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| 9 |
PSYCHOLOGICAL EFFECTS OF VIDEO GAMES

Barrie Gunter

The history of media developments is littered with examples of new forms of entertainment being introduced, attaining widespread popularity, and also attracting public concern because of their strong appeal to so many. Computer games proved to be no exception to this rule. As their popularity grew, so too did the level of anxiety about the possibly deleterious psychological effects of playing these games. A number of critics claimed that computer games had a corrupting influence on young people. These games were accused of glorifying violence and encouraging antisocial behavior. Twenty years ago, the U.S. Surgeon General, C. Everett Koop, was quoted as saying that there was "nothing constructive in the games.... Everything is eliminate, kill, destroy!" (Mayfield, 1982).

In addition to potentially harmful psychological effects, stories emerged of computers games' addictive qualities (Anderson & Ford, 1986). Thus, regularly playing computer games could cultivate a compulsion to continue playing and to display, in consequence, a diminished interest in other activities. To cease playing might result in withdrawal symptoms (Soper & Miller, 1983). Some identified physical consequences of regular computer game playing, such as tendonitis, and skin and muscle problems (Loftus & Loftus, 1983).

Not all the news about computer games was bad. Some showed positive psychological benefits accruing from involvement with these games, not least that they may contribute toward young people's computer literacy or at least a greater ease with computer technology. Computer games could also be devised with educational benefits such as vehicles for the learning of factual knowledge and experiences through which a variety of cognitive skills could be acquired (Greenfield & Lave, 1982; Rogoff & Lave, 1984; Scribner, 1986).

This chapter will examine evidence relating to all these different kinds of alleged psychological effects of computer games. Over the last quarter of the twentieth century, while most attention focused on the potential harms that these games might cause among young players, there was also a more limited, but nonetheless important, recognition of positive benefits. Although excessive playing with these games should be discouraged in the same way as excessive behavior in other contexts, much naturally occurring computer game playing takes place in healthy social contexts and can produce positive cognitive benefits.

Despite these optimistic sentiments, it is equally true that research into computer game playing is still at a fairly early stage of development. The research to date has not always yielded consistent findings and its contribution to our understanding of the impact of these games remains limited because of methodological issues that have still not been fully resolved (Sherry, 2001).

Computer Games, Occupation of Time, and Addiction

Computer and video games involve a time commitment that one can regard as a type of "effect." Playing with these electronic games has become a widespread and popular pastime among millions of children and teenagers. Much game playing initially took place in public spaces such as arcades, but today players can enjoy most electronic game playing almost anywhere, through various hardware systems such as hand-held games, personal computers, and home video consoles. The devotion of time to playing these games can vary with age and with the nature of the individual. Carried to an extreme, it may signify that a player has become dependent or even addicted to electronic game playing. Furthermore, although some cite computer games as contributing toward social isolation for some individuals, they can also provide opportunities for those who are already shy and isolated to enter new (electronic) social networks.

The notion that using computers can become either a compelling habit or even an addictive behavior

that takes over a person's life and is difficult to kick has been the focus of interest since computers and computer programming began to achieve prominence in various walks of life in the 1970s. One view was that computer programming could generate endless fascination for some people and cast an almost narcotic spell over them (Martin & Norman, 1970). Furthermore, computer users attracted a rather disparaging image of dishevelled individuals with obsessive personalities and lacking in social skills (Weizenbaum, 1976).

This computer dependency was regarded as compulsive behavior driven by the programmer's power to control the computer. The same pattern was later observed among arcade game players. Compulsively playing early electronic games was regarded as potentially problematic where those games had violent themes (Weizenbaum, 1976). Further, computer game dependency was seen as particularly harmful where it occurred among children. Some writers argued that children learned nothing useful from playing computer games and that their constant use engendered greater introversion and social withdrawal (Levy, 1984; Waddilove, 1984).

Another side effect of severe computer game dependency was that young players could be driven to take more and more extreme measures to feed their habit. Loftus and Loftus (1983) reported one case involving a thirteen-year-old boy in Des Moines, Iowa, who became a serial burglar in order to support his *Pac-Man* habit. Other observers commented on cases of youngsters stealing money to play arcade games or to buy new games cartridges for home video games (Klein, 1984; Keepers, 1990; Griffiths & Hunt, 1993). Others went without food, by forfeiting their lunch money to pay for video games (McClure & Mears, 1984) or played truant from school to spend time playing computer games (Keepers, 1990; Griffiths & Hunt, 1993). Researchers have also found signs of withdrawal symptoms such as increased irritability when some are unable to play (Griffiths & Hunt, 1993; Rutkowska & Carlton, 1994).

There has been research with adults and children to find out whether computer addiction or dependency really occurs and what form it takes. Evidence for addiction or dependency stems from an indication that playing computer or video games eats into time spent with other activities to an extreme degree. Thus, any findings that indicate that computer or video game playing does not submerge all other pursuits tend to weaken the argument for the games having addictive qualities.

There have been conflicting opinions offered as to why computer or video games may generate dependency. One factor may be found in the inherent nature of the games themselves (Loftus & Loftus, 1983), which are interactive and therefore very involving. They offer challenges and varying levels of difficulty that encourage players to engage repeatedly to display increased competence and control.

