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Recent innovations in video game addiction research and theory

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Abstract

In 1989, Margaret Shotton published her pioneering study of psychological dependency on computer technology. Since then, the empirical research literature on technology-based addictions, particularly addiction to the Internet and online video games, has grown dramatically in both the Western and Eastern contexts. Expansion of this research area reflects a dramatic growth in the popularity of new interactive digital technologies, as well as mounting concern among health professionals that some vulnerable individuals may experience harm if these technologies are used excessively. It is therefore timely to reflect critically on several key research questions within the psychological field of video game addiction, as well as the broader question of whether contemporary anxieties about high levels of computer technology use are justified.

In this paper, we provide an overview of recent innovations in video game addiction research and highlight the benefit of these contributions to the field. These innovations include: (i) changes in the conceptual definition of video game addiction, (ii) greater recognition of the diversity of the video game playing population and the psycho-structural characteristics of video games, (iii) various methodological advances and refinements, and (iv) a broader understanding of the psychosocial correlates of problem video game playing. Finally, we suggest a number of future research directions that may advance the current state of the knowledge in this area.

Introduction

In 1989, Margaret Shotton published one of the first psychological studies of excessive computer use. The impetus for this research was growing concern among public health and education professionals and the mainstream media that some computer users were becoming "anti-social, machine-code junkies" (1989, 6). Shotton conducted surveys and interviews with 106 individuals who reported being 'dependent' on their computers. These 'dependents' were described as highly intelligent and congenial, but their fascination with computer technology was often misunderstood and judged negatively by those around them. According to Shotton, 'dependents' were drawn to computers because they offered a safe retreat from an uncertain world. Some users were reported to value time spent on their computer above all other life

activities, including work and interpersonal relationships. Shotton speculated that many 'dependents' had not received adequate parental warmth during childhood and therefore began using computers to fulfil unmet attachment needs. She theorised that, over time, these users had developed a stable preference for technology-based rewards and therefore avoided participation in other life activities.

While dependency was the primary focus of the research, Shotton also argued that computer technology was appealing for other reasons. 'Dependents' used computers extensively in their adult lives in many contexts. Some worked in vocations that involved computers, such as programming, whereas others merely used computers at home each night for recreational purposes. 'Dependents' were primarily motivated to increase their knowledge of computers, and to develop a mastery over the intellectual challenges posed by computers. Although these intrinsic goals reportedly gave 'dependents' a great deal of personal fulfilment, Shotton also found that high levels of computer use were not always beneficial. Some users developed minor strain injuries or muscle pains. Home computer use did not however, appear to impact significantly on the quality of spousal relationships. In fact, spouses reported to be understanding and supportive of their partners' computer activities. Shotton therefore concluded that the potential for harm resulting from computer dependency was outweighed by the many positive aspects of computer use. In a later paper, Shotton (1991) reaffirmed this view, adding that the "need to control the computer is neither neurotic nor pathological, but provides an admirable means of coping for those who may previously have felt inadequately fulfilled" (1991, 229).

Shotton's seminal study provides a research context and platform to revisit an old but still relevant debate on the psychosocial impact of computer technologies. This debate may be framed in the form of two questions. Firstly, are contemporary anxieties about the amount of time some individuals spend using computer technologies justified? Secondly, what progress has been made in the empirical research literature regarding the psychological impact of computer technology? In considering these two rather broad questions, it should also be acknowledged that over 20 years have passed since Shotton's initial investigation of computer 'dependency'. Furthermore, computer technologies and the individuals who use them have changed dramatically in this time. Economic factors, such as increased affordability and availability, have driven the rapid adoption of computer and online-enabled technologies. Online computer technology has become a permanent fixture in virtually every family home and occupational context in the developed world. For instance, in Australia, over three-quarters of family homes have a computer, and recreational use of the Internet is currently the most popular media leisure activity (Brand, Borchard & Holmes, 2009). Computer technologies have generally become more diverse, specialised, ubiquitous, and integrated with other activities. Therefore, for researchers, the term 'computer dependency' has become conceptually imprecise in denoting a unique and singular psychological experience.

