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ABSTRACT

A 2-year longitudinal investigation of developing television viewing patterns involved 271 children who were followed from 3 to 5 or 5 to 7 years of age. Viewing was measured from diaries maintained by parents for 1 week in the spring and 1 week in the fall for 2 years. Programs were classified as (1) child informative or educational; (2) cartoons; (3) other child shows; (4) adult informational, including news and sports; (5) comedy; (6) drama; (7) action adventure; and (8) miscellaneous. Programs were also coded for two dimensions reflecting cognitive processing requirements: redundancy of characters and settings, and temporal integration demands. Age changes occurred on four program types. Viewing the child informative programs peaked at ages 3.5 and 4, then declined steadily. Viewing cartoons and general audience comedies increased from age 3 to 5, and leveled off between 5 and 7. Viewing adult informational programs decreased linearly with age. For child audience programs, the cognitive processing requirements of the programs viewed increased with age. Developmental changes were attributed to age changes in cognitive development, media knowledge, independence from adults, and activities away from home. Boys watched more than girls in four program categories: cartoons, adult informational, action adventure, and miscellaneous. (Author/RH)

The Development of Television Viewing Patterns in Early Childhood: A Longitudinal Investigation

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Abstract

THE DEVELOPMENT OF TELEVISION VIEWING PATTERNS IN EARLY CHILDHOOD: A LONGITUDINAL INVESTIGATION

A two-year longitudinal investigation of developing television viewing patterns included 271 children who were followed from ages 3 to 5 or 5 to 7. A cohort sequential design allowed separation of age changes from time of measurement effects. One-week diaries reporting all viewing by all family members were collected every six months (five diaries total). Programs were classified as (1) child informative or educational; (2) cartoons; (3) other child shows; (4) adult informational (news, sports); (5) comedy; (6) drama; (7) action adventure; (8) miscellaneous. Programs were also coded for two dimensions reflecting cognitive processing requirements: redundancy of characters and settings, and temporal integration demands.

Age changes occurred on four program types. Viewing child informative programs peaked at ages 3 1/2 and 4, then declined steadily. Viewing cartoons and general audience comedies increased from age 3 to 5, and leveled off between 5 and 7. Viewing adult informational programs decreased linearly with age. For child audience programs, the cognitive processing requirements of the programs viewed increased with age. Developmental changes were attributed to age changes in cognitive development, media knowledge, independence from adults, and activities away from home. Boys watched more than girls in four program categories: cartoons, adult informational, and action adventure, and miscellaneous.

The Development of Television Viewing Patterns in Early Childhood: A Longitudinal Investigation

The television set is a ubiquitous part of most children's environments from birth onward. Despite extensive research on social and cognitive effects of television on children (cf. Pearl, Bouthilet, & Lazar, 1982), relatively little is known about how and when patterns of television use initially develop. Cross sectional data suggest that television becomes firmly established in children's lives well before their first experiences in formal educational settings. Six-month-old infants respond to the sights and sounds of television (Hollenbeck & Slaby, 1979), and children between 1 and 2 years of age react to particular characters and events on television by pointing, verbal labeling, and selective attention (Lemish & Rice, 1986). Preschool children spend 2-4 hours a day watching television; the total time spent viewing drops slightly around age 6 when children enter school, but increases again by middle childhood (Comstock, Chaffee, Katzman, McCoombs, & Roberts, 1978; Friedrich & Stein, 1973; Singer & Singer, 1981).

It appears that the preschool years are a formative period during which children reach a basic and possibly lasting accommodation with television. Both laboratory and home observations demonstrate that between infancy and 6 years of age, children become increasingly attentive to programs while they are viewing (Anderson & Field, 1983; Anderson, Lorch, Field, Collins, & Nathan, 1986). In one investiation, 2 1/2-year-old children looked at the set for more sustained periods than younger children, suggesting a qualitative change in processing of televised information between ages 2 and 3 (Anderson & Levin, 1976).

The present study is a longitudinal investigation of the development of children's viewing patterns during the age period from 3 to 7 years. Development is broadly defined as "change over time within organisms" (Applebaum & McCall, 1983), so as to include both changes associated with age and with time of measurement. With one exception (Singer & Singer, 1981), the few studies of preschool children's home viewing have been cross-sectional. Many of the possible developmental patterns suggested by cross-sectional analyses can be examined only with longitudinal study of the same children over time (McCall, 1977). Moreover the fact that the type of programming offered changes with each season means that time of measurement is of more than methodological significance to the study of television effects.

Age- related changes in viewing could occur because of the cumulative effects of viewing experience or developmental changes in cognitive processing that influence the types of programs children comprehend and appreciate. With age, children may also become more independent of immediate adult supervision; as a result they may have more freedom to choose programming or to leave the room when others are viewing programs they are not interested in seeing. Third, as children get older, they may have more activities away from home that compete with television for their time.

Secular or historical change associated with occasions of measurement can also produce developmental change. In the case of television use, changes in availability of different types of programming and changes in the technology of television dissemination can affect viewing patterns. Annual seasonal fluctuations in viewing are also well documented. People watch television more in the winter than in the summer (Comstock et al., 1978).

Cognitive Developmental Changes and Television Viewing

A considerable body of theory and data has accumulated in the last ten years documenting the relation between children's cognitive processing abilities and their uses of television (Anderson & Lorch, 1983; Wright & Huston, 1983). Children are assumed to be active processors of the material they receive from the television set. They attend selectively; evaluate content for its comprehensibility and interest; and make decisions about what content to process or to ignore. They are often aware of variation in the amount of mental effort required to understand different programs (Salomon, 1983).

Television form influences children's interest and cognitive processing. Forms that elicit and maintain children's attention include animation, visually portrayed physical action, children's voices, character voices, sound effects, and other features often used in programs designed for children (Gibbons, Anderson, Smith, Field, & Fischer, 1986; Huston & Wright, in press). Some theorists have suggested that cumulative exposure to perceptually demanding forms may lead children to become increasingly dependent on such forms to maintain attention (e.g. Singer, 1980).

Children not only attend when animation and related features are used; they understand and recall information better than when more "adult-like" features are used (Gibbons, et al, 1986; Campbell, Wright, & Huston, 1987). Children's interest in animation and related forms is probably based partly on their growing media knowledge -- they learn that such forms signal appealing and comprehensible content. Within the age range studied here, therefore, increases in interest in animated programming might be expected.

Comprehensibility or incomprehensibility of television content, especially dialogue and narration, is another determinant of young children's attention and interest (Anderson & Smith, 1984; Field & Anderson, 1985). Obviously, what can be comprehended is a joint function of the program content and the knowledge brought to the program by the viewer.