In-depth research has indicated, however, that although a small proportion of people may shows signs of computer game dependency, it is a fairly harmless reaction (Shotton, 1989). Subsequent to this research, though, electronic games were constructed with increasingly sophisticated formats and realistic graphics. The skills required for competent play also developed further, opening up the possibility that such games could prove to be more involving than earlier versions giving them the power to generate a more powerful psychological dependence among players (Gunter, 1998).

Computer Games and Cognitive Effects

Computer games have been linked to a number of cognitive effects, both positive and negative. Researchers have found negative associations between academic achievement and playing electronic games. However, computer games also impart certain cognitive skills of a generic kind (e.g., spatial skills) and of a more specific nature (e.g., computer literacy). Electronic game formats have also been applied successfully in occupational training contexts.

Initial observations about computer games and cognitive performance centered on the negative rather than positive benefits electronic game playing could have. Some suggested that computer game playing took children and teenagers away from participating in more educational or sporting pursuits (Egli & Meyers, 1984; Professional Association of Teachers, 1994). Contrary indications emerged elsewhere, however, with evidence that computer game players may in fact be encouraged to read a great deal by the very large numbers of magazines targeted at players (Griffiths, 1996) and by findings that computer game players may be more likely than nonplayers to engage in sports (Phillips et al., 1995).

Empirical evidence has emerged that computer games can yield direct and positive effects for players both in terms of knowledge acquisition and cognitive skills development. Early research produced equivocal findings on links between reported computer game playing and school performance. In one case, access to a computer outside schools was found to have no link with academic performance (Dominick, 1984); in another instance, evidence emerged of a negative link (Braun et al., 1986), and then again of a positive link (Lockheed, Nielson, & Stone, 1983).

The growing use of computing in schools initially came under fire for displaying a lack of purposiveness and academic justification, poor quality software, and for showing a gender bias toward boys (Nairman, 1982; Sanders, 1984; Seidel, Anderson, & Hunter, 1982). Notwithstanding these criticisms, the use of computers was defended elsewhere for having many positive benefits (Gibb et al., 1983). Microcomputers and their accompanying software were reported to engage and cultivate particular kinds of complex spatial cognitive learning (Ball, 1978; Jones, 1981; Kennedy, Bittner, & Jones, 1981; Lowery & Knirk, 1983).

Quite apart from the intentional use of computers as learning instruments in computer-assisted instruction contexts, an educational potential was observed even for mainstream recreational electronic game playing. Computer and video games were able to invoke cognitive skills that were not only necessary to play these games successfully, but could also prove to be transferable to other learning situations and information processing contexts (White, 1992; Greenfield, 1994).

Computer game scenarios can provide contexts that can enhance memory for certain types of content. Young children, aged four to seven years, show better memory for pictures displayed during a computer game than when presented in a lesson format (Oyen & Bebko, 1996). The effectiveness of computer games in enhancing learning and memory for subject matter depends critically on the degree to which the to-be-learned material is integrated with the fantasy component of the game (Lepper, 1982). In examining this phenomenon further, Oyen and Bebko (1996) distinguished between "exogenous" games, in which the learning content was only arbitrarily linked with the fantasy component of the game, and "endogenous" games in which the to-be-learned content is intrinsically interrelated with the game itself. In their study, an endogenous game produced better subsequent picture content recall than did an exogenous game. One reason for this effect is that computer games can make learning more interesting (Corno & Mandinach, 1983).

Computer games can pose challenges to children that require them to utilize specific cognitive skills, but in a context that makes learning fun. Such games work best if they present a clearly defined goal or objective for the child to achieve, and offer enough uncertainty regarding outcomes at different points in play to provide a real challenge. Computer games can teach physical coordination skills, decision making, following directions, and numerical and word recognition skills (Ball, 1978). They can also cultivate an ability to divide visual attention between different tasks or aspects of a task (Greenfield et al., 1994).

Cross-national research with American and Italian undergraduates compared the cognitive skills acquisition of experienced and novice players with a computer game called *Evolution* (Greenfield et al., 1994a). This relatively nonviolent game comprised six different levels of play, with each one introducing a new set of rules and patterns of play. Male and female players were given an opportunity to practice playing the game on their own, to do so following some initial instruction and advice on how to play, or while answering questions about their experience with the game at regular intervals during play itself. The transfer of learned skills was tested via an educational computer game designed to teach the logic of computer circuitry. In this the students received a number of video demonstrations, on each of which they subsequently answered questions.

Students who were already experts at playing computer games performed well on the test of cognitive skill, especially if they had had some opportunity to play the *Evolution* game first. Even novice players, however, benefited from playing the computer game and appeared quickly to acquire essential skills that assisted them in playing with the later educational computer game. Knowledge of the computer game was acquired through practice and trial and error rather than by being told how to play it. The conditions under which the students received prior advice did not assist them in mastering the game. There were differences, however, between experts and novices in how effectively they responded to advice about game play strategies. Experts benefited from pre-playing advice about rules and strategies of the game, whereas novices did not. It seems likely that experts already had well-developed schemas relevant to game playing, which enabled them to relate to and adapt the advice given to this new computer game. In contrast, periodic questioning about the computer game task during breaks in the initial learning procedure did help novices to acquire relevant skills and to transfer them to a subsequent task. This procedure helped in the mastery of visual aspects of the game in particular, and this seemed to be the key to effective game play.

