



The Impact of Video Games on Children and Youth

In 2002, video games* will turn 30 years old. *Pong*, the first commercially available video game, was released in 1972. In *Pong*, two players tried to “hit” an electronic “ball” back and forth. From these humble beginnings, a revolution in the entertainment industry was born.

Now video games seem to be in nearly every home in America. Interactive game revenues—at \$20 billion annually (Cohen 2000)—are now as great as those of the retail software industry, and significantly greater than those of the domestic film industry (“Industrial Strengths: New vs. Old Economy Earnings” 2000). Given this pervasiveness, educators are faced with many challenges connected with video games. Although they have little control over what games students play outside of the classroom, teachers and administrators typically deal with the effects of those games in their schools.

In this *Informed Educator*, authors Douglas A. Gentile, Ph.D., and David A. Walsh, Ph.D., describe what is known about the effects of video games on children. The purpose of this discussion is to help education leaders increase their own awareness, as well as that of teachers and parents in their schools, of both the positive and negative effects video games can have. The authors also provide recommendations for ways that educators can take action to mitigate the potential harm these games may do to our children’s academic achievement, as well as to their social and emotional development.

Prevalence of Video Games

The advances in the power of the technology in recent years are remarkable. In a little over two years, video game consoles have gone from processing 350,000 polygons per second—a measure of graphic quality—to 125 million polygons per second. These advances in technology have resulted in high-quality graphics and increased game speed and complexity, allowing the games to be much more realistic and engaging.

The increasingly realistic and exciting nature of video games has helped to make them enormously popular. In fact, video and computer games are probably the fastest-growing form of media used by children. The average American child between ages two and 17 plays video games for seven hours a week. Children ages seven to 17 play for an average of eight hours a week (Gentile and Walsh under review).

On average, boys play significantly more than girls. Buchman and Funk (1996) reported that fourth- through eighth-grade boys played video games for an average of five to 10 hours a week, while girls played for three to six hours a week. However, these numbers are likely to be low estimates by today’s standards. Among eighth- and ninth-grade students studied in 2000, boys reported playing an average of 13 hours per week, with girls playing an average of five hours per week (Gentile et al. under review).

Unfortunately, there is a wide “knowledge gap” between children and adults about the extent and nature of video games. Many parents and teachers today either grew up without

*For the purposes of this discussion, the term “video games” means commercially available game software that is played on computers or on video game consoles such as PlayStation,™ rather than educational software.

playing video games, or remember *Pac-Man* as the cutting edge of technology.

In particular, most parents are unaware of a significant and popular group of ultra-violent games. In one popular game series, *Duke Nukem*, players advance not only by killing, but by committing ever more heinous acts of violence and sadism, including sexual violence. A study of over 500 parents found that 95 percent had never even heard of *Duke Nukem*, yet a survey of junior high school students revealed that more than 80 percent were familiar with the game, and many had played it (Walsh 1998).

Parental unfamiliarity with this style of video game makes it easy for children of almost any age to play them, even though the video game industry itself rates them as “not appropriate for children.” Furthermore, most stores (even those with explicit policies to the contrary) allow young children to purchase M-rated (“Mature”) games like *Duke Nukem* (Walsh 2000).

Because of the increasing attraction of video game technology, the increasing amount of time children spend with video games, and the violent nature of some of the most popular of these games, it is important to consider what the effects of video game play may be. To be sure, not all of these effects are negative—there are video games that are benign, and some are actually beneficial for children. Let’s first consider the potential benefits of this phenomenon.

Positive Effects of Video Games on Children

For many children, video games are an introduction to computer technology. Playing games may help foster a comfort level with computers, computer interfaces, and input/output devices. It is not unusual for children as young as three to have had some limited experience playing computer games and thus learn terms such as “point” and “click” and how to manipulate the keyboard and mouse.

Beyond basic familiarity with technology, some have argued that video games are the “training wheels” for computer literacy (e.g., Subrahmanyam et al. 2000). Research and experience show clearly that computer literacy includes skills beyond traditional literacy skills; chief among them is iconic skill (image representation and manipulation). Since many computer games require similar skills to those measured in nonverbal intelligence tests, there is some

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research to suggest that we can learn iconic, spatial, and visual attention skills from video games.

One study to determine participants’ relative ability to keep track of several different things on a computer screen at the same time (a skill similar to those needed by flight controllers) concluded that expert video game players were better at maintaining divided visual attention than novices. In a second study, after five hours of playing a video game, all participants showed increased response speed in the visual attention task, regardless of previous experience, thus demonstrating a causal relationship between video game play and visual attention skills (Greenfield et al. 1994). Video games can also provide opportunities for practice in following directions and in the use of fine motor skills.

