Games and Children's Brains: What is the Latest Research?
By Rachel Dunifon and Lydia Gill

Video games are used by teens of all ages, genders, and socioecomonic backgrounds. A total of 97% of teens between the age of 12-17 years old play computer, web, portable, or console games (Lenhart et al., 2008). Fifty percent of these teens said they played video games "yesterday." Research suggests both positive and negative aspects of playing video games. Though the implications of video game use is a relatively new area for research, this brief describes the most recent findings.

Types and Ratings of Video Games
A video game is a game played by electronically manipulating images produced by a computer program on a television or other display screen. In addition to computers and mobile devices, there are many types of gaming consoles. Some of the most popular ones are Play Station 3, Xbox 360, and Nintendo Wii. The Wii and Xbox Kinect are examples of a relatively new type of gaming system that requires the player to simulate an action in order for their character in the game to perform the same action. Sports games are commonly played on these systems and in general, they require more physical activity than do traditional systems.

Many gaming systems connect to the Internet, meaning that individuals can play against other people online. Around 50% of teens who play games online play against people they know from their offline lives (Lenhart et al., 2008).

There are many types of video games (Caruana, Caruana, & Bruner, n.d.):
- Action: Have a fast-paced nature and tend to be violent.
- Adventure and Role Playing: Have an element of fantasy and/or surrealism and are less intense than action games, but still often include violence.
- Arcade: Includes a broad range with different ratings. Some examples are Pacman and Soul Caliber 2.
- Strategy: Have a tactical movement element – often of troops or players.
- Simulation: Have a simulation element – often aircraft simulations.
- Driving: Have a driving element – often racing as well as crash derby or mission-based driving.
- Puzzle: Require thinking and logic skills and almost always have a low rating.

Just like movies, video games are rated based on the maturity of the game content. There are seven ratings (Entertainment Software Rating Board, n.d.):
- Early Childhood: Content is intended for young children.

- Everyone: Content is generally suitable for all ages.
    - May contain minimal cartoon, fantasy or mild violence and/or infrequent use of mild language.
- Everyone 10+: Content is generally suitable for ages 10 and up.
    - May contain more cartoon, fantasy or mild violence, mild language and/or minimal suggestive themes.
- Teen: Content is generally suitable for ages 13 and up.
    - May contain violence, suggestive themes, crude humor, minimal blood, simulated gambling and/or infrequent use of strong language.
- Mature: Content is generally suitable for ages 17 and up.
    - May contain intense violence, blood and gore, sexual content and/or strong language.
- Adults Only: Content is suitable for adults ages 18 and up.
    - May include prolonged sense of intense violence, graphic sexual content and/or gambling with real currency.
- Rating Pending: Has not yet received a rating.
    - Appears only in advertising, marketing and promotional materials related to a game that is expected to carry an ESRB rating, and should be replaced by a game's rating once it has been assigned.

The "Everyone 10+" is the lowest rating that allows mild violence, mild language and minimally suggestive themes. A recent survey found that 13% of unaccompanied 13- to 16- year-olds were able to purchase M-rated games whereas 24% were able to purchase tickets to R-rated movies (Federal Trade Commission, 2013). This shows that retailers are making an effort to enforce the age restrictions of each rating so that children cannot purchase games with inappropriate content.

The Positive Aspects of Video Game Use

Many parents worry about the effect that playing violent video games will have on their children. This is a legitimate worry, but new research shows that many children do not play violent video games. Only 3 of the top 10 most frequently played games by teens are violent (Lenhart et al., 2008). The average rating for these 10 games is just above "Teen."

Other parents worry that videogames may lead to social isolation. However, for many teens, gaming is a social experience. Sixty-five percent of game-playing teens play with other people in the room and 27% connect with others through the Internet while they play (Lenhart et al., 2008).

Since gaming is oftentimes social, players encounter a spectrum of different types of behaviors while gaming. Sixty-three percent of teens who play games saw or heard people being mean and overly aggressive while playing and 49% saw or heard people

being hateful, racist or sexist while playing (Lenhart et al., 2008). However, nearly 75% of these teens responded to these situations by asking the aggressor to stop at least some of the time. Additionally, 85% of the teens who viewed these behaviors also saw other players being helpful or generous while playing (Lenhart et al., 2008).

Another concern is that too much screen time is bad for children's eyesight. However, when given an eye test, action video gamers had better than normal vision (Bavelier, 2012). They were better able to resolve fine detail and were also better able to resolve different levels of gray, which means they are better able to pick out details while driving in fog.

Gaming also increases the ability to switch tasks, or repeatedly switching between email, a chat program, a music player or many other programs that are running and available simultaneously (Green, Sugarman, Medford, Klobusicky, & Bavelier, 2012). This has become an increasingly important skill as new technologies emerge and are integrated into our daily lives. A study done with older teens found that action video game players were better able to switch tasks than non-players (Green, Sugarman, Medford, Klobusicky, & Bavelier, 2012). Action video gamers were also better at solving tasks that measured attention and were better than normal at tasks involving tracking objects (Bavelier, 2012). Though the study was conducted in a lab setting, in the real world, this means that action video gamers may be better at tracking things while they are driving, such as the other cars around them and animals near the road.

