The effects of computer games on young children – a review of the research

Jessica Harris

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Summary

Introduction

Little research has been carried out into non-arcade electronic game playing as this was originally perceived as a harmless and enjoyable pastime. However, with the ever-increasing interest and participation of young children in this activity, much concern has been expressed about the effects of these games on children. At the centre of the debate is the question of whether they are detrimental to a young person's healthy development. There are specific concerns about the implications for aggression, addiction, criminal activity and reduced academic achievement.

This review examines the research on the effects of computer games on young children. It covers studies conducted between 1985 and 1994. (Relatively little recent research has been carried out.)

The review

The review uncovered some negative and some positive consequences for young children of playing computer games:

- some studies suggest that the playing or observing of violent games does affect young children negatively as they show increased levels of aggressive behaviour – at least in the short term
- other studies suggest that computer games have little or no effect on children's aggressive behaviour, or can even be put to good use in an educational context
- children exhibit addictive behaviour towards computer game playing
- computer games cause children to be less sociable and less academically capable
- those who commit crime to finance their game playing habit share some characteristics with other kinds of addicts and encounter various social problems.

The studies reviewed can and have been criticised in various ways. Criticisms have focused on:

- the inadequacy of samples selected
- problems of cultural specificity
- the choice of games and toys used in the research
- the studies' short-term focus and failure to consider whether game-playing has longer-term effects
- objections to the psychological research paradigm and to the artificial effects of experimental conditions.
- other weaknesses in the methodology of surveys

Discussion

The available studies into the effects of computer games on children's behaviour are limited to measuring possible short-term aggressive consequences. Therefore, the strongest conclusion emerging from the present review is the need for more research into the long-term effects of computer games on children. This points to

the requirement for longitudinal studies (rather than cross-sectional and retrospective studies) which could record developmental features of computer game players and establish the long-term effects on young children of playing computer games. Until this is done, claims as to the effects on behaviour will be weak and directions for prevention, intervention and treatment will remain limited in scope.

1. Introduction

The advent of Space Invaders in 1979 saw computer games become popular to a mass audience. By 1981, no single game dominated the field any more as new games came out, rendering Space Invaders obsolete (Surrey 1982). The increasing popularity of computer games stimulated a certain amount of research interest in their effects. While, the saturation of the market with games in the early 1980s led to some loss of interest in them by the purchasing public, the late 1980s saw the arrival of the Japanese Nintendo system and soon sales started to rise. In 1991, the Economist Intelligence Unit noted that UK sales of console games connected to televisions increased by 200 per cent and sales of hand held games had risen by 700 per cent.

Funk (1993) identified computer game playing as a relatively high frequency activity among adolescents. Research has indicated gender differences in computer game playing habits, with males playing more frequently than females (Kaplan, 1983; Griffiths, 1991a). Reasons for this include: the game content, in that games tend to contain more masculine than feminine characters (Morlock et al, 1985); the nature of the games, in that males tend to do better than females on tasks involving visual and spatial skills (Keisler et al, 1983); and social factors – women are not encouraged to express aggression in public and are unlikely to feel comfortable with games of combat or war (Surrey, 1982).

Little research has been carried out into non-arcade electronic game playing as this was originally perceived as a harmless and enjoyable pastime. However, with the ever-increasing interest and participation of young children in this activity, much concern has been expressed about the effects of these games on children, pointing to the need for some form of empirical investigation.

Some of the research to be examined in this review has suggested that the playing of computer games causes physical or psychological effects. Whilst computer game playing has not been implicated as a cause of severe psychopathology, some studies suggest some form of short term relationship between playing violent computer games and an increase in aggressive behaviour. In addition, some studies have provided support for the argument that computer game playing is potentially addictive (Anderson and Ford, 1986). One study examined in this review has specifically considered the connection between computer game playing and criminal activity.

In response to the criticisms of computer games, some have claimed that there are creative and prosocial applications of such games, with stresses on physical rehabilitation (Lynch, 1981; 1983), educational value (Silverne, 1986) and the promotion of social interaction and growth (Favaro, 1982). It has been argued that the aggressive content of computer games actually allows players to release their stress and aggression in a non-destructive way and in fact has the effect of relaxing them (Bowman and Rotter, 1983; Kestenbaum and Weinstein, 1985)

1.1. Computer games and aggression

Since the late 1970s when computer game playing joined television as a preferred childhood leisure activity, one of the main concerns that has constantly been raised is that most games feature some kind of aggression. This has led some to believe that children become more aggressive after playing such games (Koop, 1982; Zimbardo, 1982).

