

Are Computer, Video and Arcade Games Affecting Children's Behavior? An Empirical Study

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Overview

STUDY 1: A sample of 914 young people, aged 10 through 25 was surveyed in Southern California. The survey form consisted of four major sections:

1. Survey of Technology Used for Entertainment which asked about the use of 8 technologies – television, computer games, computer games attached to a television, handheld computer games, the World Wide Web, electronic mail, telephone and music. Each was answered on two scales of frequency of daily use: a four-point scale (never, rarely, occasionally and frequently) and a five-point scale (0 hours per day, 1 hour per day, 2 hours per day, 3-4 hours per day and 5 or more hours per day).
2. A demographic survey which asked age, gender, parental living situation (mother and father, mother only, father only, on own, other), number of younger and older siblings and feelings about technology.
3. Attitude about Using Technology survey included 18 items selected from the Personal TechnoStress Inventory (PTSI) covering appropriate issues for young people discussed in *TechnoStress* (Weil & Rosen, 1997).
4. Misbehavior was measured with the ADHD Rating Scale (DuPaul, 1991) which included 14 items that assessed the DSM-III-R symptoms for Attention Deficit Hyperactivity Disorder (American Psychiatric Association, 1987). Each item was rated on a four-point scale (not at all, just a little, pretty much and very much) by “*someone who knows the subject of this study*” with an additional item that asked the relationship of the person answering the ADHD Rating Scale to the subject of the study.

STUDY 2: A sample of 682 young people, aged 7 through 17 was surveyed in Southern California. The survey form included:

1. Demographic data including sex, age, grade level, and ethnic background.
2. Computer/Video game experience including age when first used a computer, computer in the home, who in the family uses home computer, hours per week playing computer and handheld video games, favorite computer and handheld video games, plus ratings of enjoyment of 12 activities, some computer-related and some not.
3. A computer attitudes scale for young people (adapted from Brosnan, 1998).

Sample Demographics

STUDY 1

The sample consisted of 914 young residents of Southern California. Ninety-two upper division students at a local state university recruited 10 young residents each, 5 male and 5 female, living in their local neighborhood. Given that the student population has been seen to represent the local Southern California area in other studies, there is strong reason to assume that we have collected data on a cross-section of this area. For reasons of anonymity for the portion of the sample under 18, it was decided not to ask any items about ethnic background. It is, however, assumed from previous studies of the same area that the population is multi-ethnic in its makeup.

The sample reflected nearly equal numbers of male (n=452) and female (n=454) subjects (eight subjects neglected to indicate gender) and a mean age of nearly 18 years (17.91). The majority (56%) lived with both mother and father in the home, while 17% lived with the mother only, 4% lived with their father only and 14% lived on their own. An additional 9% had some other living arrangement.

Instructions indicated that the ADHD Rating Scale was to be completed by “*someone who knows the subject of this study.*” Overall, these responses were collapsed into two groupings: close relative (parent or spouse) and friend (roommate, friend and other). In all, 35% of the ADHD Rating Scales were completed by close relatives and the remainder by friends.

STUDY 2

The sample included 682 young residents of the Southern California area. Seventy-five upper division students at the same university as in Study 1 recruited 10 young residents each, 5 male and 5 female, living in their neighborhood. The sample reflected equal percentages of males and females with a mean age of 13.46. Ages were further divided into ages 7-9 (n=68), ages 10-12 (n=194) and ages 13-17 (420). Ethnic backgrounds included Black/African American (25%), Asian-American (16%), Caucasian (20%), Hispanic (28%) and Other, Don't Know or missing (11%).

Results -- Study 1

What Entertainment Technologies do Young People Use?

Each young person was asked to rate his/her use of entertainment technologies on two separate scales. Based on a high correlation between these items from the two scales, it was decided to keep just the scale which indicated the number of hours per day each technology was used. These items were subjected to a Factor Analysis which indicated that young people used three separate categories of entertainment technology:

1. Games – including computer games, handheld games and games attached to a television set.
2. Internet – Surfing the Internet and sending and receiving electronic mail.
3. Entertainment – playing music, watching television and talking on the telephone.

How Much Do Young People Use Entertainment Technologies Each Day?

The following table shows the hours played on a daily basis by three different age groups: Pre-Teens (10-12), teens (13-17) and young adults (18-25).