Skill in spatial representation is one example of everyday cognitive skills utilized and developed by

computer games and other computer applications (Greenfield, 1983). Such skills allow individuals to deal with complex visual problems by being able to imagine objects in three dimensions in the mind through a kind of mental rotation of the entities observed, to imagine the relative movements of objects, to interpret and predict the unfolding of patterns, and to encode more rapidly information about visual forms (Lohman, 1979; Linn & Peterson, 1985). These skills are built up over time, and computer representations of visual fields have been found to serve as effective training tools in this context (Lowery & Knirk, 1983; Small & Small, 1982).

Playing computer games such as *Targ* and *Battlezone* was found to erode initial gender-related differences in spatial orientation, spatial visualization, and eye-hand coordination skills. Although men initially scored higher on these skills than women, after several hours of playing these games, these gender differences disappeared (Gagnon, 1985).

In another set of practice studies, Pepin and Dorval (1986) and Dorval and Pepin (1986) provided eight sessions of training on the computer game *Zaxxon* (each session included five games) to seventy undergraduate students. They also provided training to 101 twelve-year-olds, although the children received fewer practice sessions because of time constraints. A control was given the pretest and posttest with no computer game training. Among the adults, both men and women gained significantly in visual spatial skills following training on *Zaxxon*. Among the children, they observed no such changes. In the latter case, the youngsters had greater computer game playing experience than the adults, leaving less room for significant improvement after such a limited number of further playing sessions.

Other research has found strong support for the view that computer game playing can improve spatial skills performance (Forsyth & Lancy, 1987; McClurg & Chaille, 1987; Subrahmanyam & Greenfield, 1994). Children and teenagers aged ten to sixteen years, in particular, showed spatial skills benefits from playing computer games (McClurg & Chaille, 1987; Miller & Kapel, 1985).

Cognitive skills improvements occur not just with educationally oriented programs designed to pose mental challenges, but also in response to playing more action-oriented games that tend to prove more popular especially with young games players (Forsyth & Lancy, 1987; Greenfield et al., 1994b; Hayes, Lancy, & Evans, 1985; Lancy & Hayes, 1988).

Greenfield, Brannon, and Lohr (1994) tested whether computer games could contribute to developing spatial representational skills required for humans to "interface" effectively with computer technology. American undergraduate students took part in a study that examined the relationship between skills levels in playing a three-dimensional action arcade video game, *The Empire Strikes Back*, and the skills needed to complete a mental paper-folding task.

In *The Empire Strikes Back*, the game gives the player the perspective of a starship pilot flying through space. The player's task is to shoot enemy ships while avoiding asteroids and enemy fire so as to accumulate points and advance in difficulty level. The game requires players to navigate through three-dimensional space, represented on a two-dimensional screen. The test of visual-spatial skills, mental paper folding, was also one that demanded visualizing three-dimensional movement from a two-dimensional display. The key difference between the video game and paper folding was that the former was dynamic, involving a lot of movement, whereas the latter was static.

Performance in playing the video game was correlated with ability to complete the mental paper folding task in one study. In a second study, there was no short-term effect of playing the video game on mental paper folding ability, but some evidence did emerge that in the long-term, video game expertise could be beneficial to this kind of task. Practice was needed over an extended period of time to cultivate these skills.

As the way in which these games are played has been examined more closely, it has become apparent that they involve a range of cognitive skills that can become very acutely developed in individuals who are well-practiced in computer game play. Computer games are not simply an appealing pastime for young people, they may serve as an introduction to the world of computers. Furthermore, they have been found to cultivate certain categories of cognitive skills that are important in the context of other types of computer use. Indeed, some of the mental and information processing skills acquired through playing computer games may be transferable to other domains of experience. Far from impeding the intellectual growth of young people, computer games may be able to stimulate it. Although excessive computer game play, to the neglect of other pursuits—mental or physical—is not a habit that should be condoned, there do, nevertheless, seem to be some positive and beneficial side effects to young people's involvement with these games.

Computer Games and Social Behavior Effects

Playing computer games has been linked to positive and negative social effects. Negative effects research represents an extension of the media violence literature, with video game playing allegedly giving rise to arousal that might instigate aggression, imitative aggressive behavior, or simply the reduction of prosocial behavioral tendencies (Friedrich-Cofer & Huston, 1986; Gauntlett, 1995). Personality has also been invoked as a mediator of these effects. On a more positive note, constructive social skills effects can be achieved via computer games that are designed to produce these effects.