Studies examined in this review often focus on the implications for the player's level of aggression of the emphasis on violence which characterises the most popular games. This either takes the form of human violence (human character must fight or destroy things and avoid being killed) or fantasy violence (as with human violence but with a fantasy or cartoon character). In addition, many games of sport have violent sub-themes (racing, karate, and wrestling). Indeed, these games' popularity tends to be based on their realistic effects, clever marketing strategies which are aimed at children and an ever-increasing emphasis on violence and destruction. These assertions are supported by research carried out by Provenzo (1991), who looked at the content of Nintendo games and revealed that violence was, indeed, a major theme of 40 out of 47 of the most popular games.

Research on TV and aggression lends itself as a paradigm for studying the effects of computer games on young children's behaviour. From past television research it may be hypothesised that exposure to violent computer games may increase children's aggressive behaviour. Silverne, Williamson and Countermine (1983a) have noted the similarities between television and computer games: both have entertainment value, violent content and some similar physical features (action, pace and visual change). However, there is a very important difference in that children are actively involved in computer game playing and this raises the concern that computer games may in fact have a greater effect on children than television.

Indeed, their effect on aggressive behaviour has become the most commonly studied phenomenon surrounding computer games, including some work looking at how self-esteem correlates with these variables. However, the studies do not all point conclusively in the same direction. It is true that findings from the majority of the studies – especially on very young children, as opposed to those in their teens upwards – tend to show that children do become more aggressive after either playing or watching a violent computer game. But, other research uncovers no evidence of computer games having this effect on children's behaviour. Indeed, one survey has apparently found that heavy computer game use has a calming effect in providing an outlet for aggression and the open expression of competition.

1.2. Computer games and addiction

The increase in the home computer games market has resulted in the ready availability of such games. With this have come concerns about: the amount of time children spend on playing games; whether this is at the expense of other activities; and possible detrimental effects.

It has been suggested that 'computer game addiction' is like any other behavioural addiction, in that it consists of compulsive behavioural involvement, a lack of interest in other activities, association mainly with other addicts, and physical and mental symptoms when attempting to stop the behaviour – e.g. the 'shakes' (Soper and Millar, 1983).

The lack of either operational definitions or diagnostic criteria for computer game addiction probably accounts for the dearth of research in this area.

1.3. Computer games and crime

Limited research has been commissioned to investigate the link between computer games and offending by young people. However, it has been suggested that such behaviour might be as problematic for offenders as alcohol drinking (Huff and Collinson, 1987).

2. Methodology

- ***Literature search***

The literature in this area was reviewed using a CD ROM search followed by an On-line search. Key words used in the search were: *children, young, computer games, video games, behaviour, aggression, and addiction*. The majority of information was obtained from references in one particular book (Sanger 1996) which cited articles from publications, including psychology journals and journals relating to adolescence, media, personality and behaviour. Further information was obtained from references in these related papers.

- ***Criteria for inclusion – definitions***

On reviewing research in this area, it became clear that there was some disparity between definitions of computer games and there appeared to be some overlap. *Computer games* were defined as games played on personal computers whilst video games seems to be the term used for more modern home video consoles, hand-held machines or personal computers. Since there are now so many different types of computer game and terms are often used interchangeably within the research, the term 'computer games' was adopted as a generic term for both types of game. Some reported findings within the literature relate to arcade computer game playing. This is also covered in the review, although a distinction is made between games played at home and those played in arcades.

Ages of subjects in the study samples ranged from very young (4 years old) to include students and young offenders up to 21 years old[1]. Younger samples tended to be found in studies where observation methodologies were employed and researchers watched children in free play settings. Studies using surveys or randomised control trials involved older children. To include some research on computer games and crime, it was also felt to be appropriate to review a study looking at a sample of young offenders aged between 15 and 21, since this was the only research found on this subject.

Based on these criteria, 23 studies were examined. Of these, five were useful for background information only. Eighteen studies were included in the review. All used a cross-sectional design, with the exception of one (longitudinal) follow-up study[2] considering computer dependency/addiction. Six studies employed survey techniques in their research whilst five used observation of free play situations, supported in one case by interviews. Some studies used randomised control trials, relying on projective, behavioural or physiological measures of aggression or addiction, such as rating scales/checklists or the monitoring of heart rates.

Fourteen studies examined the link between computer games and children's aggressive behaviour, with two studies incorporating some consideration of self-esteem. A further two studies considered addiction as a concern of computer game playing and one looked at the connection between computer games and criminal activity. Gender differences were also explored.

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1 Because relatively few studies included samples of young children, the review was broadened to cover studies which included subjects up to the age of 21.

2 Cross-sectional study – taking a sample and studying their behaviour at any one time;
Longitudinal/follow-up study – taking a sample and comparing their behaviour at various points over time.