These are the up-sides of video games. The down-side is more difficult to verify at this time because the research evidence is just now being organized. Parents, educators, and policy makers have voiced a number of concerns about video games during the past decade. It might be that it has taken the rash of school shootings in the late 1990s to bring the research on violent video games into the public arena.

Negative Effects of Video Games on Children

Partly because video games are a new technology, and partly because they change so quickly, much less research has been conducted on the specific negative effects of video games than has been conducted on the effects of television. Nevertheless, the research base is growing. Thus far, there is little evidence that moderate video game playing has any significant negative effects. Yet, there *are* reasons for concern over excessive use. These concerns have been raised in three broad areas: physical health, cognitive skills, and social/emotional well-being.

Potential Positive and Negative Effects of Video Games: Summary

Positive Effects

- Video game playing introduces children to technology.
- Games can give practice in following directions.
- Some games provide practice in problem solving and logic.
- Games can provide practice in the use of fine motor skills.
- Games can provide practice in visual intelligence skills, such as iconic representation, spatial skills, and visual attention skills.
- Games can provide occasions for adults and children to play together.
- Games are entertaining.
- Some games encourage strategic thinking.

Negative Effects

- Excessive game playing is linked to increased risk of childhood obesity, epileptic seizures, muscular and skeletal disorders, and poor postural habits.
- Higher rates of game playing have been linked to lower grades in school.
- Children who spend excessive amounts of time playing games have less time left for other activities, including homework.
- Exposure to violent video games may increase aggressive thoughts, emotions, and actions.
- Exposure to violent games may decrease positive prosocial (helping) actions.

Effects on Physical Health

While there has not been a systematic attempt to document the effects of extended video game play on children's physical health, studies suggest that extended video and computer game play may put children at increased risk for obesity, seizures, repetitive stress injuries, and eyestrain.

The amount of time American children spend engaged in sedentary activities, such as watching television and playing video games, is considered by many researchers to be an important environmental factor for childhood obesity. Obesity has been called the most common health problem facing children today (Strauss and Knight 1999), and its incidence has been increasing, especially since the 1980s (Slyper 1998).

The "average" American child spends over six hours a day in front of a screen of some kind, be it a television, movie, video game, or computer screen (Roberts et al. 1999). To the degree that research about television viewing can be extrapolated, a number of studies reveal that the risk for obesity increases two percent for every additional hour children spend seated in front of a TV screen each day (Gable and Lutz 2000; Jeffrey and French 1998; Dietz and Gortmaker 1985).

Beyond the risk of obesity, a number of studies have documented that playing video games may trigger epileptic seizures in some children (Kasteleijn-Nolst Trenite et al. 1999; Badinand-Hubert et al. 1998). Ricci and Vigevano (1999) studied 12 different commercially available games and found that these games differed significantly in their likelihood of activating seizures. It is generally believed that rapidly flashing images activate the seizures (Ricci et al. 1998).

As we all have been learning recently, too much time working on computers can lead to a variety of health hazards, such as eyestrain, increased myopia, and muscular and skeletal problems. While most of the clinical information about these disorders refers to adults, it is reasonable to expect that heavy game players could suffer from these problems at any age. Visual strain is the number one complaint of frequent computer users (Atencio 1996; Eichenbaum 1996). Dr. Jeffrey Anshel of Corporate Vision Consulting summed it up thus: "We are increasingly becoming an information society, and the price we are paying is our eyesight" (Healy 1998).

Carpal tunnel syndrome is almost a household word these days, yet there are a wide variety of

muscular and skeletal disorders associated with heavy computer—and video game—use, including tendinitis and nerve compression. The causes for these types of disorders vary from posture at the computer to the repetitive nature of movements used with input devices (such as keyboards, mice, and joysticks). Most of the information on these types of disorders has been collected on adults. However, certain conditions have been documented in pediatric populations. In March 2000, Nintendo of America, a major video game manufacturer, acknowledged the problem by agreeing to provide protective gloves to approximately 1.2 million children because of numerous reports of hand injuries caused by the control stick of a particular game (Lemos 2000; SafetyAlerts 2000). Excessive video game playing has also led to documented cases of a form of tendinitis dubbed “Nintendinitis,” caused by repeatedly pressing buttons with the thumb during game play (Brasington 1990).

Many physicians are also concerned about postural habits while playing video games. Improper posture can lead to a number of problems in adults, including neck and back problems, headaches, muscle cramps, and irritability (Healy 1998). Little is known about whether children suffer from similar postural problems, but it is likely. It may be important to begin teaching proper posture when seated in front of the computer or video game at an early age.

Although education leaders should be concerned about these negative effects on children’s physical health, there are educational and social aspects of video game influence that we need to keep front and center. Educators deal with these influences directly at least six hours a day, and many can have dire consequences for students’ academic potential. More alarmingly, negative influences coming from excessive video game play may be contributing to the growing culture of disrespect, antisocial behavior, and even violence that is invading many schools.