Many video games have violent themes and therefore often require aggressive performance by participants (Dominick, 1984; Loftus & Loftus, 1983). In many video games, players must shoot or harm their symbolic opponents in order to win. Violence is, in fact, a theme that pervades many of the most popular games, with games such as *Streetfighter*, *Mortal Kombat*, and *Tomb Raider* being among the best and most widely played examples. Some researchers have concluded that playing violent computer games can invoke increased aggression among players (Anderson & Ford, 1986; Ballard & Wiest, 1995; Irwin & Gross, 1995; Schutte et al., 1988; Silvern & Williamson, 1987). Other researchers have failed to find evidence for such a link (Cooper & Mackie, 1986; Graybill, Kirsch, & Esselmen, 1985; Graybill et al., 1987; Scott, 1995; Winkel, Novak, & Hopson, 1987). One literature review concluded that there is clear evidence of a causal relationship between playing computer games and aggression (Dill & Dill, 1998). Another reviewer argued that the research to date has been fraught with methodological problems and that no clear conclusion can be drawn (Griffiths, 1999).

Concern about the possible effects of computer games with violent themes stems from two main developments. First, they represent one of the most popular forms of entertainment among children and adolescents. Significant majorities of boys (88 percent) and girls (64 percent) in the United States in middle-class homes report playing computer games regularly (Funk, 1993), and many of these players express clear preferences for games with themes of human or fantasy violence (Sherry, 2001). Second, fighting games (e.g., *Mortal Kombat*, *Streetfighter*, *Tekken*) and first-person shooters (e.g., *Quake*, *Doom*, *Marathon*) have increased the level of violence over earlier games with faster and more graphic depictions of human violence.

A number of theories have been offered to explain the effects of violent computer games. These theories mostly derive from research on television violence and include social learning, neo-associative networks, arousal, and catharsis. Although games share some characteristics with television, the medium is different in important ways (Dominick, 1984). Television viewing is a passive experience, whereas playing with computer games is highly active, requiring intense concentration and physical activity. Television viewers can break concentration and still follow the story. Computer game players cannot break concentration, except during programmed rest periods. Computer game violence tends to be highly abstract, as opposed to the realistic violence on television. Studies of television and film violence have shown that greater post-viewing aggression may result from viewing more realistic or realistically perceived violence on screen (Atkin, 1983; Berkowtiz & Alioto, 1973).

The most frequently cited mechanism by which computer games may result in aggressive behavior is social learning theory (Alman, 1992; Brusa, 1988; Chambers & Ascione, 1987; Graybill et al., 1985; Hoffman, 1995). Social learning theory posits that behavior is learned through imitation of attractive rewarded models (Bandura, 1994). Proponents of this theory for computer games argue that electronic games should have particularly powerful effects due to the high attention levels of players and the active identification of players with characters on the screen. It has been further argued that game players are rewarded directly for enacting symbolic violence and therefore may transfer the learned aggression to the outside world (Winkel, Novak, & Hopson, 1987).

According to the general arousal model, exciting media experiences can give rise to a heightened, nonspecific drive state (Tannenbaum & Zillmann, 1975). This arousal will enhance any preferred behavioral response. Because computer games with violent themes can generate such arousal, aggressive behavior could be enhanced if prompted subsequent to playing (Ballard & West, 1995; Brusa, 1988; Calvert & Tan, 1994; Winkel, Novak, & Hopson, 1987).

The neo-associative networks model calls upon Berkowitz's notion of priming effects whereby cues in media violence may lead to subsequent aggression due to the priming of semantically related informational nodes in memory (Berkowitz, 1984; Berkowitz & Rogers, 1986). In the case of computer games, priming effects theory would suggest that exposure to violent

games will prime a series of nodes associated with violence and aggression. In other words, playing with violent material generates hostile thoughts (Jo & Berkowitz, 1994) that might in turn promote aggressive responding under the right circumstances (Anderson & Ford, 1986; Anderson & Morrow, 1995; Hoffman, 1995).

A more positive effects notion derives from the catharsis hypothesis, which posits that violent media content can be used as a safe outlet for aggressive thoughts and feelings. Thus, an angry person may become less so as a consequence of playing a violent computer game (Calvert & Tan, 1994; Graybill, Kirsch, & Esselman, 1985; Graybill et al., 1987; Kestenbaum & Weinstein, 1985; Silvern & Williamson, 1987).

Some have raised methodological questions about research on computer games and aggression. One problem is whether the studies to date have external validity with findings that can be generalized to the outside world. Studies have varied in the treatment strength of violent computer game stimuli presented to experimental participants. The types of violent game stimuli have varied between simulated boxing (Graybill, Kirsch, & Esselman, 1985; Graybill et al., 1987), symbolic representations of bombs and missiles (Cooper & Mackie, 1986), and players shooting directly at robots and other objects on screen (Graybill et al., 1987). Later studies featured games with graphically more realistic, human-like characters (Ballard & Wiest, 1995; Irwin & Gross, 1995).

Studies have varied also in the length of treatment effect. In some cases, post-viewing measures of aggression have been taken after as little as five minutes of play, whereas in other cases, participants might be allowed to play for well over an hour. It is important to consider whether short duration of play might give rise to frustration in players who wish to play for longer or boredom for players required to play for longer durations and whether such feelings might become confounded with the experimental treatment (Sherry, 2001).