TYPE OF ENTERTAINMENT TECHNOLOGY	HOURS PER DAY		
	Pre-Teens 10 – 12 years old	Teens 13-17 years old	Young Adults 18 – 25 years old
GAMES:			
Computer Games	1	1	.5
Games Attached to an Television Set	1	1	.5
Handheld Games	1	0	.5
TOTAL HOURS PER DAY PLAYING GAMES →	3 hours per day	2 hours per day	1.5 hours per day
INTERNET:			
World Wide Web Surfing	.5	1	1
E-Mail	.5	1	1
TOTAL HOURS PER DAY USING THE INTERNET →	1 hour per day	2 hours per day	2 hours per day
ENTERTAINMENT:			
Television	3.5	3.5	2
Music	2	3.5	3.5
Telephone	1	2	2
TOTAL HOURS PER DAY USING TECHNOLOGY FOR ENTERTAINMENT →	6.5 hours per day	9 hours per day	7.5 hours per day
TOTAL HOURS PER DAY USING ALL ABOVE TECHNOLOGIES* →	10.5 hours per day	13 hours per day	11 hours per day

*NOTE: These technologies are not independent and may be used simultaneously.

Several findings are evident from the table above.

1. Pre-Teens are playing computer games more than Teens or Young Adults.
2. Teens and Young adults are using the Internet more than Pre-Teens.
3. All groups are using entertainment technologies, with the Teens using them more.
4. Television and music are the most popular entertainment technologies occupying a staggering 7 hours per day for Teens and 5.5 for both Pre-Teens and Young Adults.
5. Teens are using a variety of technologies to occupy 13 hours of their day while the other two groups are using these technologies for 10.5 to 11 hours per day.

Given that both groups must sleep and that Pre-Teens and Teens must go to school, it is amazing that so much of their day is occupied with technology. It must be noted, however, that many of the subjects are engaging in multiple activities at the same time so the actual total time is not the sum of the three activity times.

Who Uses Technology More or Less?

The following indicates the statistically significant differences when boys and girls in the three different age groups were compared:

- For PLAYING GAMES:
 - Boys played more games than girls in each age level group.
- For INTERNET USE:
 - Boys and girls surfed the same amount in each age level group.
- For ENTERTAINMENT TECHNOLOGY:
 - Girls used them more than boys in each age level group

How Do Young People Feel About Technology?

An item on the Demographic survey asked how the young people felt about new technology. This item is the same as one used in Rosen and Weil's [49-Month Study of Business Attitudes Toward Technology](#). The survey item generates a categorization of the subject as either an *Eager Adopter*, *Hesitant "Prove It,"* or *Resister* as described in the business study referred to above. Results indicated that there was no difference between age groups on attitudes toward technology, but the chart below shows the differences in attitude toward technology between males and females. Girls tended to be Hesitant "Prove Its" while boys were equally split between Eager Adopters and Hesitant "Prove Its." These results were the same for each age group.

GENDER	Eager Adopters	Hesitant “Prove Its”	Resisters
Male	43%	49%	8%
Female	19%	69%	11%

How Do Technology Use and Attitude Toward Technology Relate to Behavior?

The Attitude about Using Technology survey yielded a reasonable reliability index (Cronbach's alpha = .71) as did the Misbehavior Scale (alpha = .93). A correlation was then computed between these two scales and games, Internet and Entertainment use with the following results:

BOYS AND GIRLS	Playing Games	Surfing the Internet	Using Entertainment Technologies
Misbehavior			
<i>ALL BOYS AND GIRLS:</i>	.27***	.08*	.09**
Boys 10-12	.23*	ns	.20*
Boys 13-17	.14*	-.16*	ns
Young Men 18-25	.16*	ns	ns
Girls 10-12	ns	ns	ns
Girls 13-17	.25**	ns	.27**
Young Women 18-25	.14*	ns	ns
Attitudes Toward Technology			
<i>ALL BOYS AND GIRLS:</i>	-.15***	-.10***	.09**
Boys 10-12	ns	-.17*	ns
Boys 13-17	ns	ns	.21**
Young Men 18-25	ns	-.15**	.13*
Girls 10-12	ns	ns	ns
Girls 13-17	ns	-.17*	ns
Young Women 18-25	-.16**	-.14*	ns
*p<.05, **p<.01, ***p<.001			

The table above clearly shows that:

- More computer and video game playing is related to more misbehavior for all groups but the Pre-Teen girls.
- More use of the Internet is related to DECREASED misbehavior for Teen boys.
- More use of entertainment technologies is related to increased misbehavior in Pre-Teen boys and Teen girls.
- More game playing is related to more positive attitudes for Pre-Teen women only.
- More use of the Internet is related to BETTER attitudes toward technology for four of the six groups (all except Teen boys and Pre-Teen girls).
- More use of entertainment technologies is related to more negative attitudes for Teen boys and Pre-Teen men.