Such knowledge can be conceptualized as a set of schemas derived from regularities and redundancies in one's experiences (Anderson & Lorch, 1983; Collins, 1983; Huston & Wright, in press). Schemas include expectancies about situations that permit the person to anticipate and organize incoming information; they guide attention, influence memory, and permit inferences about content that is implied, but not given (Taylor & Fiske, 1984). Television programs that contain repeated characters and settings across episodes lend themselves to

schema formation; the regular viewer approaches a new episode with considerable knowledge about the characters, likely actions, and probable events. Hence, program series with high redundancy across episodes are likely to be more comprehensible than those with low redundancy, particularly to young children who do not bring a large store of world knowledge to their television experience.

The difficulty level of a program also depends on the degree to which temporally separate events must be integrated (Collins, 1982; 1983). In a complex story, young children often do not connect a character's motive, shown in one part of story, with the character's actions, shown in another part of the story. Hence, stories that are long, and are frequently interrupted by commercials and other distractions are relatively difficult to understand. Temporal integration abilities develop gradually during the childhood years and depend upon an expanding representational and mnemonic capability as well as a growing familiarity with the medium (Collins, 1983).

This theoretical analysis clearly implies that there are likely to be different patterns of change for different types of television programs. Television is not a monolithic or homogeneous medium, particularly for young children. Therefore, in the present investigation, different types of programs were classified (1) on the basis of form (e.g., animation) and content appropriateness for children; (2) according to the likelihood that children would have relevant schemas to apply to them; and (3) according to their demands for temporal integration of content. Some developmental changes from programs with fewer to greater cognitive demands were expected, but because a limited age range (3 to 7) was studied, none of the children were expected to shift on their own initiative to viewing the most cognitively demanding program types.

Gender differences.

Girls and boys may show different developmental patterns in television use. Singer and Singer (1981) found an increase in total viewing from age 3 to 5 for boys, but a decrease for girls. In general, boys report that they like cartoons and action adventure programs more than girls do (Comstock, et al., 1978). In laboratory studies of attention, boys are often more attentive than girls to cartoons and to commercials with high rates of action, violence, and visual special effects (Alvarez, Huston, & Wright, 1987). In surveys conducted in several nations, boys reported watching more television, particularly violent television, than girls did (Huesmann & Eron, 1986). Boys might find cartoons and action adventure programs more appealing because they contain a preponderance of male characters and masculine stereotypic themes (Huston, 1983) and because the formal features in cartoons (e.g. high action, fast music, sound effects, and rapid changes) carry masculine connotations for young children (Huston, Greer, Wright, Welch, & Ross, 1984). Singer and Singer (1981) suggested that girls might spend more time than boys accompanying their mothers on shopping trips and excursions away from home, especially on Saturday morning. In the present study, sex differences were expected favoring males for cartoon and action adventure viewing; the magnitudes of the differences were expected to increase from ages 3 to 7.

Design of the study.

A longitudinal design permitting separation of age-based from historical or secular (time of measurement) changes was selected because of the likely importance of temporal changes in program availability (cf. Comstock et al., 1978; Nesselroade & Baltes, 1979). In the one existing longitudinal study, measurements were collected four times in one year for two cohorts (3- and 4-year-olds). The viewing patterns were difficult to interpret because of likely seasonal effects and possible time-based changes in programming or children's outside activities (Singer & Singer, 1981). In the present two-year study, groups of 3- and 5-year-old children began the study at two times, separated by 6 months, so that age changes were independent of time of measurement differences.

Method

Sample and Subject Retention

The initial sample consisted of 326 children and their families in Topeka, Kansas. The children were within 3 months of their third (N=160) or fifth (N=166) birthdays at the beginning of the study. They were recruited through newspaper birth records, preschools, churches, mass media publicity, and posters placed in large office buildings, laundromats, and grocery stores. The sample was predominantly Caucasian, and all but 18 families had both parents living in the home at the beginning of the study. Educational level of each parent was coded on a scale in which 1=less than high school, 2=high school graduate, 3=some post-high school training, 4=Bachelor's degree, 5=some post-graduate training, and 6=graduate or professional degree. For fathers, mean = 3.78, s.d. = 1.40; for mothers, mean = 3.35, s.d. = 1.23. Most parents were high school graduates (96.6% of the fathers; 98.1% of the mothers). Slightly over half (53%) of the fathers and 41.1% of the mothers had completed Bachelor's degrees.

Occupational status was rated on the Duncan scale, which has a range from 1 - 99 (Duncan, 1961). Although individual occupations receive different ratings on the Duncan, they can be understood from the following average ratings: professional and technical workers = 75; managers, officials and proprietors = 57; clerical and sales workers = 47; craftsmen and foremen = 31; operatives and service workers = 17-18; laborers = 7. For fathers, the mean = 52.73, s.d. = 23.90; for mothers, mean = 52.18, s.d. = 18.52. Using 1980 census data, approximate mean Duncan scores calculated for adults in Topeka. They were 40.5 for men and 50.6 for women. Therefore, the sample appeared to represent a wide range of educational and occupational levels, but it was a volunteer sample in which white, intact, relatively stable families with husbands above the average occupational status were overrepresented. (One necessary criterion for inclusion in the study was the intention to stay in Topeka for at least two years.)

Control group. An additional sample of 41 new children in the two cohorts was recruited for a single diary collection at the end of the longitudinal study in order to test for the effects of repeated diary collection. Twenty of them completed diaries during Wave 5 of the Spring starting group (Spring, 1983); 21 completed diaries during Wave 5 of the Fall starting group (Fall, 1983). The methods of recruitment were similar to those used for the main sample; demographic characteristics of their families were similar to the main study sample (father education mean = 3.70; mother education mean = 3.14; father Duncan = 55.72; mother Duncan = 54.37).

Design

The design was a combination of cross-sequential and cohort sequential methods (Goulet & Baltes, 1970; Nesselroade & Baltes, 1979). It is illustrated in Table 1. Two cohorts, aged 3 and 5 at the beginning of the study, were followed for a two-year period. Within each of these groups, there were two "sub-cohorts:" children with birthdays from February through August began the study in the spring, 1981; children with birthdays from September through the following February began in the fall, 1981. For clarity, these subcohorts are referred to as Spring and Fall starting times.

Table 1 about here

Viewing was measured from diaries maintained by the parents for one week in the spring and one week in the fall for two years (a total of 5 diaries). Viewing by all members of the household was recorded in 15-minute intervals from 6:00 a.m. to 2 a.m. for each day. In addition, if children were in regular day care, their viewing was recorded by the caregiver. Spring and fall were sampled to avoid the extremes of heavy viewing in winter or light viewing in summer. Although each family kept a diary for only one week, each time of measurement lasted approximately three weeks with families spread across them in order to reduce the effects of weather and idiosyncratic events (such as the Sadat assassination) on the viewing measure.