There have also been a variety of different measures of post-playing aggression used. These measures have varied from actual behavior (aggression observed during free play, or in terms of willingness to help or hurt others) to paper-and-pencil measures of aggressive feelings. This can make it difficult to ascertain whether the observed findings support the popular claim that computer games with violent themes represent a danger to society. Do computer games cause people to *act* aggressively or to *feel* aggressive, or both? Choice of outcome measures has both theoretical and social consequences. Paper-and-pencil measures of hostility may reflect priming of associated nodes, but priming may not result in actual aggressive behavior. Behavioral measures such as aggression during play and willingness to help or hurt others may be more socially significant.

A recent meta-analysis of the research evidence on this subject has begun to shed further light on what might be key trigger factors. Sherry (2001) re-analyzed and compared the results from twenty studies of computer games and post-playing aggression. Three factors emerged as important indicators in this research: graphic realism of violence, length of treatment, and nature of outcome measure. Games with human or fantasy violence gave rise to stronger post-playing aggression effects than did games that were sports related. Assuming no difference in arousal levels between these types of games (though this is not proven), this could indicate evidence in support of the notion of priming of associative networks and the generation of aggressive thoughts by the violent cues in computer games with violent themes. The size of post-playing aggressive effects was negatively related to playing time, when controlling for age of players. Some studies may therefore have measured an initial arousal effect that falls off dramatically after extended play. Longer play periods may give rise to boredom. The social implication of this finding is that children and adolescents who play electronic games in long stretches may transfer less aggression from the game playing situation to the external world than those playing for relatively brief durations.

Finally, average aggression effect size for paper-and-pencil measures was somewhat larger than that for behavioral measures. This finding indicated that playing computer games with violent themes may give rise to enhanced aggressive thoughts or feelings, but these are not necessarily acted upon (Sherry, 2001).

Computer Games and Health

Finally, playing computer games has been related to health risk and benefits. Health risks include physical conditions that follow from excessive playing and also psychological effects upon those at risk of epilepsy and players with already disturbed personalities. Social health risks have also been considered in the form of social dependence on computer games and withdrawal from real social networks. More positively, computer games have been used in therapeutic contexts and as health education vehicles.

Physical and Psychophysiological Health Issues

The medical profession has voiced a number of concerns about computer game playing. According to Loftus and Loftus (1983), players reported new kinds of aches and pains. Rheumatologists have described cases of "Nintendinitis" and "Space Invaders' Wrist," in which players have suffered skin, joint, and muscle problems from repeated button hitting and joystick pushing on game machines. In a survey by Loftus and Loftus, 65 percent of (arcade) video game players examined complained of blisters, calluses, sore tendons, and numbness of fingers, hands, and elbows directly as a result of their playing.

There have also been a number of case studies that have reported some of the adverse effects of playing (nonarcade) computer and video games. These have inclded wrist pain (McCowan, 1981), neck pain (Miller, 1991), elbow pain (Bright & Bringhurst, 1992), tensynvitis (also called "Ninteninitis") (Reinstein, 1983; Brassington, 1990; Casanova & Casanvoa, 1991; Siegal, 1991), peripheral neuropathy (Friedland & St. John, 1984), enuresis (Schink, 1991), encoprisis (Corkery, 1990), epileptic seizures (Rushton, 1981; Dalquist, Mellinger, & Klass, 1983; Hart, 1990), and even hallucinations (Spence, 1993).

Some of these adverse effects were quite rare and "treatment" simply involved cessation of playing of the games in question. In the cases involving enuresis and encoprisis, the children were so engaged in the games that they simply did not want to go to the toilet. In these particular cases, they were taught how to use the game's "pause" button.

Several cases have been reported of epileptic seizures among children and teenagers following computer game play. These cases, though rare, resemble others in which seizures have been brought on by the fluttering of faulty television screens (e.g., Gastaut, Regis, & Bostem, 1962; Stefansson et al., 1977). One early observation of this phenomenon with computer games occurred with a seventeen-year-old boy playing a game called *Astro Fighter*, which was judged to have the right size, brightness, and frequently changing images, to cause seizures in susceptible individuals. In this case, the subject suffered epileptic attacks on two separate occasions after playing this particular game for twenty to thirty minutes (Rushton, 1981).

Dahlquist and his colleagues (1983) reported a case of a fifteen-year-old boy with no previous history of seizures. He played computer games regularly for one year before seizures began. On one occasion, the boy appeared to be in a daze with his hand twitching while playing a game called *Combat*. A month or so later, the boy had a further seizure while playing a *Pac-Man* computer game. Subsequently he developed a sensitivity to bright sunlight flickering through trees while being driven along a tree-lined road (Dahlquist, Mellinger, & Klass, 1983).

A further published case of computer game-induced seizure involved a thirteen-year-old girl who had been playing a Nintendo game for three hours with only a short break. At a particularly rapid phase in the game, she reported feeling strange, and then had a two- to three-minute seizure (Hart, 1990). It appears that certain shifting patterns of images and light in computer games can trigger seizures in photosensitive individuals. These cases, fortunately, are rare, but medical professionals have nevertheless given out warnings that computer games may be capable of causing these reactions among children and teenagers who have a low tolerance for flashing lights and rapidly moving and changing images.