The survey for Study 1 also asked about the relationship between the person completing the form and the subject. These were divided into close relatives (father, mother, spouse) and all others (friend, roommate, other). When the correlations for the close relatives are computed, the data in the top half of the table above becomes even more striking as seen below:

BOYS AND GIRLS	Playing Games	Surfing the Internet	Using Entertainment Technologies
Misbehavior			
<i>ALL BOYS AND GIRLS:</i>	.31***	ns	.18***
Boys 10-12	.24*	-.29*	.26*
Boys 13-17	ns	ns	ns
Young Men 18-25	ns	ns	ns
Girls 10-12	.32*	ns	ns
Girls 13-17	.28*	ns	.37**
Young Women 18-25	.40***	ns	ns
*p<.05, **p<.01, ***p<.001			

According to the table above, when you only examine the misbehavior ratings completed by someone close to the subject, the following striking results emerge:

- More computer and video game playing is related to more misbehavior by only the Pre-Teen boys and all the girls and Young Adult women.
- More Internet use is related to less misbehavior for Pre-Teen boys only.
- More entertainment technology use is related to more misbehavior for Pre-Teen boys and Teen girls.

What Best Predicts Misbehavior?

We have established the role of several variables in relationship to misbehavior. In this section we examine which of these is/are most important in predicting misbehavior. A Hierarchical Multiple Regression was performed with age, gender, attitudes toward computers, and relationship to subject entered first. Next, playing games, surfing the Internet and using entertainment technologies were entered to determine if any of them could add a significant predictability.

Results indicated that each of these 7 variables did indeed predict who would misbehave more. However, more telling, when the games, Internet and entertainment technologies were added last, they each added a unique, statistically significant prediction of misbehavior. Overall, the beta weights are listed in the table below. Beta weights show the relative predictability of each variable and as seen, age is the top predictor of misbehavior, followed by game playing and attitudes toward technology and gender.

PREDICTOR OF MISBEHAVIOR	BETA WEIGHT
Age	-.20***
Game Playing	.16***
Attitudes Toward Technology	.15***
Gender	-.13***
Relationship to Subject	.08*
Using Entertainment Technologies	.08*
Surfing the Internet	.07*
*p<.05, **p<.01, ***p<.001	

Results -- Study 2

What Computer and Video Games Do Children Play?

Among many variables, this study investigated several indices of computer and video game playing among boys and girls ages 7 to 17. One question asked the subject to identify his or her favorite computer game (played at a computer that has a keyboard) and favorite video game (including handheld games, games attached to television sets or arcade games). The list of the most popular favorite games can be found in the table below:

FAVORITE GAMES	
COMPUTER GAMES	VIDEO GAMES
Solitaire and card games (n=106)	Super Mario (n=67)
Math Blaster (n=19)	Tony Hawk (n=39)
Starcraft (n=17)	Pokemon (n=28)
Sims (n=14)	World Wrestling Federation (n=23)
Quake (n=13)	NFL Football (n=23)
Tetris (n=13)	Mario Racers (n=14)
Pinball (n=12)	Crash Bandicoot (n=14)
Diablo (n=11)	Mortal Kombat (n=14)
Doom (n=10)	Street Fighter (n=13)
PacMan (n=8)	James Bond (n=13)
Carmen San Diego (n=8)	Tetris (n=13)
Roller Coaster Tycoon (n=8)	Pac Man, Sonic Hedgehog and Marvel vs. (all n=13)

The Video Game Rating Act of 1994 established a commission to provide a rating system for video and computer games unless the game industry established a voluntary system with one year. Since that time, two ratings systems have been established. The [Entertainment Software Rating Board](#) (ESRB) produced a system in which game products are evaluated by independent raters. A rater can assign one of five categories:

1. Early Childhood -- for ages 3 and over. Contains no violence and child must be able to read some words, use game controls and have strong thinking skills.
2. Everyone (formerly called Kids to Adults) -- for ages 6 and over. May contain scenes of mild animated violence or realistic violence, some comic mischief or some crude language.
3. Teens -- for ages 13 and over. Contains more animated or realistic violence than kids' videos. May have strong language and/or suggestive themes.
4. Mature -- for age 17 and older. May contain everything in the Teen category, plus realistic blood and gore, strong four-letter language, use of drugs and sexual innuendoes.
5. Adults Only -- 18 and older. Contains graphic sex and/or violence, in addition to everything in the Mature category.

A second rating system has been created by the [Recreational Software Advisory Council](#) (RSAC), a nonprofit organization, which rated each product on a 0 (lowest) to 4 (highest) in three areas: (1) violence, (2) nudity/sex, and (3) language.

Since the ratings done by the ESRB are indexed by age, it seemed more appropriate to categorize computer and video games by that system. Overall, 64% of the subjects listed a computer game as their favorite and 72% listed a favorite video game. The tables below show the breakdown across all age groups and then within each age group for computer games (first table) and video games (second table). Note that the age breakdown is 7-12 and 13-16 (not 17 as in Study 1) since these fit the ESRB ratings system and that the squares marked with red indicate children listing their favorite game as one that is not appropriate for their ages.

AGE GROUP	ESRB RATINGS OF COMPUTER GAMES		
	EVERYONE (6 and older)	TEEN (13 and older)	MATURE (17 and older)
ALL SUBJECTS	73%	14%	13%
BOYS 7-12	71%	14%	14%
BOYS 13-16	43%	31%	26%
GIRLS 7-12	96%	3%	1%
GIRLS 13-16	86%	12%	2%
AGE GROUP	ESRB RATINGS OF VIDEO GAMES		
	EVERYONE (6 and older)	TEEN (13 and older)	MATURE (17 and older)
ALL SUBJECTS	60%	31%	9%
BOYS 7-12	59%	30%	12%
BOYS 13-16	47%	43%	10%
GIRLS 7-12	86%	12%	2%
GIRLS 13-16	59%	30%	11%

Noting the boxes in red, results indicate that:

- 28% of Pre-Teen boys' favorite computer games and 42% of their favorite video games are inappropriate for their ages.
- Only 4% of Pre-Teen girl's favorite computer games and 14% of their favorite video games are inappropriate for their ages.
- 26% of Teen boys' favorite video games are for Mature audiences! This compares to only 2% of young girls.

- 10% and 11% of Teen boys and girls, respectively, use mature theme video games as their favorites.

Overall, it is apparent that, particularly boys, and more specifically young boys, are playing computer and video games that are age inappropriate.

What Activities Do Young Boys and Girls Enjoy?

A 12-question survey asked these young children and teenagers to rate various activities on a "fun" scale from 0 (no fun at all) to 100 (the most fun possible). The table below shows the data for all subjects and then lists the TOP 5 for each gender and age group.

ALL SUBJECTS	TOP 5 CHOICES			
	YOUNG BOYS	TEEN BOYS	YOUNG GIRLS	TEEN GIRLS
Watching Television	Playing Video Games	Playing Sports	Playing Video Games	Talking on the Telephone
Playing Video Games	Playing Sports	Playing Video Games	Reading a Book	Watching Television
Playing Sports	Watching Television	Watching Television	Watching Television	Reading a Book
Talking on the Telephone	Playing Computer Games	Surfing the Internet	Talking on the Telephone	Surfing the Internet
Surfing the Internet	Surfing the Internet	Talking on the Telephone	Playing Sports	Sending/Receiving E-Mail

The table above clearly indicates that:

- Boys enjoy more solitary activities than girls at all ages.
- Both young boys and girls have the most fun playing video games.
- Teenage boys prefer sports and then video games as compared to teenage girls who prefer talking on the phone and watching television.

Who Starts Using Computers at a Younger Age?

One item on the questionnaire for this study asked at what age the subject first used a computer. A two-way Analysis of Variance was conducted to determine whether there were any age or gender differences. Results indicated that both boys and girls had their first computer experiences at 8 years old. Further, there were no differences between boys and girls at any age group.