Parents were instructed to record as a "viewer" anyone who was present for more than half of a 15-minute interval in which the television was turned on. This definition was adopted to avoid parental judgments about when the child was "watching," but it undoubtedly resulted in a slight overestimate of true viewing. One recent investigation included a comparison of diary measures with videotapes made in the home during viewing (Anderson, Field, Collins, Lorch, & Nathan, 1985). Diaries slightly overestimated children's viewing time, but the correlations between the two methods were 0.84, indicating that diaries are a valid method of assessing individual differences.

In the present study, validity was also assessed indirectly by examining errors in the diaries (e.g. wrong program title for time and channel listed). Two subjects were eliminated because their diaries contained large numbers of errors.

A total of 271 subjects returned four (N=27) or five (N=244) diaries and were, therefore, considered to have sufficient data for analyses of viewing. To determine whether there was selective retention, correlations were computed between the number of diaries returned and the following variables measured in an initial home visit: sex of child, starting season, parent education, parent occupational status, maternal employment, family size, sibling composition, cable options, number of television sets, child's score on the Peabody Picture Vocabulary Test (PPVT-R), child's preschool attendance, child's media preferences. The only significant correlate was the child's score on the Peabody Picture Vocabulary Test, r (324) = 0.16. Children whose parents returned more diaries performed better than the low return rate groups. Therefore, the retained sample may have a slightly restricted range of vocabulary scores in comparison to the original sample, but, in general, the sample retained is comparable to the original sample.

Classification of Television Programs

Because the theoretical framework emphasized the categories of programming viewed, an extensive coding system was developed for categorizing available television programs (CRITC, 1982). Each program was classified on six dimensions. Four of these were similar to those used in other media research: (1) intended audience (child or general) (2) informative purpose (yes or no), (3) animation used (full, partial, none); (4) program type (real world events and information; variety; comedy; drama; or action adventure). The other two dimensions were designed to index the cognitive processing demands of the program. (5) Temporal integration demands were defined by the average time span during which a continuous plot or theme endures. They were coded on a scale from 1 = less than five minutes (e.g. Sesame Street, news) to 6 = multiple episodes (e.g. soap opera). (6) Unfamiliarity or redundancy was defined by the amount of repetition or redundancy of scenes and characters from one episode to another. It was intended to assess the extent to which children could form schemas for a program series that would apply to later episodes. It was coded on a scale from 1 = most settings and characters are the same across episodes to 4 = no continuing characters or settings.

All programs in the TV Guide and cable guides for the viewing weeks were coded on the basis of raters' knowledge of the series and descriptions in the television guides. Of the 5007 titles in the list, the proportion that could be coded on each dimension was: audience = 95.7%; purpose = 95.9%; animation = 95.1%; program type = 90.2%; temporal integration demands = 90.6%; redundancy = 91.1%. Rater agreement on each dimension was: audience = 97%; purpose = 95%; animation = 98%; program type = 93%; temporal integration demands = 86%; redundancy = 84%.

Each program viewed by a child was assigned ratings on each dimension from this master file of coded programs. Any programs viewed that did not appear in the television guides (e.g. videotapes) were also coded whenever possible. Viewing frequencies could then be calculated as the number of 15-minute intervals the child viewed any program category defined by a single dimension or a combination of dimensions.

Results

Total Viewing Time

Although viewing of particular program types was the major focus of the analyses, total viewing times are presented for comparison with other studies. The mean number of hours per week viewed by each cohort at each age is shown in Table 2.

Table 2 about here

Viewing Different Program Types

If programs were subdivided on all six dimensions simultaneously, frequencies of viewing would be unacceptably small. Moreover, if all six dimensions were crossed, there would be many empty cells containing no television programs. Therefore, three different subdivisions were planned. First, viewing frequencies were calculated in 22 mutually exclusive and exhaustive groups based on: intended audience, informative purpose, animation, and program type (Dimensions 1 - 4). These were then collapsed to eight categories on the basis of content and form similarity to meet the criterion that fewer than half of the children had non-zero viewing frequencies in any category. The final categories included three types of programs intended for child audiences: (1) informative, partial or no animation; (2) animated, noninformative; (3) other, noninformative, partial or no animation; and five intended for general audiences: (4) informational (including news, sports, documentaries); (5) comedy; (6) drama; (7) action adventure; and (8) miscellaneous (game, variety and unclassified programs).

Distributions of viewing in most categories were positively skewed; therefore, square root transformations were used in the final analyses after determining that they produced more normal distributions than logs or raw scores. For the 27 children with one missing diary, values were estimated using the BMD least squares program for estimating missing data. The estimation was based on the child's gender, cohort, start time, and other diary frequencies. Approximately 2% (27 out of 1355) of the values in the final data set consisted of such estimated data.

The design of the study permitted separation of age changes from those due to time of measurement. Analyses of variance were performed on viewing frequencies in each program category using sex (2), cohort (2), starting time (2), and wave (5) as independent variables. The results of these analyses are summarized in Table 3. Age changes are indicated by main effects of cohort and wave or by an interaction of cohort x wave. Main effects and interactions involving starting time indicate time of measurement effects that might be due to seasonal variations or to secular changes in broadcasting patterns. Orthogonal polynomials were calculated to determine the patterns of changes over time.

Table 3 about here

Age changes. Age-related changes occurred on four program types: child informative, child animated, general audience informative, and general audience comedy. The means are presented in Figure 1. Viewing child informative programs increased to a peak at ages 3 1/2 and 4, then declined to a low point at age 7. The significant main effects of cohort, wave, and the interaction of cohort x wave indicate a developmental change independent of time of measurement (Table 3). The analysis of orthogonal polynomials produced a significant linear trend for the cohort x wave interaction, indicating that the slopes of the age changes for the two cohorts were significantly different.

Cartoon viewing, by contrast, increased from age 3 to 5, and leveled off during the 5 to 7 age period. There was a significant main effect of wave and an interaction of cohort x wave. The linear effect was significant for the interaction, indicating different slopes for the two cohorts.

Children also watched fewer adult informational programs as they got older. There was a significant main effect of cohort and a main effect of wave. The change over waves followed a linear pattern (i.e., the linear trend was significant).

Older children watched comedies designed for general audiences more than younger children. There was a significant main effect of wave and a significant interaction of cohort x wave. The linear component was significant for the interaction; viewing increased slightly between ages 3 and 5; it peaked around age 5 1/2 to 6, with a subsequent drop. (see Figure 1).