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Effects on Cognitive Skills

A growing number of studies are finding a negative correlation between amount of time spent playing video games and school performance. Some early

studies (e.g., Creasy and Myers 1986; Lin and Lepper 1987) showed an inconsistent relationship between video game play and grades. More recently, however—partly because of changes in video games since the mid-80s—a preponderance of studies are showing a fairly consistent negative correlation between recreational video game play and school performance. For example, Gentile et al. (under review) found that for eighth-grade and ninth-grade students, lower grades were associated with both more years of video game play and more hours played each week.

Harris and Williams (1985) showed that high school students who reported playing more each week and those who reported spending more money on games received lower grades in English classes. Others (Anderson and Dill 2000; Paschke, Green, and Gentile 2001) have documented a similar relationship between amount of play and grades for college students.

While there does appear to be a negative effect of heavy video game play, this effect does not generalize to children’s computer use for different goals.

Some researchers have studied differential uses of computer and video game technologies and how these influence school performance. For example, Lieberman, Chaffee, and Roberts (1988) contrasted different types of computer users among middle-school children. Two of the types they defined highlight their findings: *recreational users* and *intellectual users*. *Recreational users* used computers to play video games frequently; they were also the heavy television viewers and performed most poorly in school. *Intellectual users* used computers for writing computer programs and for schoolwork; they were the lightest television viewers and performed best in school. Thus, while there does appear to be a negative effect of heavy video game play, this effect does not generalize to children’s computer use for different goals.

One thought-provoking theory as to why heavy video game use correlates with poor school performance has been called the *displacement hypothesis*—electronic media are hypothesized to influence both learning and social behavior by taking the place of activities such as reading, family interaction, and social play with peers (Huston et al. 1992). Simply put, whatever time children spend on electronic entertain-

ment media is not being spent on other educational and social activities. In our sample of eighth-grade and ninth-grade students, the *average* boy plays video games for 13 hours (or a little more than a half a day) a week. That is 13 hours each week that he is not engaged in homework, reading, or participating in other activities. One out of five boys plays at least 19 hours (or about three-quarters of a day) a week. And one in ten plays for at least 27 hours a week—more than a full day! It is likely that students who play this much put themselves at greater risk for school failure because they are not using this time to do school work.

However, we must stress that the majority of research about video game impact on school performance is correlational, and causality cannot necessarily be inferred. It is also likely that students who have problems in school will be less inclined to do homework, and will be more inclined to spend time participating in something they feel they can excel at. Thus, poor school performance could be a cause of heavy video game use, rather than the other way around.

Effects on Social and Emotional Well-Being

In this area of impact, we can learn from research on television effects, which has shown that both the *amount* of TV watched and the *content* of the shows can have substantial effects on children. Regarding amount, research has shown that heavy TV viewers expend less effort at schoolwork, play less well with friends, and have fewer hobbies and activities than light viewers (Huston et al. 1992). Content also has effects independent of the amount of exposure. For example, television programs high in violence have been shown to increase aggression and fear. They desensitize young viewers to violence and increase their appetites for more violence (Donnerstein, Slaby, and Eron 1994). On the other side of the coin, educational television has been shown to teach prosocial attitudes (for example, non-racist attitudes), skills, and empathy (Calvert 1999).

While the research conducted on video games is still growing, there are at least four reasons why we should expect video games to have an even greater impact than television. These reasons are based on what we already know from both educational research and research on television's effects.

1. Identification with an aggressor increases imitation of the aggressor. It is known that children will imitate aggressive actions more readily

if they watch an aggressor that they identify with in some way. On television, it is hard to predict which, if any, characters a person will identify with. In many violent video games, however, the player is required to take the point of view of one particular character—and this character is not usually a positive role model. This is most noticeable in “first-person shooter” games, in which the players “see” the harm and destruction their character causes as if they were that character in the video game.

- 2. Active participation increases learning.** Video games by their very nature require active participation, whereas viewers tend to be more passive observers of content on television. Again, in violent video games, the “action” is harm and destruction.
- 3. Repetition increases learning.** Video games often require players to do the same thing over and over (e.g., shoot other things), and the games themselves are often played repeatedly. This increases the odds that children will learn from them. We should ask what they are learning.
- 4. Rewards increase learning.** Video games often reward players for participating. This helps educational games be more effective. But many popular video games are likely to reward children who learn aggressive, destructive behavior and attitudes. In contrast, television rarely provides a reward structure for the viewer.

Research shows a spiraling connection between video games, aggressive thoughts, aggressive emotions, aggressive actions, and antisocial activities.