Some overlap was found between the various studies. For example, different studies sometimes employed similar methods to look at aggression and addiction. This review has been structured with studies under the subject headings which seem most appropriate.

2.1. Weaknesses of studies

- ***Samples***

All of the studies in this review can be criticised for their small sample sizes, especially those using observation techniques. There is therefore a strong possibility that samples are not representative of the population of young children as a whole. It is also worth noting how samples are selected. In all cases, subjects were selected from specific areas, they attended a certain school or university and had some degree of choice in taking part. The selection criteria may also, therefore, introduce a degree of bias. A particular problem is that some categories of vulnerable children are unlikely to be represented among those included in samples. This is a failing of the research since such people may well be those most likely to be subject to adverse effects connected with the playing of computer games.

- ***Cultural specificity***

All but two of the studies in this review were conducted in the United States. It is worth bearing in mind cultural differences that may exist between the United States and the United Kingdom when considering how applicable findings are from one to the other.

- ***Modelling influences***

Modelling influences[3] have been cited as an explanation for the relationship between televised aggression and subsequent aggressive behaviour in the past. Some thought must be given to the rather unnatural experimental settings which arise in many cases. Such contrived situations might raise the issue of demand artefacts, i.e. subjects may well guess what the researchers are looking for and respond accordingly.

- ***Computer games and toys***

The sorts of computer games which are used in the studies is another area which needs to be considered carefully. What is the rationale behind the choice of games that are used? Studies have tended to select just one game with an aggressive theme to compare with one or more games with non-aggressive or mildly aggressive themes. However, aggressive games used in different studies, which might be equivalent on a number of dimensions, might differ on some other unmeasured dimension. It therefore makes it difficult to relate the findings of one study to those of another. In a similar way, the rationale behind the selection of toys that are used in free play settings needs to be examined critically. Some studies conduct prior research to select appropriate sorts of toys.

- ***Time***

Given that work in this area spans two decades, it must be recognised that games change over time – for example, in content and technological sophistication – and therefore the effects they potentially have on people may change. Newer games may in some way be more psychologically rewarding than the games of a decade ago, in that they require more complex skills and improved dexterity and feature socially relevant

3 The artificial effects of experimental conditions designed to represent real-life situations.

topics and better graphics. Greater psychological rewards may mean that newer games are more ‘addiction inducing’, for example, although such an assertion needs empirical backing.

- ***Psychology***

Most of the research in this review has been conducted by psychologists. Psychology has been criticised for being based on crude assumptions insensitive to broader or more complex issues. It might be argued that children will always emulate what they see, but does this render them inherently aggressive? Such research could be accused of spending too much time on abstract ideas and concepts and too little time on addressing social issues.

- ***Surveys***

Survey questions tend to seek a single, simple cause of behaviour and might elicit responses which are in fact an oversimplification of reality. There are bound to be many factors which contribute to aggression, addiction or crime. It is unlikely that such behaviour is linked to computer game playing to the exclusion of all else.

3. A review of the research findings

(A table of all studies reviewed can be found in appendix A)

At the centre of almost all debate concerning the playing of computer games is the question of whether they are detrimental to a young person's healthy development. Research has identified four main types of behaviour related to this activity: aggression, addiction, criminal behaviour and effects on academic achievement.

3.1. Aggression

Evidence of an increase in aggressive behaviour

Various methodologies have been employed in research looking at the effect of computer games on aggression. This must be borne in mind when comparing the studies' findings. The following studies have provided some support for the claim that computer games result in an increase in children's aggressive behaviour.

One survey found impulsiveness and aggression were related to frequency of computer game use, although this was found only for boys' involvement with arcade-based computer games (Lin and Lepper, 1987). The study included male and female subjects from in and around Florida. Subjects were asked about computer game use, their perceptions of sex differences in the ability to use computers, perceptions of their own aggressiveness and of their abilities including academic achievement and leisure activities. Teacher ratings were also obtained on subjects' competence, aggressiveness, popularity, drive and liking for school, relative to other students. There was no indication that computer game use decreased sociability and there was only weak evidence that it impaired academic performance. The authors suggest that computer games supplement rather than replace social play activities, although they might replace the reading of books.

The reliability of these findings might be questioned on the basis that this study relies heavily on self-reporting and therefore on subjects' perceptions of their own abilities and aggressive behaviour. In addition, the survey is open to the criticism of bias in that it was restricted to students from one specific area and from the same social class.

Four studies of aggressive behaviour have relied on observation of children in free play settings (Silverne and Williamson, 1987; Irwin and Gross, 1995; Schutte et al, 1988; Cooper and Mackie, 1986). Observers gauged the effects of different games on children's choices of toys and on their distribution of rewards and punishments to other children, after they had played computer games with aggressive or non-aggressive themes. These studies are open to the criticism that sample sizes were small and it is not certain to what extent findings are generalisable.