Time of measurement effects. There were no overall effects of starting time, but there were significant interactions of start time x wave on six of the eight program types. Almost all of the trends were nonlinear. These changes have substantive interest to determine how broadcasting changes or other secular changes affect viewing, but they also demonstrate the importance of the cohort sequential component of the design for separating age change from secular change. Without that component, several of the developmental changes found would mistakenly have been attributed to age. The parallel changes for the spring and fall start times associated with time of measurement are apparent in Figure 1.

Two of the time of measurement effects have substantive interest. For child informative programs, the significant interaction of cohort x starting time x wave indicates that children in the two starting times and the two cohorts followed different developmental patterns. The quartic trends for the four groups were significantly different. The differences in trend for the two starting times in cohort 2 may be due to the fact that they started school at different ages. The spring starting time children were eligible for kindergarten in the fall, 1981 and for first grade in the fall, 1982. The fall starting time children started a year later because their birthdays were beyond the September 1 cut-off used by the schools. Drops in viewing were associated with school entry points, as indicated on Figure 1.

None of the children in Cohort 1 were old enough for public school, but parent reports about preschool attendance were obtained at the beginning and end of the study. At age 3, children in the two starting times were equally likely to be in preschool, but the spring group were significantly more likely to be in preschool or day care than the fall group during the final year of the study, r (121) = .18, p <.05. As preschool attendance was negatively associated with the amount children viewed child informative programs (Pinon, 1986), it may account for the lower frequencies of the spring group.

For general audience comedies, viewing in both cohorts dropped during the fourth occasion of measurement (see Figure 1). The significant interaction of starting time x wave indicates a time of measurement effect; there were significant quadratic, cubic, and quartic trends in this interaction. Hence, the nonlinear components of the curves in Figure 1 appear to be a function of secular trends or seasonal variations. The developmental change within each cohort was fundamentally linear. With correction for the extrinsic factors, such as a decline in programming or change in scheduling, that may have produced the drop in viewing at the fourth time of measurement, the developmental pattern appears to be similar to that for animated programs -- an increase between 3 and 5, followed by a leveling off between 5 and 7.

Sex differences. Sex differences in viewing emerged between 3 and 5 and became more pronounced as children got older. In three program categories, boys watched significantly more than girls: cartoons, adult informational, and action adventure (see Table 3). Although the interactions of sex with cohort and wave were not significant for these program categories, the difference between the means for boys and girls appeared to increase with age. For general audience miscellaneous programs, the sex x cohort interaction was significant. Males viewed more than females in the older cohort, but not the younger one. The means are shown in Figure 2.

Figure 2 about here

Control group. Viewing diaries for Wave 5 were collected from the control group to determine the effects of repeated diary keeping on the main sample. Analyses of variance of Wave 5 frequencies were performed using sex (2), cohort (2), starting time (2), and group (2) (longitudinal or control) as independent variables. There was a main effect of group for one of the eight program categories -- adult informational programs, F (1,302) = 6.49, p<.05. The longitudinal sample reported more viewing (Mean = 2.34) than the control group (Mean = 1.82). There were interactions of group x sex for child noninformative programs, F (1,302) = 4.17, p<.05 and action adventure, F (1,302) = 5.28, p<.05. The means for child noninformative shows were: longitudinal boys = 1.78; girls = 1.71; control boys = 1.29; girls = 1.96. The means for action adventure appear in Figure 2. The interactions of group x sex x cohort were significant for child animated programs, F (1,302) = 4.74 p<.05 and general audience miscellaneous, F

(1,302) = 3.98 p<.05. The means for the longitudinal and control groups are shown on Figure 2. There no systematic differences between the control group and the longitudinal group; it does not appear that there was any simple effect of repeated diary keeping on the reports by the longitudinal sample.

Developmental Changes in Viewing and Cognitive Demands of Programs

Age changes in viewing were expected to be partly a function of cognitive developmental changes that permit children to understand increasingly complex or demanding programs. The cognitive demands of programs were indexed on two dimensions: redundancy of content across episodes and temporal integration demands.

Redundancy. All programs were classified on a 4-point scale designating the amount of redundancy of characters and settings across episodes. Other factors being equal, programs with high redundancy were expected to be less cognitively demanding and more readily comprehended than those with low redundancy. Therefore, low values on the scale indicate high redundancy; high values indicate lack of redundancy.

The average redundancy of programs viewed by each child was computed as follows. Each child's viewing was assigned an average redundancy level for each wave. Every 15-minute interval of viewing was multiplied by the redundancy rating for the program viewed; the sum of the ratings for all intervals viewed was divided by the number of intervals viewed to obtain the average redundancy level of the programs viewed. These averages were computed separately for child audience and general audience programs because the cognitive demands of the two types are likely to be qualitatively different. These averages are independent of total viewing frequency. They indicate the mean level of programs viewed regardless of the total amount viewed. Subjects with zero viewing in child or general audience programs had to be dropped because no average level could be computed. Therefore, the total number of subjects in these analyses was 250 and 248 respectively. Each 15-minute interval of viewing was assigned a value of 1 to 4 based on the redundancy rating of the program broadcast. The sum was divided by the total number of intervals viewed to obtain an average level. Once again, averages were computed separately for child audience and general audience programs.

For child audience programs, analysis of variance of sex (2) x cohort (2) x starttime (2) x wave (5) produced a significant main effect of cohort, F (1,242) = 5.64, $p<.05$, and wave, F (4,239) = 2.71, $p<.05$, and a significant interaction of starttime x wave, F (4,239) = 8.47, $p<.001$. The means are shown in Figure 3. The older cohort had higher levels than the younger cohort, as predicted. The change across waves was a slight increase with age modified by time of measurement effects. There was a significant cubic trend in the main effect of wave, F (1,239) = 9.07, $p<.01$ and a significant quartic trend in the starttime x wave interaction, F (1,239) = 20.05, $p<.001$.

Figure 3 about here

The means for general audience programs, divided by gender, are

shown in Figure 3. There was a significant main effect of wave, F (4,238) = 3.37, $p<.01$, and significant interactions of sex x cohort, F (1,241) = 7.94, $p<.01$, sex x cohort x wave, F (4,238) = 2.58 $p<.05$, and starttime x wave, F (4,238) = 16.72, $p<.001$. Both boys and girls declined slightly from age 3 to 4. Girls' scores remained relatively stable across the age range sampled, but boys's scores increased between 5 and 7. Once again, these patterns were modified by time of measurement effects.

Temporal integration demands. Programs were classified on an 6-point scale indexing the length of their average content unit. The average temporal integration level of programs viewed by each child was computed following the same procedure as that used for redundancy. Each 15-minute interval was assigned a value of 1 to 6 based on the temporal integration demand of the program viewed. The sum was divided by the total number of intervals viewed to obtain an average level. Once again, averages were computed separately for child and general audience programs.