Social Health Issues

Other speculative negative aspects of video game playing that have been reported include the belief that computer game play is socially isolating and prevents children from developing social skills (e.g., Zimbardo, 1982). One researcher has reported that computer game players use the machines as "electronic friends" (Selnow, 1984). However, this does not necessarily mean that players play these games instead of forming human friendships and interacting with their peer groups. Indeed, some of the young people surveyed by Selnow indicated that going to video game arcades represented an important aspect of their social life. These arcades were meeting places and places to go to observe other people and to learn how people behave when with others.

This impression that video game arcades represent an important social environment was reinforced elsewhere. Colwell, Grady, and Rhaiti (1995) reported that heavy video game players tended to see their friends more often outside school than did nonplayers, and had a need to see their friends on a regular basis. In fact, no difference has been found between high and low frequency video game players in terms of their inherent sociability (Rutkowska & Carlton, 1994). Frequent players tend to enjoy just as many friendships and contacts with friends as do less frequent players (Phillips et al., 1995).

The social aspect of computer and video games can be experienced at home just as much as in arcades where online games are played. Multi-user domains (MUDs) represent a broad class of online adventure games in which two or more participants can interact in fantasy virtual worlds that they can even help to create. By the mid 1990s, one estimate calculated that there were three hundred such games worldwide (Pavlik, 1996), with scenarios ranging from medieval villages to science fiction settings. Some observers and participants recognize MUDs as a major attraction among computer games players (Quittner, 1994). Their allure has much to do with the psychological and social experience afforded by playing with MUDs. Regular users can establish relationships with other players, and through their involvement in MUDs can become members of virtual communities (Rheingold, 1993).

The MUD program represents a set of tools with which users can create a social and cultural environment in which to enjoy a rich and varied range of communications with other people. The anonymity that players enjoy, unless they choose voluntarily to give this up, leads to less inhibited communications than found in the real world. Players feel freer to speak their minds and vent their feelings without holding back as they probably would in face-to-face interactions with others (Kiesler & Sproull, 1986; Kiesler, Siegel, & McGuire, 1984). Such disinhibition can be manifest in terms of greater aggressiveness and hostility or as greater friendliness and intimacy (Reid, 1995). In such a computer-mediated environment, participants lack the nonverbal cues they would normally experience in real world environments when communicating with others, which often function to temper verbal and physical behaviors (Rice & Love, 1987). This observation is challenged, however, by the fact that MUD users have developed nonverbal cues and signals even with text-based communications, and a lexicon of symbols that carry emotional connotations has been created for use alongside verbal language.

Social and Therapeutic Value of Computer Games

The rapid evolution of new technologies on the home entertainment front has brought a proliferation of new computer-based games that some therapists have adopted as tools in the therapeutic process. Such games can be especially effective with young and adult patients, serving as an excellent way to establish a rapport with the therapist and to control and shape behavior (Spence, 1988; Gardner, 1991).

Computer games can be used as training aids for certain cognitive and perceptual-motor disorders (Lynch, 1981). These disorders can appear in patients who have been in accidents, have had strokes, or who have simply been born with such problems. Loftus and Loftus (1983) reported the case of a teenage girl who suffered brain damage after being involved in a car accident. This damage manifests itself in terms of a sudden inability to spell (spelling dyspraxia). Computer game therapy was used on a twice-weekly basis to treat the disorder. This mostly involved playing a game called *Hangman*, in which two people guess letters in a word. If they guess a correct letter, there is no penalty. If an incorrect letter appears, another portion of the "hangman" is added on. After two months of this treatment, the dyspraxia problem was significantly reduced.

According to Gardner (1991), using computer games in his psychotherapy sessions provided common ground between himself and his client and provided excellent behavioral observation opportunities.

During the mid 1980s, researchers found that computer games could facilitate cooperative behavior among children and be used to reinforce desirable conduct within educational settings (Stein & Kochman, 1984; Salend & Santora, 1985). There have been a number of innovative uses of computer games in therapeutic contexts. "Video game therapy" was used by Lynch (1981, 1983) for various types of mental disorder (e.g., stroke patients). Not only can computer game performance be compared between patients and "normals," but video game playing can be used as a training aid to some cognitive and perceptual-motor disorders. Further to this, Szer (1983) reported the case of using video game playing as physiotherapy for someone with an arm injury, and Phillips (1991) reported the case of using a hand-held video game (Nintendo *GameBoy*) to stop an eight-year-old boy picking at his face. In this latter case, the child had enurodermatitis and scarring due to continual picking at his upper lip. Previous treatment had included a brief behavior modification program with food rewards for periods free of picking, and the application of a bitter tasting product to the child's fingers. These failed to work, so Phillips recommended the use of a hand-held computer game that was a psychologically rewarding experience and kept the boy's hands occupied. After two weeks the affected area had healed, and at a two-month follow-up, Phillips reported no problems related to the child's continued use of the game.

Computer games have been applied to the treatment of young people with a variety of handicaps.