Research on the effects of violent games is still in the early stages, but the results are consistent across studies and also with our expectations. We should pay attention to this research, because it does not bring good news. It shows a spiraling connection between video games, aggressive thoughts, aggressive emotions, aggressive actions, and anti-social activities.

Anderson and Bushman (2001) conducted a meta-analysis of 35 different studies of violent video games to see if these reveal similar patterns in their

findings. They identified a consistent pattern in five areas.

1. **Exposure to violent games increases physiological arousal.** Studies measuring the physiological responses to playing violent video games (compared to non-violent games) have shown that violent games increase physiological arousal. Heart rate, systolic blood pressure, and diastolic blood pressure all increase when playing violent games. Ballard and Weist (1996) showed that a violent game (*Mortal Kombat* with the blood “turned on”) resulted in higher systolic blood pressure responses than either a nonviolent game or a less graphically violent game (*Mortal Kombat* with the blood “turned off”).

Studies by Lynch (1994; 1999) have shown that the effect may be even greater for children who already show more aggressive tendencies. Students who scored in the top 20 percent on a trait hostility scale showed much greater increases in physiological response than students scoring in the bottom 20 percent of trait hostility. When playing a violent video game, more-hostile children also showed much greater responses than did low-hostile children in adrenaline, testosterone, and other physical reactions bodies have when engaged in a fight. The interaction with trait hostility is important because it suggests that the harmful effects of playing violent games may be even greater for children who are already at risk for aggressive behavior.

2. **Exposure to violent games increases aggressive thoughts.** Studies measuring cognitive responses to playing violent video games (compared to nonviolent games) have shown that violent games also increase aggressive thoughts. These findings have been found for males and females, children and adults, and in experimental and correlational studies.

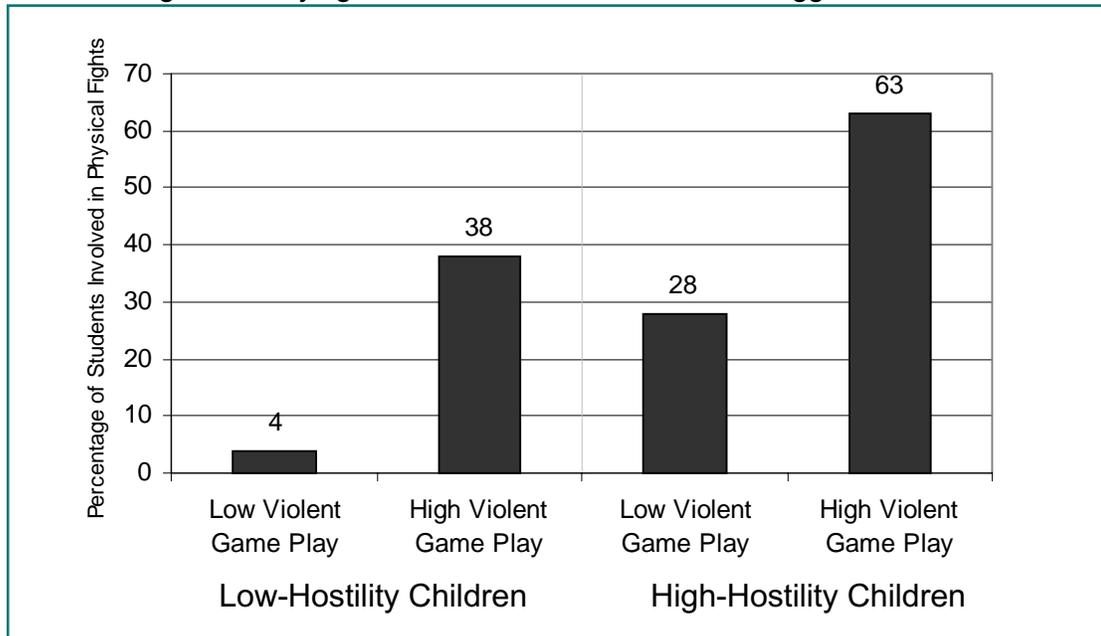
Some studies have found that exposure to violent video games increases *hostile attribution bias*, a term that describes the manner in which aggressive children perceive the actions of peers (Kirsh 1998, Gentile et al. under review). Children with this bias tend to interpret ambiguous social cues as being of hostile intent, and these children are more aggressive (Crick and Dodge 1994). Crick (1995) found a robust relationship between hostile attribution bias and various indicators of children’s social maladjustment, such as

depression, negative self-perceptions, and peer rejection.