The average temporal integration levels were subjected to analyses of variance of sex (2) x cohort (2) x starttime (2) x wave (5). For child audience programs, there were significant main effects of cohort, F (1,242) = 43.59, $p<.001$, wave F (4,239) = 11.02, $p<.001$, and an interaction of starttime x wave, F (4,239) = 3.71 $p<.01$. The means are shown in Figure 3. As expected, the mean temporal integration level of programs viewed increased with age. The older cohort watched more demanding programs than the younger cohort, and the temporal integration level increased across waves. The linear trend for wave was significant, F (1,239) = 38.61, $p<.001$.

For adult audience programs, there were no differences associated with age. The only significant effect was an interaction of starttime x wave, F (4,237) = 4.75, $p<.001$, indicating fluctuations as a function of time of measurement.

Discussion

A major purpose of this study was to illuminate how young children develop patterns of television use. By their third birthdays, the average children in the sample were already watching between 2 and 3 hours of television a day; they were already experienced viewers. That statement must be qualified in two ways. First, the variation among individuals was extremely high. The range of total hours viewed in one week was a low of 0 to a high of 75.75 hours. Second, "watching" was defined as presence in the room. Films of home viewing made by Anderson et al. (1986) show that children between ages 3 and 7 attend visually to the television set approximately 50 - 70% of the time that they are in the same room. Although attention increases with age, it is likely that attention during diary-coded viewing varies widely with the type of program being viewed. We also know that at least partial auditory attention to television often continues during the time that a young child is not looking at the screen.

Age-related Changes in Attention, Comprehension, and Interest

One major purpose of this study was to determine whether the age-related cognitive changes demonstrated in earlier laboratory investigations would predict changes in home viewing patterns. This hypothesis was based on the assumption that children's own preferences guide at least some of their viewing. That assumption may be more valid for child audience programs than for general audience programs, particularly programs broadcast during heavy adult viewing times (i.e., news and prime time). Factors other than children's interests or preferences that are likely to affect viewing include viewing choices by other family members and scheduling of activities that preclude television viewing.

Two potential determinants of developmental change were of particular interest: cognitive developmental changes in ability to comprehend form and content, and cumulative exposure to perceptually salient forms. The increase in viewing animation is consistent with the hypothesis that children become increasingly attracted to perceptually salient forms with exposure, but the parallel increase in viewing non-animated situation comedies suggests that other explanations may be more parsimonious. One obvious quality shared by the two program types is humor, a program attribute with well-demonstrated effectiveness in attracting and holding children's attention (Bryant, Zillmann, & Brown, 1983). As comprehension abilities increase with age, appreciation of the humor in cartoons and comedies probably also increases. Children may also become increasingly aware that animation and humor signal content that is interesting, appealing, and child-appropriate.

Cognitive developmental changes generally affect children's comprehension of television programs, and comprehension (or failure to comprehend) in turn influences their interest in viewing. Some of the program classifications were designed to reflect the cognitive processing demands placed on the viewer. The grouping by intended audience -- child or general -- provided a gross division of probably comprehensibility. More refined indices of cognitive processing demands were ratings for redundancy and temporal integration demands. Redundancy of settings and characters was designed to index the likelihood that a regular viewer might have available schemas applicable to a new episode of the program. Temporal integration requirements provided an index for grouping programs by the length of a content segment that must be integrated in order to understand the major content themes.

The three types of classification were not independent, nor were they intended to be. The unfamiliarity and temporal integration dimensions were intended to illuminate some of cognitive processing demands that might account for developmental changes in program categories. For example, comedies have more redundancy and shorter temporal integration demands than drama or action adventure programs. Most child audience programs have high redundancy, but informative programs have shorter temporal integration requirements than noninformative programs. There is no way to control for these confounds because they are part of the naturally occurring medium. The overlap and nonindependence of temporal integration and familiarity with program type are consistent with the notion that these cognitive demand dimensions are partially responsible for the age changes in viewing different program types.

For example, analysis by program type demonstrated a decline with

age in viewing child informative programming and an increase in viewing animated noninformative programs. About 2/3 of the child informative viewing was devoted to Sesame Street, a program with content designed for 3- to 5-year-olds that has highly repetitive settings and characters and low temporal integration requirements. The decline probably does not indicate a generalized loss of interest in informative programming as much as an advance in comprehension abilities that allows enjoyment of slightly more demanding programming. There are relatively few informational programs on the air that have content and form appropriate for older children (Kerkman, Huston, Wright, & Eakins, 1987).

Age changes in children's time schedules for activities away from home also account for changes in viewing, particularly for weekday daytime programs. Total viewing time declined when children entered preschool and public school. The declines were due almost entirely to decreases in viewing daytime programs -- child informative programming and multiepisode dramas. This finding may appear mundane -- it is obvious that children cannot watch television when no set is available. At a more conceptual level, it suggests that television viewing should be conceptualized at least partly as a default option in people's daily schedules. Alternative activities determine how much time is available to exercise that default; only after the effects of such activities are taken into account does it make sense to examine individual attributes as influences on viewing.

Developmental changes in viewing general audience programs appear to be less dependent on cognitive processing requirements than on situational and social variables. The decline with age in viewing adult informative programs might better be described as a decline in involuntary exposure to programs chosen by parents or other family members. News, sports, and documentaries are probably well beyond the comprehension and interest of children in the age range from 3 to 7. Such programs require extensive world knowledge and have little redundancy. With age, children have greater freedom and willingness to be away from immediate supervision by parents, so they may be more apt to leave the room during programs in which they are not interested. They may also become more discriminating and aware of what they can and cannot understand on TV.

Sex differences in viewing patterns were in many cases more pronounced than age changes, suggesting that individual attributes other than cognitive developmental change account for a considerable amount of children's television use. Sex differences in viewing emerged during the period from 3 to 7 in four program categories. By age 7, boys watched more cartoons, action adventure dramas, adult informational programs, and miscellaneous programs than girls. This gender difference is consistent with findings that boys are often more visually attentive than girls to television programs shown in laboratory settings (Alvarez et al., 1987) and that boys in several nations report watching more violent programs than girls do (Huesmann & Eron, 1986). Both the content and form of cartoons and action adventure programs are more masculine than feminine. Most of these programs are violent and contain high levels of action and other formal features associated with masculinity (Huston & Wright, in press). Adult informational programs included sports, a program type likely to be more interesting to boys

than to girls.