Research on computer dependency has diversified to attend to the multiple types of computer technology and the users who may be dependent on them. In particular, recent studies have mainly focussed on problematic use of two technologies: the Internet and video games. There is also ongoing debate as to whether some forms of persistent and maladaptive use of these technologies may, in some cases, be considered a form of 'addiction'.

While some researchers believe that these so-called 'technological addictions' do exist (Fisher, 1994; Griffiths, 2000), these disorders are not currently recognised by mental health authorities such as the American Psychiatric Association or the World Health Organisation. Similarly, some researchers are resistant to the notion of addiction to technology as a clinical concept, because it may distract public attention from what are perceived to be more serious, bona fide drug-based addictions, such as heroin addiction (Jaffe, 1990). Nevertheless, in the

last two decades, an increasing body of empirical research has investigated the nature, prevalence, and correlates of these computer-based addictions.

Given the broad theoretical scope and variety of studies conducted on Internet and video game addiction, this paper specifically focuses on the area of psychological dependency on video games. The aims of the paper are twofold: (i) to highlight innovations in research and theory that have been developed since Shotton's (1989) investigation of computer dependency, and (ii) to identify new directions for future research on technology-based addiction. These innovations are then critically examined in regard to the following research questions:

1. What is video game addiction?
2. Who becomes addicted to video games?
3. Are some video games addictive?
4. How do we study video game addiction?
5. What are the risk factors for video game addiction?

What is video game addiction?

The conceptual definition of video game addiction has been an ongoing topic of debate. Shotton's (1989) research was largely guided by anecdotal reports in the 1970s and 1980s that some users of computer technology were 'addicted' to computers in much the same way that others became addicted to certain psychoactive drugs. In this sense, her research operated on the assumption that people could become 'dependent' on computers, but she did not qualify precisely what this symptomatically involved. In fact, all of her 'dependent' users were self-defined rather than being based on any objective criteria.

Similarly, early studies of problematic video game use often did not propose specific psychological criteria for dependent or problem video game use (e.g. Selnow, 1984). Research studies tended to focus on factors such as amount of time or money spent on video games, or the extent to which video game playing displaced other activities, in their conceptual framing of problem behaviour. For example, Selnow's (1984) study defined 'heavy' video game play according to the basis of frequency of visits to an arcade, average playing duration and amount of money spent on the video game machine.

In numerous studies, those individuals who played video games on a highly regular basis, or played video games instead of going to work or school, were thought to be 'problem' or 'dependent' users. This emphasis on time spent playing and the negative consequences of video game play over other more fundamental psychological criteria for addiction (such as impaired control) led to a large number of individuals being classified as 'addicted'. It may be for this reason that some studies have reported prevalence rates of video game addiction in adolescents above 10%, an unusually high rate for addictive behaviours (e.g. Griffiths & Hunt, 1998).

In Shotton's (1989) study, 'dependent' individuals volunteered to participate by responding to a newspaper advertisement. The specific details of the criteria or assessment tools that were used to screen for, or verify, psychological dependence on computers were limited. Historically, this research practice of assuming psychological dependence or addiction based on indicators like high levels of use or conflict with other life areas was not uncommon. Attempts to improvise other tests for assessing addictive behaviour have also encountered difficulties. Some studies in the 1990s adapted the DSM-III-R criteria for pathological gambling and substituted the word 'gambling' for 'video game playing' (Fisher, 1994; Griffiths, 1997; Griffiths

& Hunt, 1998). The assumption that video game playing was sufficiently similar to gambling, or that video game playing may be a type of impulse disorder, was rarely questioned. Given these issues of validity, it is perhaps not surprising that Shotton concluded that the individuals in her study did not appear to be 'dependent' on computers at all, rather they were simply highly involved in computers as a form of hobby and sometimes used them as a way of coping with stressful life events.

Since the 1990s, some attempts have been made to produce a standard set of criteria for measuring video game addiction. One popular model is Brown's (1997) 'components' model of addiction, which states that six core features must be present for a significant period of time in order to indicate addiction. In regard to video game playing, these criteria include:

- *Salience.* This occurs when video game playing becomes the most important activity in a person's life, dominating their thoughts (preoccupation and cognitive distortions), emotions (cravings), and behaviour (deterioration of normal behaviours).

- *Mood modification.* This refers to changes in a person's mood state that occur as a result of playing video games, such as increase in physiological arousal or a tranquilising feeling of calm.