Horn, Jones, and Hamlett (1991) examined the effectiveness of a video game format in training three children, aged between five and eight years, with multiple handicaps (e.g., severely limited vocal speech acquisition) to make scanning and selection responses similar to those needed to operate communication aids manufactured to assist them with their speech difficulties. The video scanning and selection game systematically shaped their behavior that involved selecting from among a number of boxes containing words. Playing this game produced improvements in the ability of the children to perform this task, which was subsequently found to transfer well to the application of a similar skill needed to operate a communication device.

Computer games may provide a distraction or an escape from worry and painful situations or feelings, having both physical and psychological benefits for young people. There are also many reports (e.g., Kolko & Rickard-Figueroa, 1985; Redd et al., 1987; Vasterling et al., 1993) that computer games have been used as a diversion from the side effects of cancer chemotherapy during childhood and that such distraction tasks can reduce the amount of pain killers children need.

Evidence has also emerged that computer games can alleviate feelings of anxiety. In one study, physiological and psychological measures of anxiety were taken of female college students, around half of whom were preclassified as having highly anxious personalities, and half as being relatively calm. Although the high-anxiety women were more likely to report being anxious throughout the experiment, physiological measures of skin conductance revealed that their arousal level actually decreased while they were playing a video game. For nonanxious women, no such effect was observed (Naveteur & Ray, 1990). Spence (1988) is another advocate of the therapeutic value of video games, incorporating them into his repertoire of behavior management techniques.

Other reports of the application of commercially available computer software to the therapeutic context indicate positive results. Some recommend computer games for their capabilities to provide distinctive help in overcoming certain therapeutic problems in a form of treatment to which adolescents will readily respond. Such computer-based games have recently been found to offer satisfactory treatment solutions for even quite complex therapeutic problems among adolescent patients. One such illustration was the development of an adventure-based computer game for the treatment of adolescents with difficulty controlling sudden impulses to behave in unusual or antisocial ways (Clarke & Schoech, 1994).

Video adventure games and games involving fantasy role playing can be effectively used to train adolescents to deal with real-life situations, by creating scenarios that may not exist in the adolescent's own experience. Mystery computer games can be used with good results when working with groups of adolescents suffering psychiatric problems. The group can learn by observing and modeling the behavior of group leaders as well as by participating in the development of successful problem-solving strategies (Favelle, 1994).

Even with young children, successful therapeutic applications have been reported. In one study, an ordinary office personal computer loaded with a role playing game, an electronic play program, a program that combined a simple word processor with a collection of pictures to produce cartoon-type stories, and a game of explanation suitable for pre-schoolers was used to conduct play therapy with children (Kokush, 1994). Throughout, the software applied was low cost and commercially available. Case examples illustrated the use of such PC-based programs in a small, private practice. The therapeutic progression of the young clients and their relationship with the therapist were described. Successful treatments were reported, but not without problems along the way. On balance, however, computer-based games were found to be a useful addition to the therapeutic tool-kit of the child therapist.

Other Psychological Applications

Computer games and simulations have been developed to assist promotional and educational campaigns aimed to put across social and health-related messages to children and adolescents. Bosworth (1994) reported the use of these technologies in a comprehensive health promotion campaign aimed at adolescents. They were used to attract the attention to young people to BARN (Body Awareness Resource Network) as well as to hold their interest across the duration of the campaign. This program comprised six topic areas: AIDS, alcohol, other drugs, body management, human sexuality, smoking, and stress management. Quiz games challenged players to test their knowledge on a topic. Simulations challenged users to apply health information in nonjudgemental, hypothetical situations. The games played an important part in turning young people's attention on to this health campaign and worked equally well among frequent and infrequent computer game players.

Cahill (1994) reported on research with *Health Works*, a prototype AIDS education program developed by the new York State Department of Health for schoolchildren aged between eleven and fourteen years. Health Works featured state-of-the-art interactive computer video programs and animated graphics on five stand-alone computer stations, housed in a customized mobile unit. Between January 1989 and June 1992, *Health Works* was visited by more than 17,000 students at 172 schools in New York State, including New York City. Cahill analyzed results concerning its impact for over thirty-eight hundred New York City students.

The findings revealed that computer games can take students beyond straightforward factual learning to a deeper involvement with the subject matter, having a much more powerful impact on strength of learning and likelihood of adoption of recommended health-related behaviors. The *Health Works* visits to schools served as booster sessions for classroom AIDS education.

Another computer-based program was developed around the same time to campaign against drug use. Oakley (1994) described the development and utilization of *Smack*, a computer-driven game for teenagers, which addressed drug abuse. The game was developed to illustrate to teenagers the negative consequences associated with drug use. The game was comprised of simulations requiring teenagers to make decisions regarding drug use and to respond to the consequences of such decisions. It was found that the program reinforced the anti-drug attitude of teens who were not inclined toward drug use.

Other games have been developed to assist with the moral development of young people and the rehabilitation of those who have already become offenders. Sherer (1994) described the development and application of a computerized therapeutic simulation game for raising the moral level of adolescents or to re-socialize those who had already got into trouble. The effects of the game on moral development were determined by a moral development measure. The level of moral development of thirteen teenagers who participated in this exercise and fourteen others who served as a comparison group, all aged fifteen years, was measured before and after exposure to the therapeutic game. Participants met for sixteen weekly, two-hour sessions in which the first hour was spent playing with the computer game followed by a further hour of discussion. Two out of five indices of moral development were found to show improvements as a result of playing with the computer game. Counsellors reported that the teenagers had been stimulated by the computer game experience, and the teens themselves enjoyed the games and thought they were relevant to the issues being addressed.