Although there are no known gender-based cognitive differences that might determine viewing differences, by age 7, boys actually viewed programs that were more cognitively demanding (less redundant across episodes) than those viewed by girls. Hence, their viewing experience may have provided more practice in processing difficult material than girls' viewing did. Of course, girls may well practice similar cognitive skills with non-television media, particularly print.

Finally, a note on longitudinal design is in order. The design used in the present study met minimal requirements for allowing separation of the effects of age, cohort, and time of measurement (cf. Nesselroade & Baltes, 1979). The results clearly demonstrate the power provided by such a design in comparison to simple longitudinal or cross-sectional methods. The time of measurement variations were probably a function of changes in program offerings and schedules as well as variations in weather. They were for the most part nonlinear over time. It is substantively interesting that such variables have considerable influence on children's viewing patterns. Even more important for the major questions addressed in the study is our ability to separate sources of variation associated with time of measurement from those associated with age. Although ideal longitudinal designs sometimes appear beyond the range of pratical application, the present study demonstrates the considerable benefits that can accrue from the extra effort involved in developing a sophisticated design.

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Table 1

Design of Longitudinal Study

Cohort & Start Time	Time of Measurement					
	1981 Spring	1981 Fall	1982 Spring	1982 Fall	1983 Spring	1983 Fall
	Age of Children					
1978, Spring	3	3 1/2	4	4 1/2	5	
1978, Fall		3	3 1/2	4	4 1/2	5
1976, Spring	5	5 1/2[a]	6	6 1/2[b]	7	
1976, Fall		5	5 1/2	6[a]	6 1/2	7[b]

a. Entered kindergarten

b. Entered first grade

Table 2.

Total Hours of Television Viewed Per Week

Cohort					
Younger			Older		
Age	Mean	S.D.	Age	Mean	S.D.
3	19.2	9.87	5	19.2	10.85
3 1/2	19.9	10.75	5 1/2	19.0	11.28
4	19.6	10.02	6	17.7	10.50
4 1/2	19.1	10.09	6 1/2	15.9	10.32
5	20.8	10.93	7	15.5	9.48

Table 3

Analyses of Variance of Eight Program Types: F Ratios

Dependent Variable	Effect			
	Cohort	Sex	Cohort x Sex	Start Time (ST) x Sex
	(1,263)	(1,263)	(1,263)	(1,263)
Child Audience				
Informative	52.76***	0.45	0.22	0.03
Animated	2.76	12.51***	1.43	0.72
Other	0.70	2.53	0	0.02
General Audience				
Informational	7.16**	6.25*	2.28	1.32
Comedy	1.65	1.86	0.45	4.96*
Drama	2.51	0.09	1.28	2.59
Action adventure	2.36	22.07***	3.40	2.19
Miscellaneous	0.07	3.43	6.67 *	6.62**

Note. -- There were no significant main effects of Start Time or interactions other than those shown.

* $p < .05$, ** $p < .01$, *** $p < .001$

a. Linear trend significant at $p < .05$.

b. Quadratic trend significant at $p < .05$.

c. Cubic trend significant at $p < .05$.

d. Quartic trend significant at $p < .05$.

Table 3 (continued)

	Wave	Cohort x Wave	ST x Wave	Cohort x ST x Wave
	(4,260)	(4,260)	(4,260)	(4,260)
Child Audience				
Informative	39.13***abc	9.19***a	2.01	3.73**d
Animated	6.87**a	4.66***a	10.70***bd	0.37
Other	23.51***abc	1.54	45.45***abcd	0.36
General Audience				
Informational	7.48**a	0.37	4.54***bd	0.92
Comedy	6.96**ac	4.09**a	13.08***bcd	1.21
Drama	5.53***ab	1.13	0.86	1.58
Action adventure	27.09***ab	0.90	7.19***bc	0.68
Miscellaneous	1.64	0.10	8.20***bcd	0.79

Figure Captions

Figure 1. Mean viewing frequencies for each age level and time of measurement for child informative, child animated, general audience informative, and general audience comedy.

Figure 2. Mean viewing frequencies for boys and girls at each age for child animated, general audience informative, action adventure, and miscellaneous.

Figure 3. Average levels of redundancy and temporal integration demands in programs viewed at different age levels.

