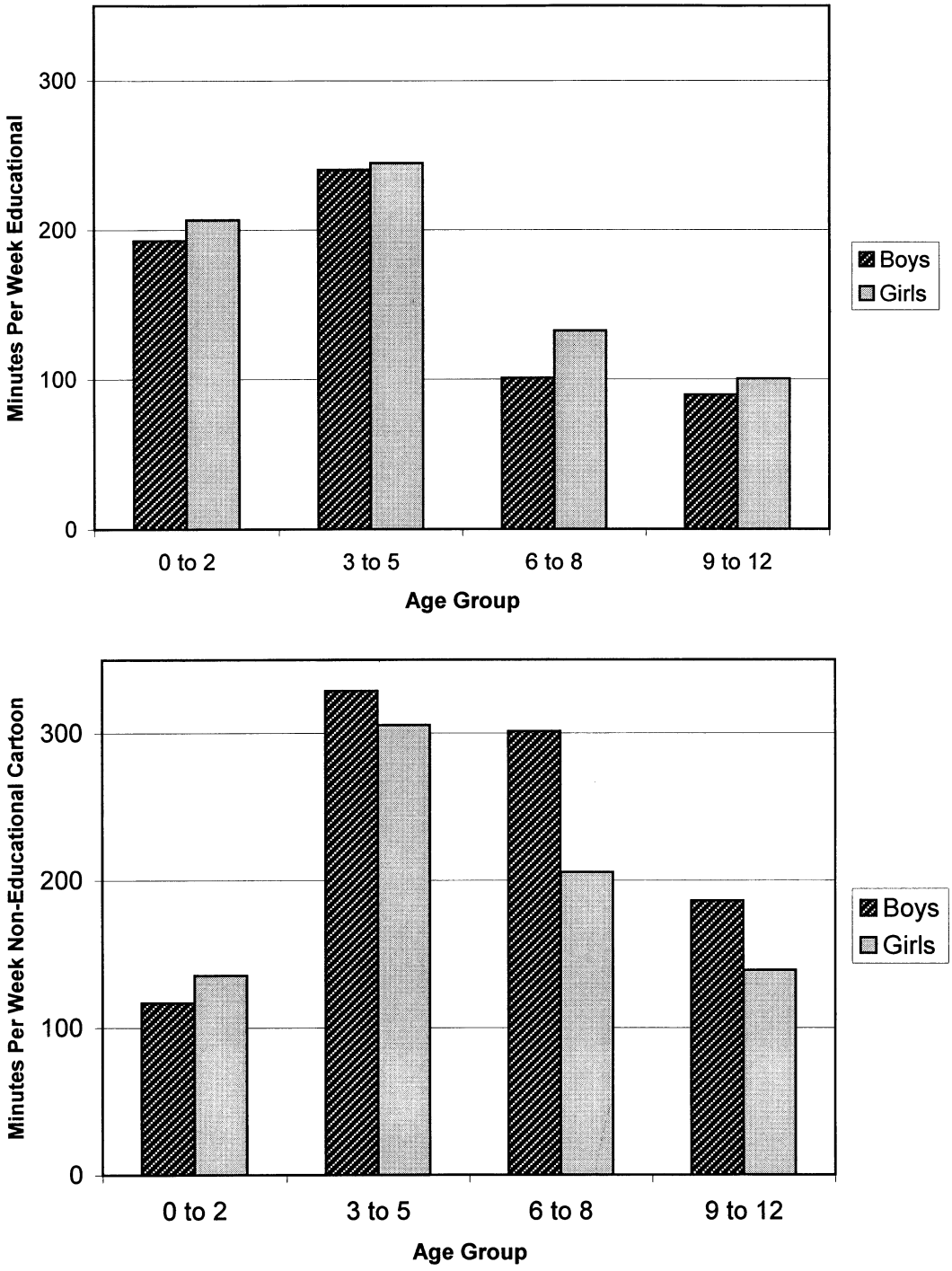


Fig. 1. Minutes per week of educational program and noneducational cartoon viewing by age and gender.

with viewing peaking among the 3–5-year-olds. Immediately following the peak, use of noneducational cartoons drops by 19%. Educational television viewing drops more severely after its peak: 6–8-year-olds watch 47% less educational television than do 3–5-year-olds. While 6–8-year-olds begin to move away from programs designed primarily for children, they do so more rapidly for educational programs than for noneducational cartoons.