The study by Silverne and Williamson (1987), for example, has suggested that research on the link between television and aggression lends itself as a paradigm for studying the effects of computer games on children's behaviour. Using observation techniques, they exposed children to either a violent computer game (Space

Invaders) or a violent cartoon (Roadrunner) and then monitored physical, verbal and object aggression[4] in a free play situation. The authors uncovered significant differences in aggressive behaviour relative to baseline behaviour for children who had played the game or had watched the violent cartoon. Strengths of this research included a concern for observers of children's behaviour to work independently of each other so that they were not aware of each other's assessments and for there to be two or more to ensure reliability.

However, there is a danger that findings may have been a result of time as children became used to the experimental conditions and to each other. It might be that levels of aggression increase due to familiarity and the presence of peers might make children more attentive to scores than to the content of the games. It is also worth noting that the sample size comprised just 28 children. In addition, this research, as with many other studies, examined just one violent computer game (Space Invaders). Although this game shares a component of violence with other computer games, results may not generalise to other violent games.

A study by Irwin and Gross (1995) indicates that subjects who played a game with an aggressive content exhibited significantly more object aggression during free play and more inter-personal aggression during a frustrating situation than youngsters who played non-aggressive games. The researchers observed children after they had played one of two computer games: one featured frequent acts of physical aggression and a second depicted no interpersonal aggression. Computer games were rated by two people working independently of each other and unaware of the experimental conditions, and reliability was therefore ensured.

In another study, Schutte et al (1988) interpreted their findings as showing that young children who play computer games later tend to act similarly to the way their computer game character acted. They explain this finding with reference to social learning theory[5]. Indeed, aggressive behaviour appeared more likely to occur following the playing of a violent computer game than a non-violent computer game.

However, as with other similar studies, this one also has its limitations. Researchers considered the behaviour of just 31 children in seeking to interpret the behaviour of children as a whole. In addition, as just one game was used in the study it cannot be ruled out that something specific to that game, other than the portrayal of violence, made the children more aggressive. A question mark also hangs over the measure of aggression they used. In this case they counted the frequency with which the child hit and kicked a 'bobo' doll. This might be interpreted as an act of playful aggression and need not be exclusively negative. Some distinction between types of aggression must be made if this sort of research is to render meaningful results.

Various research explores the relevance of other variables, such as gender, in studying the effects of computer games on children. Cooper and Mackie (1986) found differences in boys' and girls' perceptions of pen-and-paper games, non-violent computer games and violent computer games. A survey was conducted two weeks prior to this study, in which children in the same school district rated two games as significantly different in their portrayals of violence. Toys for use in a free play session were also rated by girls and boys beforehand as aggressive or non-aggressive toys. An increase in aggressive behaviour emerged in the main study as an effect almost entirely confined to girls. Since boys tend to play or behave in a more aggressive fashion generally, the difference in levels of aggression after playing a violent computer game compared to baseline behaviour was greater for girls than for boys.

4 The exhibition of aggression towards an inanimate object

5 The basis of social learning theory is that people model their own behaviour on what they see, behaviour which is reinforced through the application of rewards and punishments.

Both Cooper and Mackie (1986) and Silverne and Williamson (1987) noted there were no significant differences in aggression levels between active computer game players and passive computer game observers.

Personality factors may also be important. Winkel et al (1987) found that computer games, regardless of their aggressive content, did not lead to an increase in heart rate or aggression in young people. However, they found that those with particular personality traits were more likely to react aggressively, including boys described as 'more relaxed, tranquil and composed' and ' reserved, self-assured' girls.

Aggression has been measured in other ways. Various experimental studies have used randomised control trials to examine the effects of playing different types of computer games on players in the short-term. Such methods tend to randomise samples to different laboratory conditions in settings that are very unnatural, and therefore findings cannot be viewed unconditionally as a true indication of real life situations.

Research using randomised control trials has found that playing aggressive computer games can have short term negative effects on game-players' emotional state and that players of highly aggressive games show increased hostility and anxiety. In a laboratory experiment using a randomised control trial, Anderson and Ford (1986) found that university graduates who had played a violent computer game exhibited a higher level of hostility and anxiety than those who had played a mildly aggressive game. The authors measured hostility using a Multiple Affect Adjective Checklist[6]. However, it is difficult to say whether any observed effects were due to the level of aggression in the games or to other differences in the experimental situations. This study also relied heavily on self-reported aggression, which may or may not be an accurate indication of actual levels of aggression.