3. **Exposure to violent games increases aggressive emotions.** Studies measuring emotional responses to playing violent video games (compared to nonviolent games) have shown that violent games increase aggressive emotions. Adolescents themselves often seem to recognize this. When asked to name the “bad things” about computer games, many students reported that they make people more moody and aggressive (Griffiths and Hunt 1998). In this study, students who were more “addicted” to video games were significantly more likely to be in a bad mood before, during, and after play than were non-addicted students.
4. **Exposure to violent games increases aggressive actions.** Studies measuring aggressive behaviors after playing violent video games (compared to nonviolent games) have shown that violent games increase aggression itself. In one study, students played either a violent or nonviolent game. After playing this game, they were given a competitive reaction time task to play against another student. If they beat the other student, they got to deliver a loud “noise blast,” and were able to control how loud and how long the noise blast would be. Students who had played the violent video game delivered longer noise blasts to their opponents (Anderson and Dill 2000).

In a study of eighth and ninth graders, students who played more violent video games were also more likely to see the world as a hostile place, get into frequent arguments with teachers, and be involved in physical fights (Gentile et al. under review). Looking at the chicken-or-egg aspect of the relationship (i.e., “violent video games are not the cause; these are naturally hostile and aggressive kids”), this study found that exposure to video game violence was a significant predictor of physical fights, even when students’ sex, hostility level, and amount of video game playing were controlled statistically. Figure 1 on the following page shows the percentages of students who reported being involved in physical fights within the previous year. Note especially that children with the lowest hostility scores were almost 10 times more likely to have been involved in physical fights if they played a lot of violent video games than if they did not play violent games (38

Figure 1. Playing Violent Video Games Increases Aggression



Source: D.A. Gentile, P.J. Lynch, D.A. Walsh, and J.R. Linder. Under review. "The Effects of Violent Video Game Habits on Adolescent Aggressive Attitudes and Behaviors."

percent compared to 4 percent). In fact, the *least* hostile children who played a lot of violent video games were *more* likely to be involved in fights than the *most* hostile children who did not play violent video games.

5. **Exposure to violent games decreases positive prosocial (i.e., helping) actions.** Studies measuring prosocial attitudes and behaviors after playing violent video games (compared to non-violent games) have shown that violent games decrease players' tendencies toward positive behaviors. For example, seventh- and eighth-grade children who spent more time playing video games were rated by their classmates as showing fewer positive social interactions than children who spent less time playing video games (Van Schie and Wiegman 1997). A study currently being conducted with third-grade children is finding similar results. Children who are exposed to more media violence (including violent video games, TV, and movies) are rated as more aggressive and less prosocial by their peers and by their teachers (National Institute on Media and the Family forthcoming).

In sum, while the research on violent video games is still emerging, the results appear to warrant concern. Children (and adults) who play more violent

In sum, children (and adults) who play more violent video games are more likely to experience aggressive feelings and thoughts, take part in aggressive actions, and be less likely to behave in positive, prosocial ways. This appears true for both boys and girls, and significantly, also for children who are not naturally aggressive.

video games are more likely to experience aggressive feelings and thoughts, take part in aggressive actions, and be less likely to behave in positive, prosocial ways. This appears to be true for both boys and girls, and significantly, also for children who are not naturally aggressive. One group of researchers concluded:

even if children with more problematic behavior are simply more likely to prefer violent games, playing such games is not likely to improve behavioral problems. These children may, in fact, be more vulnerable to adverse influence because of pre-existing behavioral problems....Recent reports linking school violence with electronic game-playing merit careful study (Funk, Buchman, and Germann 2000, 238).

What Education Leaders Can Do

The pattern of the effects that video games have on our children poses serious challenges for educators, who have to deal with the effects of violent video games in schools and classrooms. Evidence is mounting that suggests school performance and computer and video game technologies are linked—and the link can be positive or negative. The question is, “How can we minimize the negative effects and capitalize on technology’s potential benefits?”

We present five recommendations that can be implemented in schools.

1. Educate yourself and your teachers about the effects of video games (both positive and negative).

Start with the information presented in this *Informed Educator*. It should help you and your staff become better prepared to monitor student technology use in school appropriately. It also should help you better educate children about how to get the maximum benefits from technology. And it should help you educate parents.

If you have school media education/media literacy programs, you might want to evaluate them to make sure they include information about the potentially damaging effects of video games. If you do not have such a program, you might consider establishing one.

2. Educate parents about video games and the tools they have to help their children choose appropriate games.

This recommendation is vital, because research shows that parents who are informed about video games and who are involved in helping their children select games to play have children who are less aggressive and who perform better in school (Gentile et al. under review). Educators are in a unique position to be able to help parents close the knowledge gap about video games.

The ratings that are required to be on video game packages (see page 9) are one useful tool for parents. These ratings are provided by the Entertainment Software Rating Board, and can be a big help in deciding whether a game is appropriate and for which children. Other organizations also provide ratings, such as KidScore®, a parent-generated rating system (online at www.mediafamily.org/kidscore).