A computer simulation game called *Busted* was designed as part of a program to reduce antisocial behavior in young offenders. The aim of this game was to raise delinquents' awareness of their own conduct and the consequences of antisocial behavior for victims, and to work on these youngsters' interpersonal skills when dealing with other people. The rehabilitation program using this game ran for three to four weeks, during which it was played once or twice a week for around one and a half hours a time by three to six players. The game set up scenarios in which players had to take decisions, make choices, and receive the consequences of those choices. Firm conclusions about the effectiveness of *Busted* have not yet been reached and its evaluation is still continuing. A preliminary evaluation conducted in two high school classrooms yielded positive results, with both boys and girls showing a degree of enthusiasm for the game and claiming to have learned something from it. Teachers also reportedly found the program useful. Whether it can produce longer term attitudinal and behavioral changes remains to be seen. Nevertheless, this project represents one more illustration of the way computer games are being applied to problems relating to children's and adolescents' social and moral development (Sherer, 1994).

Computer games can have both positive and negative health implications. Clinical observations have revealed that certain types of computer games, coupled with intensive playing of them, can give rise to adverse physiological reactions, causing epileptic seizures among individuals with such a predisposition as well as producing physical strains, aches, and pains deriving from bad posture or repetitive movements during play. Counterbalancing these problems, however, is evidence that playing video games can have positive benefits for youngsters in the sense of boosting feelings of self worth and in the context of treating behavioral disorders. As with many other forms of home entertainment, computer games need to be used sensibly in a carefully managed fashion. Where they represent part of a social scene for young people, their use seems to be generally controlled and related to positive feelings about self. Where they are used as a social distraction and a form of escape or withdrawal from social contact, they represent part of an undesirable behavioral syndrome that needs to be discouraged.

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| 10 |
THE THERAPEUTIC VALUE OF VIDEO GAMES

Mark Griffiths

Until recently, most reported effects of video games centered on the alleged negative consequences. These included video game addiction (e.g., Griffiths & Hunt, 1995, 1998), increased aggressiveness (e.g., Griffiths, 1998), and the various medical and psychosocial effects (Griffiths, 1996). However, there are abundant references to the positive benefits of video games in the literature, including brief overviews (e.g., Lawrence, 1986; Griffiths, 1997). Despite research into the more negative effects, for over twenty years, researchers have been using video games as a means of researching individuals. Many of these reasons also provide an insight as to why games may be useful therapeutically. For instance:

- Games are a natural part of human behavior. Using video games as a measurement tool, the researcher achieves the relaxation and ease that can be essential to successful experimentation.
- Video games can assist children in setting goals, ensuring goal rehearsal, providing feedback, reinforcement, and maintaining records of behavioral change.
- Researchers can use video games when examining individual characteristics such as self-esteem, self-concept, goal-setting, and individual differences.
- Video games are fun and stimulating for participants. Consequently, it is easier to achieve and maintain a person's undivided attention for long periods of time (Donchin, 1995).
- As research tools, video games are very diverse and attract participation by individuals across many demographic boundaries (e.g., age, gender, ethnicity, educational status; Washburn & Gulledge, 1995).
- Video games also allow participants to experience novelty and challenge.
- Video games also allow participants to engage in extraordinary activities and to destroy or even die without real consequences (Washburn & Gulledge, 1995).
- Video games can be useful because they allow the researcher to measure performance on a very wide variety of tasks, and can be easily changed, standardized, and understood.
- Video games may help adolescents regress to childhood play (because of the ability to suspend reality in videogame playing)

Research dating back to the early 1980s has consistently shown that playing computer games (irrespective of genre) produces increases in reaction times, improved hand-eye coordination, and raises players' self-esteem. What's more, curiosity, fun, and the nature of the challenge also appear to add to a game's therapeutic potential. This chapter will concentrate on the reported therapeutic benefits of video game playing. Some evidence suggests that important skills may be built or reinforced by video games. For example, video game playing can improve spatial visualization ability (i.e., mentally rotating and manipulating two- and three-dimensional objects) (Subrahmanyam & Greenfield, 1994). However, video games were more effective for children who started out with relatively poor skills. It was therefore suggested that video games may be useful in equalizing individual differences in spatial skill performance.

Many people seem surprised that video games have been used innovatively in a wide variety of therapeutic and medical contexts. As we shall see during the course of this chapter, "video game therapy" has been used successfully in rehabilitation for stroke patients, people with traumatic brain injuries, burns victims, wheelchair users, Erb's palsy sufferers, children undergoing chemotherapy, children with muscular dystrophy, and autistic children.

Video Games as Physiotherapy and Occupational Therapy

Video games have been used as a form of physiotherapy and/or occupational therapy with many different groups of people (e.g., those who are physically handicapped, learning disabled, emotionally disturbed, etc.).