Griffiths and Dancaster (1995) examined the relationship between type A personality[7] and arousal in computer game play (not necessarily a violent game). An experiment was carried out whereby a heart speedometer was attached to the subject's earlobe whilst they were playing a computer game. Subjects were encouraged to do well by being told that they would receive £10 if they obtained the highest score. It was found that, during game play, subjects would have significantly higher heart rates as compared with base line levels and that type A subjects would experience a significantly greater increase in arousal when playing than type B subjects.

A very small sample (just 24 students) was used in this study. This makes it very difficult to generalise from these findings to the population as a whole.

Evidence against an increase in aggressive behaviour

Some studies have uncovered little or no evidence of a link between computer games and aggression. Sanger (1996) conducted a study which provided little evidence that children were being particularly affected by the fictions of computer games or videos. Whilst his research does not specifically focus on aggression in children, he was able to detect from observations and interviews that children are able to differentiate between fact and fiction, apart from a few individuals whose lives already contained evidence of some history of emotional disturbance. Sanger identifies that the link between computer games and aggression in children is a particular concern of parents and teachers. It is worth bearing in mind a potential bias in this

6 This checklist, developed by Zuckerman and colleagues (Zuckerman, Lubin, Vogel and Valerius, 1964) measures hostility, anxiety and depression. Each of the three scales consists of a set of positive words (e.g. peaceful) and a set of angry words (e.g. angry). Subjects circle the words that describe how they currently feel.

7 Type A personalities – competitive, achievement orientated, exhibiting time urgency and anger or hostility
Type B personalities – low levels of competitiveness, time urgency or hostility, easy-going, philosophical about life.

study in that subjects were selected from just one school. Sanger maintains that the more educated are able to distinguish between fact and fiction/entertainment, and yet his research is based on findings from just one school in one area. His findings were not central to the purposes of the research, however, since the main aim was to explore more general issues about children and computer games for teachers and parents, and not to focus specifically on computer games and aggressive behaviour in young children.

In a randomised control trial involving projective and behavioural measures, Graybill et al found no short-term differences between the effects of violent versus non-violent computer games and no powerful short-term effects of playing computer games which have violent content. Some children watched whilst some played violent computer games and no difference was found in children's behaviour in this respect either (Graybill, 1987).

On an even more positive note, survey evidence exists to support the claim that the playing of aggressive computer games has a calming effect. Kestenbaum and Weinstein (1985) carried out an empirical study of the relationship between heavy computer game use in adolescent male subjects and personality and psychopathological factors. The authors argue that heavy computer game use plays a role in managing developmental conflicts and is instrumental in discharging aggression in allowing the open expression of competition. Agreeing with Sanger (1996), Kestenbaum and Weinstein go on to suggest that the widespread anxiety about computer game playing is a largely parental issue.

3.2. Aggression and self-esteem

Some research has set out to address the link between computer game playing and self-esteem as well as aggression. Low self-esteem might well lead to more frequent play which would in turn lead to more mastery and therefore higher self-esteem. Sanger (1996), for example, found several examples, particularly among boys, of children with apparently low levels of self-esteem and confidence enjoying game playing for the sense of mastery and control it endowed.

One survey indicated that boys with low self-esteem tended to spend more money per week on game playing and go alone to video arcades (Dominick, 1984). A survey carried out by Fling et al (1992), on the other hand, uncovered no such connection. Evidence of a relationship between amount of computer game play and aggressiveness was found in both studies, however, which was consistent with results described earlier, including Lin and Lepper (1987), as well as those showing aggression in younger children after playing a violent computer game (Silverne and Williamson, 1987; Schutte et al, 1988).

There are doubts about the representativeness of the samples used in both the Dominick and Fling et al studies. They included subjects from just one geographical locale. Dominick studied computer game playing only amongst young boys, and choice of respondents was narrowed down further to those who chose to give up a free period to complete the questionnaire. Findings in both studies were based on respondents' own estimates of, amongst other things, their computer game playing activities, school performance and social class. Both also relied on respondents' hypothetical aggressive reactions to given frustrating situations as well as self-reported measures of self-esteem. Choices of responses were limited in both studies to those provided on item checklists or scales. The study carried out by Fling et al also incorporated teachers' measures of respondents' self-esteem and aggression. This added another layer of information, although responses were still limited to checklist responses and were still subjective. In order to produce more generalisable findings it would be necessary to carry out further research which included a representative sample of young people in a range of different settings, and using more objective ways of measuring aggression.

3.3. Addiction

The increase in the home computer games market has resulted in the ready availability of such games. There has been accompanying concern about the amount of time children spend on playing games, whether this is at the expense of other activities and possible detrimental effects.