Video games also have educational potential. Although education-oriented games do not appear in the ten most frequently played games (Lenhart et al., 2012), they may increase in popularity in the future. One study (Squire, Barnett, Grant, & Higginbotham, 2004) found that children who played an electromagnetic simulation game called Supercharged during physics class and received supplemental materials and interactive lectures from a teacher scored better on conceptual exams than students who only went to lectures from the same teacher.

Research has also shown that video games requiring physical exertion are appealing to young people, improve their fitness, and develop motivation for physical exercise (Papastergiou, 2009). Researchers measured children's and adolescent's aerobic workout while playing an interactive game called Dance Dance Revolution (DDR) and compared their results to recommendations for physical activity made by the American College for Sports Medicine (ACSM). They found that participants were within the heart rate range recommended by the ACSM for achieving an aerobic workout and improving cardiovascular endurance (Papastergiou, 2009).

The Negative Aspects of Video Game Use

There is a lot of concern regarding use of violent video games and anti-social behaviors. Linking children's aggressive behaviors to violent video games is challenging because it is difficult to separate whether aggressive behaviors are due to violent video games or if

previously aggressive youth are drawn to violent games. One study (Anderson et al., 2008) found that the amount of time children spent playing violent video games was related to how physically aggressive the child behaved 4 months later, even after controlling for initial levels of aggressive behavior. Other studies (Gentile, Lynch, Linder, & Walsh, 2008; Anderson & Bushman, 2001) support these results as well, but they are limited in only measuring violent behavior and violent video game exposure at one point in time. Anderson and Bushman (2001) did a review of many past studies on the topic of violent video games and aggressive behaviors. They looked at experimental study results and nonexperimental study results separately. The experimental studies showed short-term exposure to violent video games causes at least a temporary increase in aggression. The nonexperimental studies showed exposure to violent video games is correlated with aggressive behaviors. Nonexperimental studies are not as powerful of a study design as experimental studies because they do not prove causation, but it is still useful to show that exposure to violent video games and aggressive behaviors are associated with each other.

Parents have a key role to play in determining the nature of their children's use of video games, both in terms of how much time teens spend playing games, as well as the content of the games. Research shows mixed findings about how well parents do this. Parents and children have different perceptions of how much youths' video game use is monitored. In one study (Anderson & Bushman, 2001), 90% of eighth to twelfth graders reported that their parents never checked video game ratings before purchase and 89% reported never having their video game time limited. However, 90% of parents reported they "always or sometimes know what games their children play," and 72% of parents say "they always or sometimes check the ratings before their children are allowed to play a game"(Lenhart et al., 2008). A total of 31% of parents sometimes play games with their children. Another study (Carlson et al., 2010) found that when children reporting that their parents have rules about how much time the child could spend watching television or playing video games are less likely to exceed recommended time limits compared with children who did not report that their parents had rules. These findings suggest that parents play a key role in monitoring their children's time playing video games. However, in order for rules to work, both parents and children must be aware of the rules and agree that they are enforced.

Additionally, there are gender differences in preference for violent video games. When asked, boys reported preferring higher levels for violence than girls (Gentile, lynch, Linder, & Walsh, 2008). This means that parents may need to be more diligent about monitoring their sons' video game use.

The American Academy of Pediatrics recommends that children 2 years and older should be limited to 2 or less hours of media time per day (American Academy of Pediatrics [AAP], 2001). Children should spend time doing a variety of activities in order to stay health and develop normally, such as being physically active and interacting with peers. A large study (Carlson, et al., 2010) used self-reported measures to find

relationships between screen time, parents' restriction on screen time, and physical activity. Physical activity was negatively associated with screen time, meaning the more time children reported being physically active, the less screen time they reported. Researchers did not prove that doing physical activities directly replaced screen time, but this trend has been seen many times. Association trends such as these have led researches to believe that too much screen time is not healthy because it takes away from other health promoting activities.

Summary

Playing video games is a popular pastime for many people – especially children and adolescents. A wide variety of games are available – spanning from adventure games to violent games. Gaming is a social experience for many youth, whether they play with other people in the room or online against other people. Though many youth experience anti-social behaviors during these social interactions, this sometimes leads to opportunities to take a stand against such behaviors. On average, gamers have better eye sight than non-gamers and perform better on certain attention tasks, and some games promote physical fitness. Video also games have the potential to be used as powerful teaching tools. On the negative side, use of violent video games is associated with increased aggressive behaviors. Additionally, time spent playing video games can crowd out time spent in more healthy activities, such as exercise, reading or school work.

In conclusion, video games have both positive and negative aspects. In order to maximize the good aspects of video games, parents should learn about and set rules and guidelines regarding the games their children play and how often they play them, and also consider engaging in games with their children in order to better understand the games as well as promote the positive aspects of gaming.

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