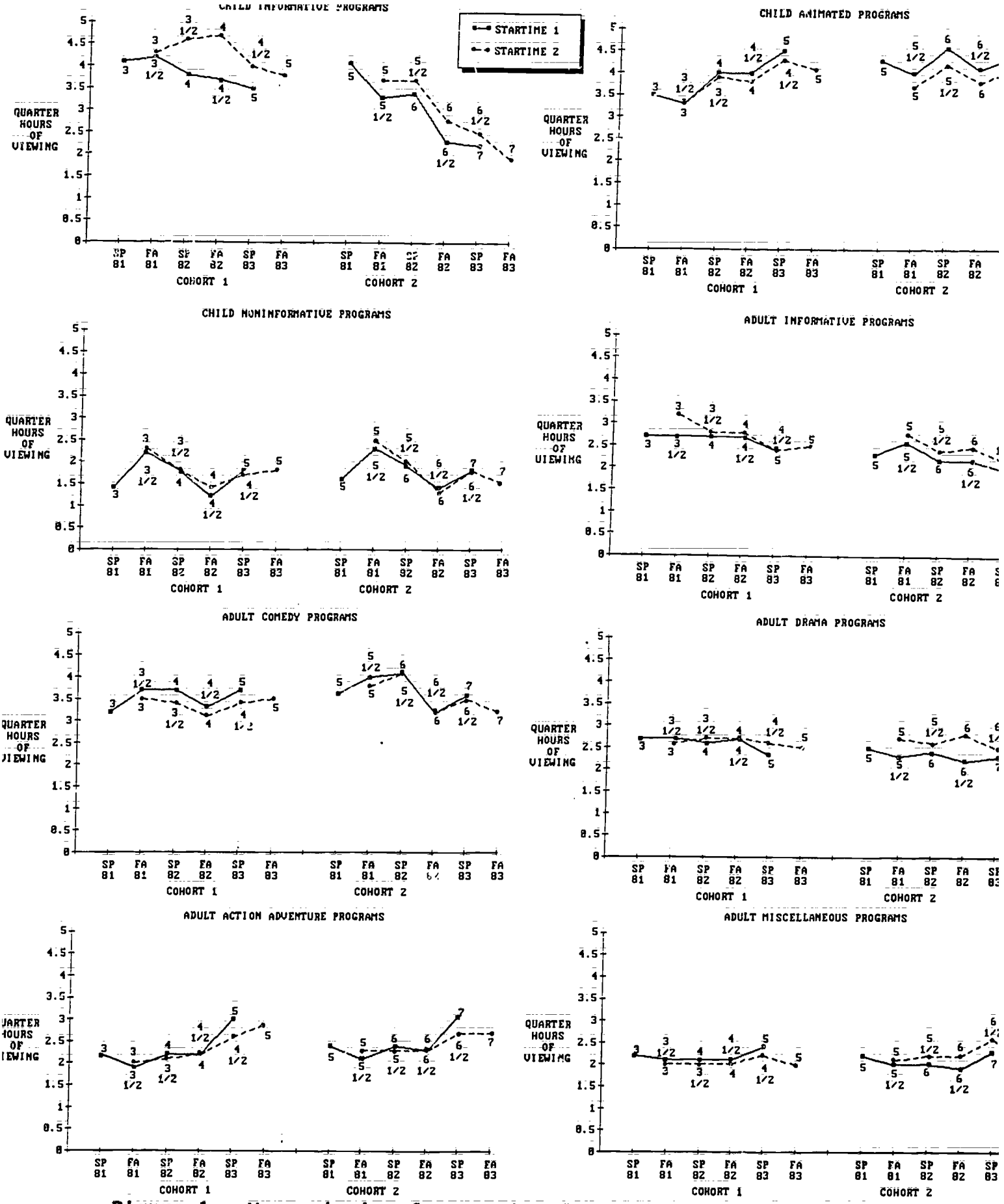

Figure 1. Mean viewing frequencies for each age level and time of measurement for eight categories of child and general audience programs. (SP = Spring measurement; FA = Fall measurement; Field points = Age of child)

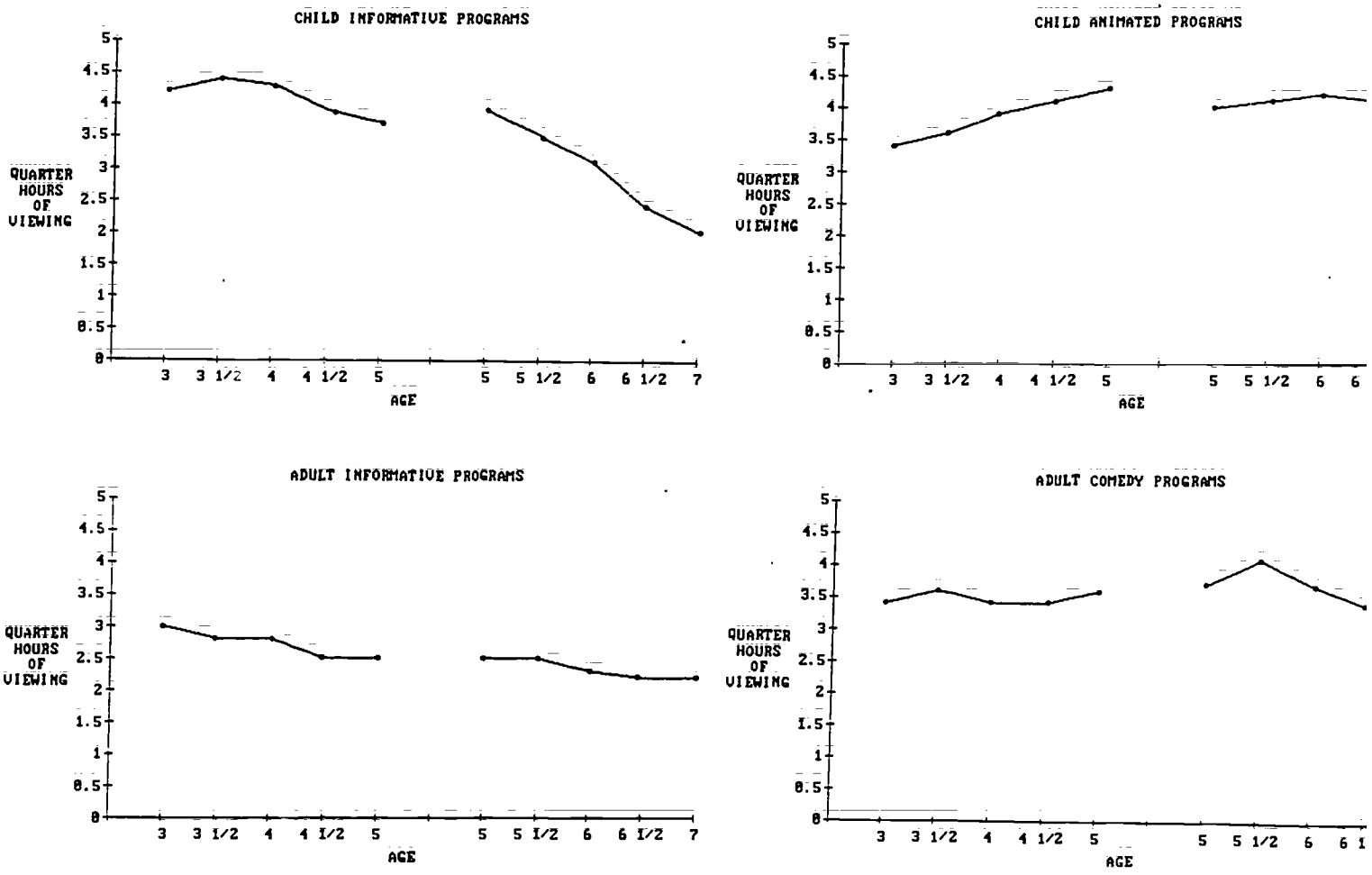

Figure 2. Mean viewing frequencies at each age level for child informative, child animated, general audience informative, and general audience comedy.