There are similarities between studies looking at computer games and aggression and those studying addiction, in that both assess arousal. Griffiths and Dancaster (1995) (see above) also relate their findings to addiction. However, as with aggression, it is important to define what is meant by 'addiction'. Griffiths and Dancaster work on the principle that a participant can be *operationally defined* as being addicted.

Griffiths and Dancaster (1995) argue that *personality variables* are important in understanding the aetiology of addictive computer game playing. Most research on 'addictive personality' has centred around pathological measures (levels of psychopathology, depression, etc.) whereas recent studies suggest the need to widen the search to measures not concerned with pathology.

With a view to studying computer game addiction amongst children, Phillips et al (1995) carried out a survey to quantify the extent of home computer game playing in a typical population of 11 to 16 year olds. The most common pattern of play was daily, with most of the players playing for between one half and one hour per day. An 'addiction' scale identified a small population of players whose behaviour might be considered to be addictive[8].

Phillips was keen to identify normal behaviour in terms of home computer game playing amongst schoolchildren. However, the study has weaknesses in this respect. Firstly, it relies on self-reporting of computer game behaviour and, as noted in relation to other studies, this may not be a reliable means of data collection. Secondly, it was confined to just one town.

Shotton (1989) conducted the only UK follow-up study specifically on computer game addiction. 127 people (half being children and 96% being male) were selected who had been self-reportedly hooked on home computer games for at least five years. 75 of these were measured against two control groups and it was reported that computer dependent individuals were highly intelligent, motivated and achieving people but often misunderstood. A five-year follow-up found that the younger cohort had done well educationally, gone on to university and then into higher-ranking jobs. Shotton concludes that although a small number of people were in danger of becoming dependent, it was a harmless dependence.

However, Shotton's research was biased in that it was done with people who were *self-reportedly* hooked on computer games, thereby missing the unknown – and probably very large – number of those unaware of or choosing not to acknowledge this condition. In addition, respondents were familiar with the 'older generation' computer games which were popular in the earlier part of the 1980s rather than the computer games of the 1990s. Games have changed and the effects they have on people may also have changed.

3.4. Crime

In an attempt to investigate a possible link between gambling, computer games and crime, Huff and Collinson (1987) devised a survey which was distributed amongst a sample of 100 consecutive admissions to HM Youth Custody Centre, Feltham. All subjects were males aged between 15 and 21 years, predominately from SE England. Some information on the subjects was taken from custody records, such as age, present offence,

8 Addiction scale based on an adaptation of criteria for pathological gambling (American Psychiatric Association, 1987)

previous convictions, etc. A self-report questionnaire then asked about gambling and computer game playing. Computer game playing was defined throughout the questionnaire as the use of coin-operated computer machines and not home computer games.

Findings revealed that, of the 100 respondents, 60 gambled and 60 played computer games. Criminal computer game players were defined as those who reported as having stolen to play computer games, whilst non-criminal players had never stolen to fund their habit. The authors found that criminal versus non-criminal gamblers were distinct on fewer variables than criminal versus non-criminal computer game players. Criminal computer game players were found to be younger than non-criminal players, first started playing and started playing regularly at an earlier age, played more frequently and more regularly spent all their money when they played. They also apparently encountered more relationship problems, took more time off work and regularly neglected their food intake.

The findings of this study are limited in several respects. Firstly, just 13 per cent of the respondents reported that they had at some time stolen to play computer games. Secondly, accuracy of information might be called into question given that it is based on self-reporting. Lastly, a criticism of surveys in general is that questions tend to seek a single, simple cause of behaviour and might elicit responses which are in fact an oversimplification of the real situation. In this survey, computer game playing may only be a factor, albeit a prominent one, among a range of other possible causes of offending.

3.5. Academic achievement

Various research has found computer games to have effects on children's academic achievements, although it should be stressed that games are not necessarily violent in nature for these purposes.