Research shows that most parents do not know about, understand, or use the video game ratings to

choose what games to allow their children to rent or buy (Gentile and Walsh under review). A first step would be to encourage parents to do a survey of video games that are in their own homes. As educators with a strong vested interest, we must make sure parents learn about the ratings and why it is important that they monitor video game use at home, perhaps by offering parent education programs at school. Parents also need our support when they put their foot down about violent video games. When they say “no,” we should support them, just as we expect their support.

3. Use your position as an education leader to set the cultural climate in schools and in the community.

As a community leader, you can try to convince businesses in your community not to sell or rent “M” (Mature) rated games to children under 17, and not to carry the most violent of these games at all. Try to get cooperation from civic groups and the news media, too. One avenue could be to write to editors of local papers.

You could also examine school policies, to make sure that any use of computer games or video game play as a reward for good behavior does not inadvertently encourage children’s participation in harmful video game play. Many schools have policies in place to eliminate the playing of violent video games on school grounds.

4. Be aware of the level of video game involvement of students, especially students with behavior problems.

Ten years ago, none of us would have thought this recommendation would be needed. Unfortunately, it is a different world today. We have seen too many cases where not being vigilant has led to tragic consequences.

Although the United States Secret Service has stated that there is “no accurate or useful profile of ‘the school shooter,’” there are risk factors that may be identified by students, teachers, and administrators (Vossekuil et al. 2000, 5). Disturbingly, in over half of the recent school shootings, the shooters were identified by friends as being highly involved in violent video games (Heidt 2000). Funk (in press), has argued that a preference for violent video games may be an indicator of risk for several problems, including aggression, lower self-esteem, anxiety, and depression. Combined with the research discussed earlier, which shows that heavy video game use can increase

The Entertainment Software Rating Board Video and Computer Game Rating System

The Entertainment Software Rating Board (ESRB) is an independent, nonprofit organization established to provide parents and consumers with objective information to help them make informed decisions regarding computer software. Almost every video and computer game has a rating symbol and content description on the box. The following ratings, which appear on the front of the package, indicate the age range for which the software is appropriate. In addition, content descriptors outlining the content of the game appear on the back of the package. For more information, visit the ESRB website at www.esrb.org.



Early Childhood

Titles rated “Early Childhood (EC)” have content suitable for children ages three and older and do not contain any material that parents would find inappropriate.



Everyone

Titles rated “Everyone (E)” have content suitable for persons ages six and older. These titles will appeal to people of many ages and tastes. They may contain minimal violence, some comic mischief (for example, slapstick comedy), or some crude language. Note: This designation replaced the “Kids to Adults” rating as of January 1, 1998.



Teen

Titles rated “Teen (T)” have content suitable for persons ages 13 and older. Titles in this category may contain violent content, mild or strong language, and/or suggestive themes.



Mature

Titles rated “Mature (M)” have content suitable for persons ages 17 and older. These products may include more intense violence or language than products in the Teen category. In addition, these titles may also include mature sexual themes.



Adults Only

Titles rated “Adults Only (AO)” have content suitable only for adults. These products may include graphic depictions of sex and/or violence. Adults Only products are not intended to be sold or rented to persons under the age of 18.



Rating Pending

Product has been submitted to the ESRB and is awaiting final rating.

aggression (especially in naturally hostile children), it can be a matter of life and death for teachers and administrators to pay attention to how much students talk and think about playing video games, especially violent video games.

It is our responsibility to monitor student aggression and help them keep it in check. Monitoring their involvement with video games is one way to do that.

5. Capitalize on children's fascination with video games to promote educational games.

Many children are enthralled by video games. Furthermore, there are many excellent games available that promote skills such as problem solving and cooperation. There are also many educational games that teach specific academic skills, as well as complex simulation games like *Sim City*. Teachers and parents should capitalize on children's interest in video games to promote these positive games.

Summary

The growing popularity of video games among young people has led to concerns about their possible negative effects on children's physical health, cognitive skills, and social skills. Although there is currently no evidence that *moderate* use of video games harms children, the research suggests that these concerns are valid when it comes to excessive video game use. Thus, education leaders have legitimate concerns about the prevalence of video games and the violent nature of many of the most popular games.

This presents a difficult dilemma—educators have little, if any, control over what students watch and play outside of the school. However, by increasing our own knowledge and understanding of our students' participation in video games, we can become better prepared to educate teachers and parents and to enlist their help in curbing excessive video game use and in countering its effects. The collaborative efforts of school and home are needed to guide students toward more beneficial and educational uses of computer technology.