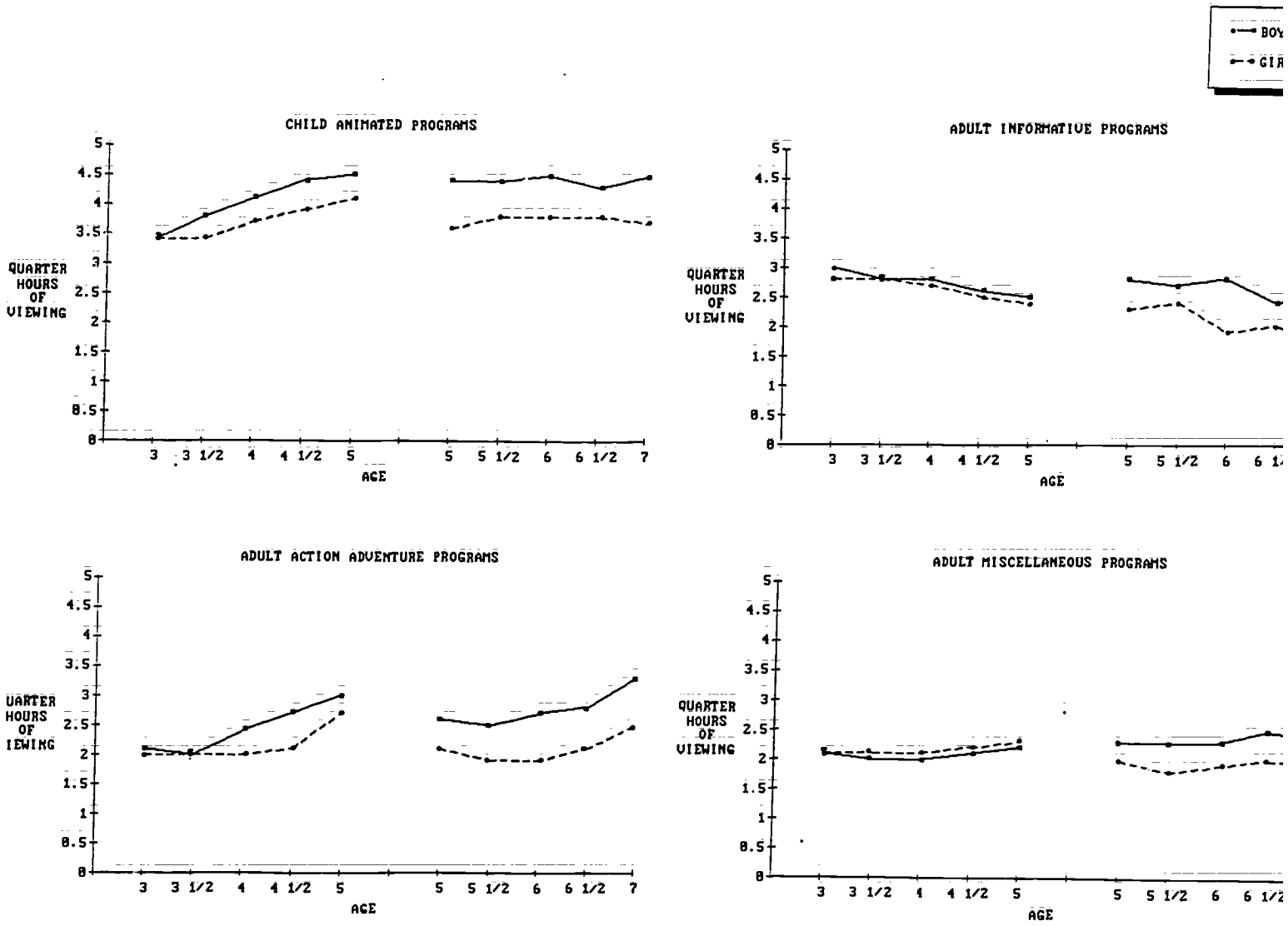

Figure 3. Mean viewing frequencies for boys and girls at each age for child animated, general audience informative, action adventure, and miscellaneous.

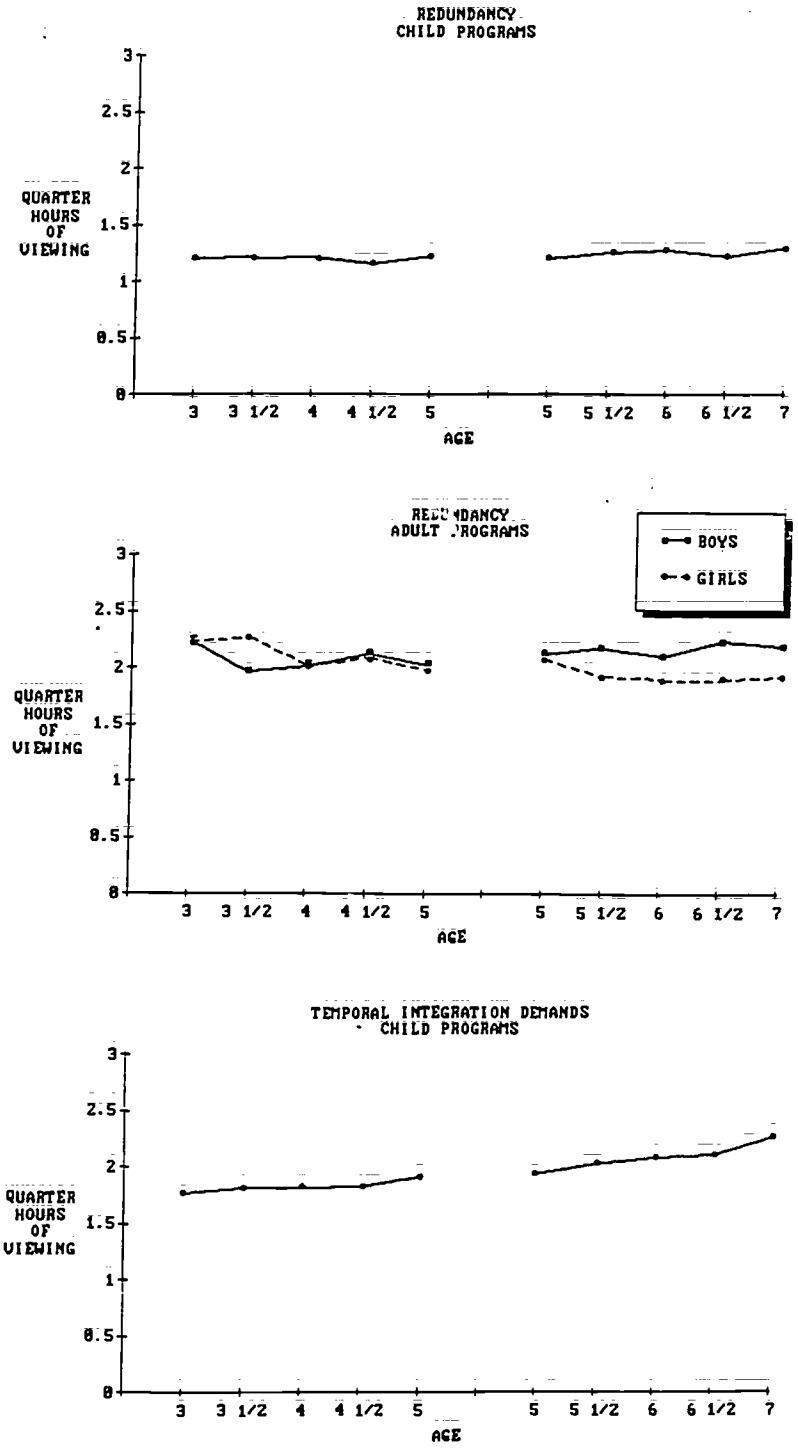

Figure 4. Average levels of redundancy and temporal integration demands in programs at different age levels.