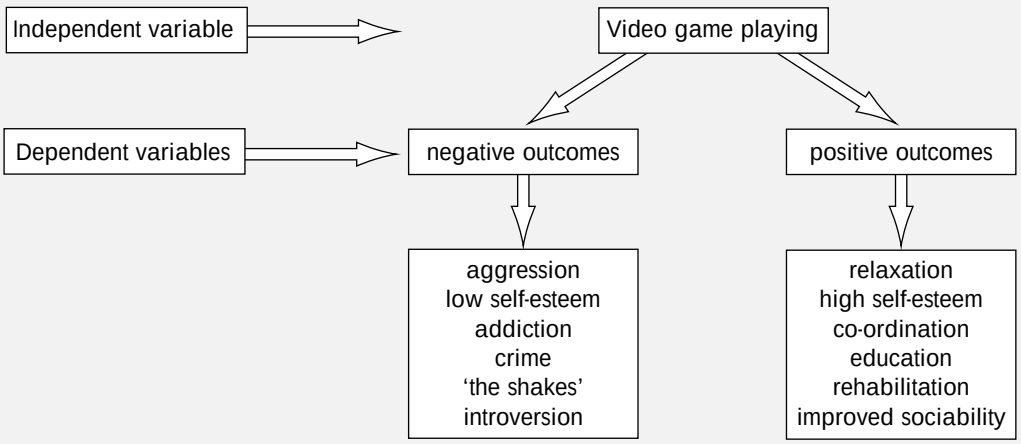
Creasey and Myers (1986) found no academic differences between playing and non-playing groups and no differences in either leisure activities or peer contacts. In fact, the authors found children to be the most involved with computer games where it was a relatively new activity for them, the novelty and therefore effects resulting from this activity disappearing with time.

Another piece of research which uncovered a more positive aspect of computer games was carried out by Schwartz (1988). He set out to compare customary teacher-based tutoring of reading and comprehension with practice on a set of computer games derived from analysis of the reading process. 24 primary school children were selected, who were of average intelligence and who were 18 months or more behind their peers in reading comprehension. The children were split into two groups and assigned to teacher-based tutoring or to a computer game training group where they received practice on four computer games. Training in both conditions focused on word decoding and phonics.

The study found that almost all students improved their reading comprehension test scores after training, although the poorest readers made significantly greater gains in the computer game condition than in the teacher training condition. However, findings from this study are tempered by the fact that only a small number of students were involved. In addition, only one teacher-training programme was used; others might have rendered different results in producing greater comprehension gains. Along the same lines, only specific computer games were used in the training which does not account for potential variation in comprehension gains between games. Ten weeks were set aside for the training exercise in this study, although this may not have been sufficient to gain the full benefit of the two training programmes.

4. Discussion

Figure 4.1: The positive and negative effects of computer games on young children



This review has considered various studies which have investigated the effects of computer games on young children and which have found there to be both positive and negative consequences (see figure 1).

The main finding that has emerged from this review is that research into the effects of long term exposure to computer games on subsequent behaviour is noticeably lacking and at present remains speculative (Griffiths, 1993), leaving theoretical analysis somewhat weak. The studies which have been carried out examining the effects of computer games on children's' aggressive behaviour and self-esteem only involve a measure of possible short-term aggressive consequences.

However, although the evidence is sparse, various studies seem to suggest that the playing or observing of violent games does affect young children negatively as they show increased levels of aggressive behaviour – at least in the short term (Griffiths 1991b). Strong research evidence indicates that children who play a game with an aggressive content exhibit significantly more object aggression and more inter-personal aggression than those who play non-aggressive games. Arousal might be reflected in a child's attempt to act out the sort of behaviour of characters in the game he or she has just played. However, not all studies are in agreement. Some suggest that computer games have little or no effect on children's aggressive behaviour, or can even be put to good use in an educational context.

On the one hand, research has found children to exhibit addictive behaviour towards their participation in computer game playing (Phillips et al, 1995). On the other, people classified as having addictive personalities have been found to be highly intelligent and very successful in other areas of life (Shotton, 1989). This is in contrast to some claims that computer games cause children to be less sociable and less academically capable, a claim which is also refuted by research conducted by Lin and Lepper (1987).

Griffiths argues that much research needs to be carried out into the roots, causes and incidence of addictive amusement machine play, as well as into the families of such individuals and the impact of addictive playing on schooling (Griffiths, 1991b).

From the only research found to have been done looking at crime and computer game playing, it seems that those who commit crime to finance their habit share some characteristics with other kinds of addicts and encounter various social problems. Further study of both offender and non-offender groups would be necessary to confirm the findings of this study, restricted as it was to small samples.

A key question with research such as that examined in this review is the issue of causation. Do children exhibit more aggressive behaviour after playing computer games with aggressive content or do more aggressive or impulsive children play those sorts of games more than their less impulsive friends?

It is tempting to interpret findings from the above studies as evidence of causal relationships of one sort or another. However, results emerging from these studies should not necessarily be interpreted as strong evidence of causal relationships, but should instead indicate where there might be the need for further research. Even with statistically significant findings there is still the problem as to what direction causation is in. For instance, taking aggressive behaviour, there might be three different models which could account for the heightened aggression after playing computer games:

- "Causal effects" model – children's use of computer games increases their impulsivity or aggressiveness.
- "Self-selection" model – aggressive or impulsive children enjoy playing computer games more than their less impulsive or aggressive peers.
- "Third variable" model – both computer game use and aggressiveness is determined by a third factor, such as the degree of parental control over children's activities.