*3.3.2. Gender effects*

There was also a main effect for gender, Pillais' $F(9,2079) = 12.61$, $P < .001$. Boys and girls differed in four of the nine genre categories: boys were higher viewers of *non-educational cartoons*, $F(1,2087) = 14.72$, $P < .01$; *fantasy/supernatural*, $F(1,2087) = 9.38$, $P < .01$; and *sports*, $F(1,2087) = 62.87$, $P < .01$. Girls were higher viewers of *comedy*, $F(1,2087) = 16.28$, $P < .01$; and *other*, $F(1,2086) = 7.36$, $P < .05$. Educational viewing did not differ by gender.

*3.3.3. Age×Gender interactions*

The MANOVA revealed significant interactions of Age × Gender in four genres: *comedy*, $F(3,2087) = 12.78$, $P < .01$; *sports*, $F(3,2087) = 12.11$, $P < .01$; *relationship dramas*, $F(3,2087) = 4.23$, $P < .01$; and *cartoons*, $F(3,2087) = 3.98$, $P < .01$ (see Table 1 for means and standard deviations).

Significant Age × Gender interactions indicated that among 9–12-year-olds, girls watched more comedy and relationship dramas than boys. Among boys, viewing of sports programs increased dramatically with each successive age group. Boys in the 9–12-year-old group watched almost twice as much sports programming as did boys ages 6–12.

For both genders, the pattern of minutes of noneducational cartoons viewed peaked among 3–5-year-olds and then declined as a function of age. This decline, however, occurred more quickly among girls than among boys. The 6–8-year-old girls spent much less time viewing noneducational cartoons than did 3–5-year-old girls. This is not true for boys; their major movement away from noneducational cartoons appeared in the 9–12-year-old group. Among the 9–12-year-olds, girls watched fewer minutes of noneducational cartoons than did boys.

*3.3.4. Age×Gender×Program Genre interactions*

Noneducational cartoons and educational programs were a major focus throughout the analyses, in part because they have important implications for school readiness (Wright & Huston, 1995) and for subsequent scholastic achievement (Anderson et al., in press). In order to explore the relationship among watching these types of programs and children's age and gender, a mixed-model MANOVA was employed. A marginally significant three-way interaction was found, $F(3,2087) = 3.12$, $P = .05$ (see Fig. 2 for graphical depiction of differences in educational and noneducational cartoon program viewing by age and gender). The figure shows that 9–12-year-old boys spent more time watching noneducational cartoons than did 9–12-year-old girls. Boys apparently lose interest in these noneducational cartoons at an older age than do girls. The reverse was true for educational programming. For both genders, 6–8-year-olds watched considerably fewer minutes of educational programming