References

- Anderson, C.A., and B.J. Bushman. 2001. "Effects of Violent Games on Aggressive Behavior, Aggressive Cognition, Aggressive Affect, Physiological Arousal, and Prosocial Behavior: A Meta-analytic Review of the Scientific Literature." *Psychological Science* Vol. 12: 353-359.
- Anderson, C.A., and K.E. Dill. 2000. "Video Games and Aggressive Thoughts, Feelings, and Behavior in the Laboratory and Life." *Journal of Personality and Social Psychology* Vol. 78: 772-790.
- Atencio, R. 1996. "Eyestrain: The Number One Complaint of Computer Users." *Computers in Libraries* (September 1996): 40-43.
- Badinand-Hubert, N., M. Bureau, E. Hirsch, P. Masnou, L. Nahum, D. Parain, and R. Naquet. 1998. "Epilepsies and Video Games: Results of a Multicentric Study." *Electroencephalography & Clinical Neurophysiology* Vol. 107: 422-427.
- M.E. Ballard and J.R. Weist. 1996. "Mortal Kombat: The Effects of Violent Video Game Play on Males' Hostility and Cardiovascular Responding." *Journal of Applied Social Psychology* Vol. 26: 717-730.
- Brasington, R. 1990. "Nintendinitis." *New England Journal of Medicine* Vol. 322: 1473-1474.
- Buchman, D.D., and J.B. Funk. 1996. "Video and Computer Games in the '90s: Children's Time Commitment and Game Preference." *Children Today* Vol. 24: 12-16.
- Buckalew, L.W., and P.B. Buckalew. 1983. "Behavioral Management of Exceptional Children Using Video Games as Reward." *Perceptual and Motor Skills* Vol. 56: 580.
- Calvert, S. 1999. *Children's Journeys through the Information Age*. Boston, MA: McGraw-Hill College.
- Cohen, A. 2000. "New Game [PlayStation 2]." *Time* (October 30, 2000): 58-60.
- Creasy, G.L., and B.J. Myers. 1986. "Video Games and Children: Effects on Leisure Activities, Schoolwork, and Peer Involvement." *Merrill-Palmer Quarterly* Vol. 32: 251-262.
- Crick, N.R. 1995. "Relational Aggression: The Role of Intent Attributions, Feelings of Distress, and Provocation Type." *Development and Psychopathology* Vol. 7: 313-322.
- Crick, N. R., and K.A. Dodge. 1994. "A Review and Reformulation of Social Information-Processing Mechanisms in Children's Social Adjustment." *Psychological Bulletin* Vol. 115: 74-101.
- Dietz, W.H., and S.L. Gortmaker. 1985. "Do We Fatten Our Children at the Television Set? Obesity and Television Viewing in Children and Adolescents." *Pediatrics* Vol. 75: 807-812.
- Donnerstein, E., R.G. Slaby, and L.D. Eron. 1994. "The Mass Media and Youth Aggression." In *Reason to Hope: A Psychological Perspective on Violence and Youth*, L. D. Eron, J. H. Gentry, and P. Schlegel, editors (pp. 219-250). Washington, DC: American Psychological Association.
- Eichenbaum, J.W. 1996. "Computers and Eyestrain." *Journal of Ophthalmic Nursing & Technology* Vol. 15: 23-26.
- Funk, J.B. In press. "Children and Violent Video Games: Strategies for Identifying High Risk Players." In *Children and the Popular Culture*, D. Ravitch and J. P. Viteritti, editors.
- Funk, J.B., D.D. Buchman, and J.N. Germann. 2000. "Preference for Violent Electronic Games, Self-Concept, and Gender Differences in Young Children." *American Journal of Orthopsychiatry* Vol. 70: 233-241.