Just as results might not provide clear evidence of meanings for relationships neither should 'negative' findings be ignored, i.e. the absence of a relationship might be telling in itself. If the frequency of computer game playing remains high, then related issues, such as gender and age differences, location of play, game preference and sensitivity to game content, should be studied.

The research looked at in this review has made various claims. However, it is doubtful whether the research methods used are sound enough to say that conclusive evidence supporting these claims has been provided. Much of the research in this area emanates from a psychology background and in attempting to explain or to account for problems associated with computer games, the research might be accused of spending too little time addressing social issues, such as family background or education.

The strongest suggestion emerging from the present review is that there is a necessity for more research into the long-term effects of computer games on children, incorporating the duration of effects and whether repeated playing has cumulative effects. There is a need for longitudinal studies (rather than cross-sectional and retrospective studies) recording developmental features of computer game players and establishing the long term effects on young children playing computer games. Such research may help in identifying potentially vulnerable adolescents or establishing programs for clinical intervention (Griffiths, 1991b). Research in this area, of whatever kind, would also benefit from using larger, more randomly selected samples of children from more than one school and from different areas. However, this obviously has cost and resource implications, which are often a disincentive for such study.

Research such as that which is reviewed here may help in identifying potentially vulnerable adolescents or establishing programs for clinical intervention (Griffiths, 1991b). However, until there is an established body of research literature examining the long-term effects of computer game play on young children, claims as to the effects on behaviour will be weak and directions for prevention, intervention and treatment will remain limited in scope.

Appendix A

Aggression:

Study	Year	Subjects	Method	Finding
Kestenbaum and Weinstein	1985 USA	n=208 11-14yo	Survey	Aggressive VGs have a calming effect Sugg:widespread anxiety re:VG playing largely a parental issue
Cooper and Mackie	1986 USA	n=84 10-11yo	Observation of free play	Girls increase in aggression. No effect in boys.
Anderson and Ford	1986 USA	n=60 students	Randomised Control Trial	Higher aggression computer games increased hostility
Lin and Lepper	1987 USA	n=210 10-12yo	Survey	Increase in impulsivity/aggressive fantasies for boys' involvement with arcade-based VGs
Graybill, Strawniak, Hunter and O'Leary	1987 USA	n=126 8-12yo	Randomised Control Trial	No increase in aggression
Winkel, Novak and Hopson	1987 USA	n=56 14yo	Randomised Control Trial	No increase in aggression
Silverne and Williamson	1987 USA	n=28 4-6yo	Observation of free play	Increase in aggression
Schutte, Malouff, Post-gorden and Rodasta	1988 USA	n=31 5-7yo	Observation of free play	Increase in aggression
Griffiths and Dancaster	1995 USA	n=24 students	Randomised Control Trial	During game play both A + B subjects had significantly higher heart rates Type A subjects experienced significantly greater arousal
Irwin and Gross	1995 USA	n=60 7-8yo	Observation of free play (Heart rate)	Increase in aggression
Sanger	1996 UK	n=100 4-9yo	Observation/ Interviews	Little evidence that children were particularly affected by the fictions of computer games.

Self-esteem:

Study	Year	Subjects	Method	Finding
Dominick	1984 USA	n=250 16-17yo	Survey	Significant relationship between computer game playing and aggressive delinquency
Fling, Smith, Rodriguez, Thornton, Atkins and Nixon	1992 USA	n=153 11-14yo	Survey	Amount of computer game play correlated with aggression and not with self-esteem

Addiction:

Study	Year	Subjects	Method	Finding
Shotton	1989 USA	n=127	Follow-up study	Younger cohort had done well educationally and professionally 5 years on
Phillips, Rolls, Rouse and Griffiths	1995 UK	n=868 13yo	Survey	7.5% players identified whose behaviour might be considered to be addictive

Crime (coin-operated video games):

Study	Year	Subjects	Method	Finding
Huff and Collinson	1987 UK	n=100 15-21yo YCS	Survey	'Criminal'* VG players younger, started playing younger, played more freq, morein freq spent all money when played, had more relationship problems, took more time off work and neglected food more than 'non-criminal' players.

*Criminal: they reported having stolen to play video games.

Academic achievement:

Study	Year	Subjects	Method	Finding
Creasey and Myers (1986)	1986 USA	n=64	Survey	no academic differences between playing and non-playing groups and no differences in either leisure activities or peer contacts
Schwartz	1988 USA	n=24	Randomised Control Trial	Children taught reading/comprehension through computer games methods improved more rapidly than those taught through tutor-based methods.

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