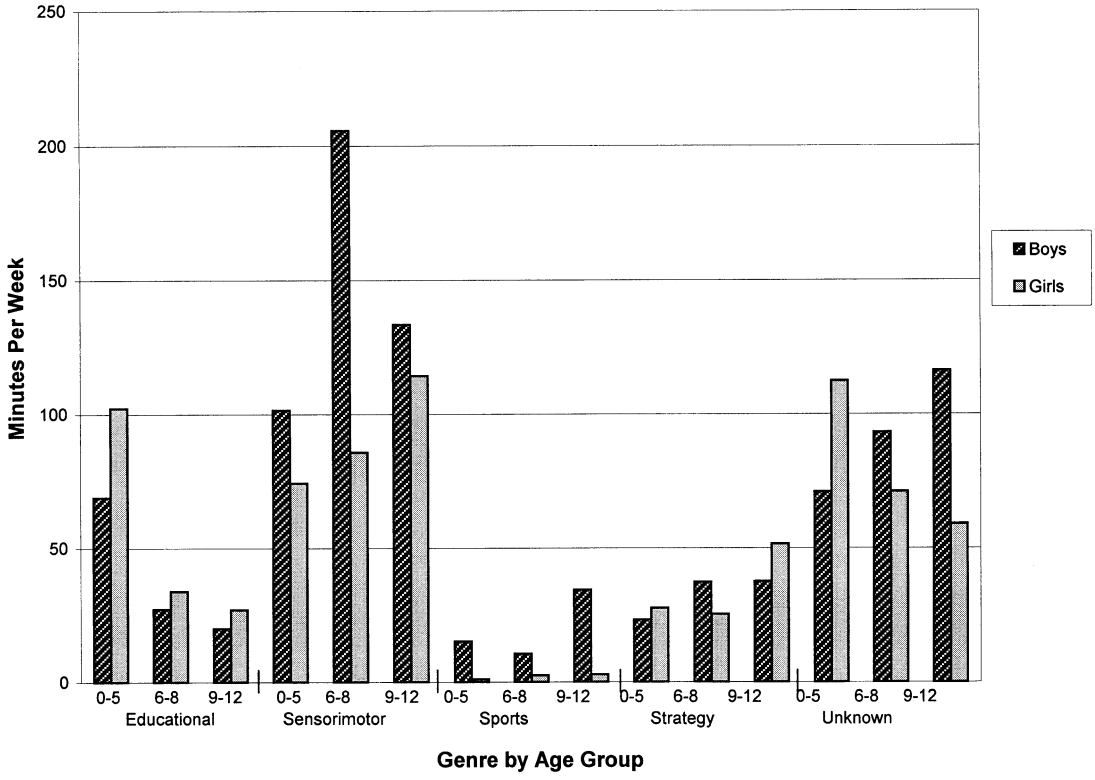


Fig. 2. Minutes of video game play of each type by age and gender.

than did 3–5-year-olds. Girls' viewing, however, did not decline as dramatically as boys' between these two age groups.

### 3.4. Video game play in sample

Among the entire sample used in this study ($N=2902$), 25% reported playing games at least once in their time use diaries, while 75% reported no game use. Chi-square tests by sex for game play vs. no game play within each age group indicated no sex differences in the number of 0–2-year-old boys and girls who played (boys: $n=16$, girls: $n=13$) compared to those who did not (boys: $n=334$, girls: $n=332$). However, all chi-square tests for sex differences in the three remaining age groups were significant [ages 3–5, $\chi^2(1)=8.33$, $P<.01$; ages 6–8, $\chi^2(1)=22.81$, $P<.001$; ages 9–12, $\chi^2(1)=46.75$, $P<.001$]. Taken together, these chi-squares indicated that the number of children playing video games increased with age, and that boys played more games than girls in each age group (players ages 3–5, boys: $n=90$, girls: $n=46$; nonplayers ages 3–5, boys: $n=290$, girls: $n=263$; players ages 6–8, boys: $n=141$, girls: $n=80$; nonplayers ages 6–8, boys: $n=178$, girls: $n=228$; players ages 9–12, boys: $n=218$, girls: $n=126$; nonplayers ages 9–12, boys: $n=218$, girls: $n=329$).

### 3.5. Total minutes of video game play

Due to the large proportion of nonplayers, parametric analyses of total video game play were conducted for players only ($n = 730$). This sample included the six participants for whom total game play minutes for their second diary were imputed from their first. Because the 0–2-year-old age group contained only 29 children, it was combined with the 3–5-year-old age group. Boys ($M = 374.77$, S.D. = 417.41) spent significantly more minutes per week playing video games than did girls ($M = 264.85$, S.D. = 255.61), $F(1,669) = 9.78$, $P < .01$. There were no significant age effects on total minutes of game play.

### 3.6. Video game play by game type

The sample used for the categorical analyses included only those who completed two diaries ($n = 724$). Fig. 2 shows means for Age × Gender × Game-Type Use.

#### 3.6.1. Age effects

Significant main effects were found for *educational* games, $F(2,666) = 20.42$, $P < .01$, and *sports* games, $F(2,666) = 5.57$, $P < .01$. For *educational* games, 0–5-year-olds ($M = 81.65$, S.D. = 126.79) played more than did 6–8-year-olds ($M = 29.21$, S.D. = 83.88) and 9–12-year-olds ($M = 22.73$, S.D. = 89.11). For *sports* games, 9–12-year-olds ($M = 22.02$, S.D. = 67.18) played more than did 6–8-year-olds ($M = 8.06$, S.D. = 24.69). There were no significant age effects for the sensorimotor, strategy, and "unknown" game types.

#### 3.6.2. Gender effects

A significant gender effect was found only for *sports* games, $F(1,666) = 24.62$, $P < .01$. Boys ($M = 22.66$, S.D. = 64.97) played more sports games than did girls ($M = 2.33$, S.D. = 9.94). The gender effects for *sensorimotor* games reached marginal significance, $F(1,666) = 4.11$, $P < .043$. There were no gender differences for educational, strategy, and "unknown" game types. Analyses revealed only marginally significant Age × Gender interactions for two game-type categories: *sports*, $F(2,666) = 3.41$, $P < .05$, and *unknown*, $F(2,666) = 3.69$, $P < .05$ (see Fig. 2).