However, there were striking differences between age groups. 7 to 9 year olds had their first computer experience at 5.9 years of age which was not different from 10-12 year olds (6.5 years). Both these groups started using computers at a much younger age than the Teens who started at 9 years old. This is quite a difference and most likely parallels that rapid rise of computer and video games for children, teens and young adults.

Summary and Conclusions

Major conclusions can be drawn from the following areas in this study:

1. **TECHNOLOGY IS USED FOR ENTERTAINMENT AT STAGGERING DAILY AMOUNTS**
 - GAMES: Pre-Teens play computer and video games 3 hours per day, more than Teens (2 hours per day) and Young Adults (1 hour per day).
 - INTERNET: Teens and Young Adults use the Internet 2 hours per day, more than Pre-Teens who use it an hour a day.
 - ENTERTAINMENT TECHNOLOGIES: Television, telephone and music are consumed by all groups with Teens (9.5 perhaps overlapping hours per day) showing more use than Young Adults (7.5) who in turn use them more than Pre-Teens (6.5).
2. **AT ALL AGE LEVELS BOYS AND GIRLS SHOW SIMILARITIES AND DIFFERENCES IN THEIR PATTERNS OF TECHNOLOGY USE.**
 - GAMES: Boys play them more than girls.
 - SURFING THE INTERNET: Boys and girls surf the same amount.
 - TELEVISION, MUSIC, TELEPHONE: Girls use these technologies more than boys.
 - Pre-Teens are introduced to the computer 2.5 years earlier than Teens.
3. **GAME PLAYING, INTERNET USE AND ENTERTAINMENT TECHNOLOGY USE IS RELATED TO MISBEHAVIOR.**
 - More game playing is related to more misbehavior.
 - Increased Internet surfing is related to decreased misbehavior, perhaps from more research-based uses of the Internet, rather than game playing.
 - Increased use of entertainment technologies (television, telephone, music) is related to more misbehavior, particularly in Pre-Teen boys and Teen girls.
4. **BOYS ARE PLAYING GAMES THAT ARE INAPPROPRIATE FOR THEIR AGES.**
 - COMPUTER GAMES: One in four Pre-Teen boys favorite computer game are rated for Teen or Mature (17+) audiences. One in four Teen boys favorite computer game is for Mature audiences.
 - VIDEO GAMES: 42% of Pre-Teen boys' favorite video games are rated as Teen or Mature audiences. 10% of Teen boys' favorite video games are rated for Mature audiences.

5. **THE BEST PREDICTORS OF MISBEHAVIOR INCLUDE AGE AND GENDER BUT ALSO GAME PLAYING AND ATTITUDES TOWARD TECHNOLOGY.**
6. **CHILDREN ARE BEING EXPOSED TO COMPUTER AND VIDEO GAMES AT A MUCH YOUNGER AGE THAN THEIR OLDER BROTHERS AND SISTERS.**

Overall, this study supported the common notion that children, teens and young adults are using technology for entertainment. Several controversial findings emerged.

Increased computer and video game playing was related to increased misbehavior. Why do young people, who appear to be able to "attend" for hours in front of a video game, find it so difficult to attend in class? The simple answer lies in the environment. A video game or computer game is fast-paced, interactive and enticing. Kids are literally drawn in to the environment and then captured by its "holding power" (Turkle, 1984). In fact, we adults suffer from the same problem. How often do we say to our loved one, "I'll just be a minute, I've got to check my e-mail (or stocks, or the Internet, or whatever draws us to the computer) only to have hours pass by until we resurface?

For children, this "holding power" is so positive that they find the school environment has what we refer to as "disengaging power." School, with its focus on group and individual paper-and-pencil activities is clearly less enticing than the video game environment that the child plays many hours per day. Thus, the child removes him/herself from the task through a process called disengaging. Literally, the child seeks a different environment, one that more nearly approximates the richness of their computer game world. For many, that world exists inside the mind. For others, there is no such world available during school time so one of frenetic activity is created instead.

This study has also given us a hint about what environment might be used in the school to avoid having the child disengage. Since Internet and World Wide Web use was related to increased good behavior, we might assume that an environment, patterned after web pages, would help entice children and keep them interested. With increased use of animation and interactive web participation, children could just as easily be drawn into a web-like environment as they are into a computer game and many behavioral problems