- Gable, S., and S. Lutz. 2000. "Household, Parent, and Child Contributions to Childhood Obesity." *Family Relations* Vol. 49: 293-300.
- Gentile, D.A., P.J. Lynch, D.A. Walsh, and J.R. Linder. Under review. "The Effects of Violent Video Game Habits on Adolescent Aggressive Attitudes and Behaviors."
- Gentile, D.A., and D.A. Walsh. Under review. "A Normative Study of Family Media Habits."
- Greenfield, P.M., P. deWinstanley, H. Kilpatrick, and D. Kaye. 1994. "Action Video Games and Informal Education: Effects on Strategies for Dividing Visual Attention." *Journal of Applied Developmental Psychology* Vol. 15: 105-123.
- Griffiths, M.D., and N. Hunt. 1998. "Dependence on Computer Games by Adolescents." *Psychological Reports* Vol. 82: 475-480.
- Harris, M.B., and R. Williams. 1985. "Video Games and School Performance." *Education* Vol. 105: 306-309.
- Healy, J.M. 1998. *Failure to Connect: How Computers Affect Our Children's Minds—For Better and Worse*. New York: Simon & Schuster.
- Huston, A.C., E. Donnerstein, H. Fairchild, N.D. Feshbach, P.A. Katz, J.P. Murray, E.A. Rubinstein, B.L. Wilcox, and D.M. Zuckerman. 1992. *Big World, Small Screen: The Role of Television in American Society*. Lincoln, NE: University of Nebraska Press.
- "Industrial Strengths: New vs. Old Economy Earnings." 2000. *Wired* (November 2000): 122.
- Jeffery, R.W., and S.A. French. 1998. "Epidemic Obesity in the United States: Are Fast Foods and Television Viewing Contributing?" *American Journal of Public Health* Vol. 88, No. 2: 277-280.
- Kasteleijn-Nolst Trenite, D.G., A.M. da Silva, S. Ricci, C.D. Binnie, G. Rubboli, C.A. Tassinari, and J.P. Segers. 1999. "Video-Game Epilepsy: A European Study." *Epilepsia* Vol. 40 (Supplement 4): 70-74.
- Kirsh, S.J. 1998. "Seeing the World through Mortal Kombat-Colored Glasses: Violent Video Games and the Development of a Short-term Hostile Attribution Bias." *Childhood* Vol. 5: 177-184.
- Lemos, R. 2000. *Nintendo Issues Game Gloves*. Online: headline.gamespot.com/news/00_03/09_vg_ningloves
- Lieberman, D.A., S.H. Chaffee, and D.F. Roberts. 1988. "Computers, Mass Media, and Schooling: Functional Equivalence in Uses of New Media." *Social Science Computer Review* Vol. 6: 224-241.
- Lin, S., and M.R. Lepper. 1987. "Correlates of Children's Usage of Video Games and Computers." *Journal of Applied Social Psychology* Vol. 17: 72-93.
- Lynch, P.J. 1994. "Type A Behavior, Hostility, and Cardiovascular Function at Rest and After Playing Video Games in Teenagers." *Psychosomatic Medicine* Vol. 56: 152.
- Lynch, P.J. 1999. "Hostility, Type A Behavior, and Stress Hormones at Rest and After Playing Violent Video Games in Teenagers." *Psychosomatic Medicine* Vol. 61: 113.
- Paschke, M.B., E. Green, and D.A. Gentile. 2001. *Physiological and Psychological Effects of Video Game Play*. Poster session presented at the 36th Annual Minnesota Undergraduate Psychology Conference, St. Paul, MN, April 2001.
- Ricci, S., and F. Vigeveno. 1999. "The Effect of Video-Game Software in Video-Game Epilepsy." *Epilepsia* Vol. 40 (Supplement 4), 31-37.
- Ricci, S., F. Vigeveno, M. Manfredi, and D.G. Kasteleijn-Nolst Trenite. 1998. "Epilepsy Provoked by Television and Video Games: Safety of 100-Hz Screens." *Neurology* Vol. 50: 790-793.
- Roberts, D.F., U.G. Foehr, V.J. Rideout, and M. Brodie. 1999. *Kids & Media @ the New Millennium*. Menlo Park, CA: Kaiser Family Foundation.
- SafetyAlerts. 2000. *Hand Injuries Prompt Nintendo to Provide Protective Gloves for "Mario Party" Video Game Users*. Online: www.safetyalerts.com/t/ch/mario.htm
- Slyper, A.H. 1998. "Childhood Obesity, Adipose Tissue Distribution, and the Pediatric Practitioner." *Pediatrics* Vol. 102. Online: www.pediatrics.org/cgi/content/full/102/1/e4
- Strauss, R.S., and J. Knight. 1999. "Influence of the Home Environment on the Development of Obesity in Children." *Pediatrics* Vol. 103. Online: www.pediatrics.org/cgi/content/full/103/6/e85
- Subrahmanyam, K., R.E. Kraut, P.M. Greenfield, and E.F. Gross. 2000. "The Impact of Home Computer Use on Children's Activities and Development." *Children and Computer Technology* (Fall/Winter 2000): 123-144.
- Van Schie, E.G.M., and O. Wiegman. 1997. "Children and Videogames: Leisure Activities, Aggression, Social Integration, and School Performance." *Journal of Applied Social Psychology* Vol. 27: 1175-1194.
- Vossekuil, B., M. Reddy, R. Fein, R. Borum, and W. Modzeleski. 2000. *U.S.S.S. Safe School Initiative: An Interim Report on the Prevention of Targeted Violence in Schools*. Washington, DC: Department of the Treasury.
- Walsh, D. 1998. *1998 Video and Computer Game Report Card*. Minneapolis, MN: National Institute on Media and the Family.
- Walsh, D. 2000. *5th Annual Video and Computer Game Report Card*. Minneapolis, MN: National Institute on Media and the Family.

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This *Informed Educator* was written by Douglas A. Gentile, Ph.D., Director of Research, and David A. Walsh, Ph.D., founder and President of The National Institute on Media and the Family, a national resource for educators, parents, community leaders, and other caring adults who are interested in the influence of electronic media on children.

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