## 4. Discussion

With respect to television use, the present data support the general findings in the existing literature. Previous studies of television use have found that preschool children (3–5-year-olds) and older elementary school children (9–12-year-olds) spend more time with television than do young school-aged children (6–8-year-olds) and very young children (0–2-year-olds; Timmer et al., 1985). This pattern is also evident in the present data. Very young children watch whatever their adult caregiver is watching and do a lot of secondary viewing. Correspondingly, the drop in total weekday television viewing at 6 to 8 years of age corresponds to the age at which most children begin regular attendance at a full-day school

program. The concurrent rise in weekend viewing may represent a "compensatory" adjustment for loss of weekday viewing time to school demands. It is also in part a function of the fact that many school-age children are permitted to watch later in the evening on Saturday nights. Thus, it is likely that these changes are due to changes in contextual demands on children's time.

The gender differences clearly indicate the diverging interests of girls and boys, and are best understood at the level of analysis involving Age × Gender interactions in individual genres of programming. As children's tastes become differentiated in consistent ways, the nonhomogeneity of the medium becomes apparent. *How much* you watch becomes less critical than *what* you watch, and global statements about use of a monolithic medium become less and less meaningful. Specifically, the older girls' attraction to the relationship dramas offered during weekday, primetime broadcasts could account for part of the three-way observed interaction between gender, age, and genre. Another part of the increase in weekday viewing for 9–12-year-old girls corresponds with the rise in viewing comedy programs. It is probable that these girls are beginning to become interested in weekday evening situation comedies that generally target teenagers and adults.

With respect to the two most viewed program categories, which are also the two with most nearly opposite relations to outcomes in the longitudinal literature, apparently boys maintain their interest in noneducational cartoons into the older age groups more readily than do girls, whereas girls remain interested in educational programs longer than do boys (Anderson et al., in press). There is a quality of maturity and serious social concern among the girls that is not evident among most boys, and an attraction to action, confrontation, and probably violence among boys that is not shared by girls.

With respect to video games, it is no surprise to find boys spending about three times as many minutes per week in engagement with games as girls. Just as previous research has shown for the initial advent of television, new media tend to fill time previously devoted to functionally equivalent media. That is, television displaced the use of radio, records, telephones, and comic books rather than taking time previously devoted to high-level educational activities or serious leisure reading. In the present study, we find that the drop in TV viewing for older boys has occurred at the same time that sensorimotor and later sports games were captivating their attention. It is therefore of serious concern that there is no comparably attractive route from viewing educational TV programs to interactive media use for girls.

For girls, the future may be more optimistic. New games, both computer and video-based, are being developed to engage the involvement of girls. Many involve some serious relationships, social knowledge, or "people-sense" (like the *Sim Family* game). The same emerging effort toward interesting girls in interactive play and learning is evident in new protected and monitored websites and chat rooms for girls on the Internet. Clearly, such efforts are needed if we are to give girls a headstart in the cyber world comparable to that now enjoyed by boys.

Most of the games reported are played on Sega, Nintendo, or Play Station platforms. While there is a growing overlap of software across platform boundaries, it is still true that there are many more educational interactive games marketed as CD-ROMs for computers than are made for the popular video game platforms. Conversely, there is a very high

proportion of sensorimotor, sports, shooting, and fighting games made for the video game platforms, but a larger share of the adventure and strategy games are made for use on computers. The fact of a disproportionate share of the less educational, more violent games being used by low-income and minority children in the PSID-CDS has been noted by Scantlin (1999), and gives cause for concern. It is not simply the higher cost of computer hardware and software that produces ethnic and socioeconomic inequities in children's electronic play. Research on television use shows similar discrepancies, which are not due to differences in access. Poor and minority children in America, especially boys, watch more violent and other commercial entertainment television programming, and less educational and informative programming than do majority and middle-class youngsters (Comstock, 1991; Huston & Wright, 1997).

While there are few surprises in the outcomes, they serve as "snapshot" population estimates for the nation as of 1997, and provide a baseline for longitudinal comparison when the next Child Supplement diaries are collected. These new data on the same sample are expected to be collected in 2001 and to be available in 2003. We believe there is an urgent need for developmentally organized research of the same depth and variety for children's use of interactive electronic media as has been devoted over the past 20 years to the effects of various kinds of television. We need studies of different ages and different contexts, experiments and surveys, and especially longitudinal studies in order to converge on valid conclusions, analogous to those we have already reached about television outcomes, in the domains of interactive media. It is our hope that this study establishes a few of the anchor points necessary for such a program of applied research.

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