- *Tolerance.* This refers to the process whereby increasing amounts of video game play are required to achieve the former mood-modifying effects. This means that players gradually increase the amount of time they spend engaged in video game playing.

- *Withdrawal.* These are the aversive mood states and/or physical effects that occur when video game play is suddenly discontinued or reduced. Psychological withdrawal symptoms include feelings of frustration, irritability and flattened affect.

- *Relapse.* This refers to the tendency for the player to make repeated reversions to earlier patterns of video game play, and for even the most extreme patterns typical of the height of excessive video game play to be quickly restored after periods of abstinence or moderation.

- *Harm.* This refers to the negative consequences of excessive video game play. Harm includes conflicts between the addicted video game player and other people (family members and friends), other activities (job, school, social life, hobbies and interests), and from within the addict themselves (psychological distress).

These six criteria were an improvement on previous conceptualisations of problem video game play that involved ambiguous or inappropriate criteria. However, these criteria were not without some limitations. Recent work by Charlton and Danforth (2007) challenged the reliability of the components model of addiction as it applies to video game addiction. In their study of 442 online video game players, they found that a large number of individuals who reported a positive engagement with video games also endorsed some of the addiction criteria. In particular, the criteria of preoccupation, tolerance, and euphoria appeared to indicate both high engagement and addiction to video games. Thus, these criteria were not particularly useful in distinguishing or separating out problem behaviour from healthy playing behaviour, and the criteria could therefore misclassify some individuals as 'addicted'.

While the components model of addition has aided researchers in developing a profile of the features common to addicted individuals, Charlton and Danforth's (2007) research underscores the need for constant scrutiny of the assumptions about what constitutes addiction as distinct from healthy obsession. This issue is of paramount concern to clinical practitioners, who may encounter individuals with excessive video game playing behaviour and are tasked with the assessment and treatment of their problems. Empirical evidence is invaluable in advancing the theoretical debate on how video game addiction should be conceptualised. Just as some commentators have cautioned that the term addiction should not be trivialised by applying it to

any and all activities, it is also important that researchers do not lose sight of the fact that many people use computer technologies in healthy and productive ways.

Who becomes addicted to video games?

The sample of 'dependent' computer users in Shotton's (1989) study was predominantly male, aged over 18 years (*M* = 29.7 years), and had attained a level of education higher than the general population. These individuals reported using computers for an average of 38 hours each week. This demographic profile therefore challenged the prevailing stereotype in the media and academic papers (e.g. Soper & Miller, 1983) that it was mainly children and adolescents who were dependent on computers.

Subsequent research studies in the 1990s attempted to investigate broader playing demographics, such as adult players, but the primary focus was often on younger players because the effects of prolonged computer use were thought to be most detrimental for these users. However, in the last decade, a number of studies have recognised the diversity of the video game playing population. A study by Brand, Borchard and Holmes (2009) found that the average age of Australian players is 29 years, including 8% of players who are over the age of 55 years, and 41% of players who are female. In terms of playing behaviour, 22% of players play every day, 35% play a "few times" each week, and the remainder play less frequently.

Studies of online video game players also tend to identify a diverse clientele. Griffiths, Davies, and Chappell (2003) surveyed 11,457 players of the popular online video game *Everquest*. Over 60% of the sample was older than 18 years. Over 30% were currently enrolled in secondary or tertiary education, 14% were studying at an undergraduate level, and 2% were studying at a postgraduate level. Of those who were employed, 23% had completed secondary school, 33% had an undergraduate degree, and 9% had a postgraduate degree. While the sample of Griffiths et al. was exceptionally large relative to many population studies conducted in psychology, the total playing population of most online video games can number in the millions. Therefore, it is possible that adolescent players do in fact represent the majority of the player base, but they simply did not take part in the study. Nevertheless, the large number of adults who consistently report to play these video games demonstrates that video games are not an activity exclusively for children and adolescents.

Recent survey and case study evidence suggests that, while male adolescents are at greater risk of developing problems with their computer use, video game addiction is not unique to any particular demographic of users. The introduction of casual puzzle games, portable hand-held games, and online multi-user games has attracted many females to video games. Similarly, the social interaction (via chat, texting, and working cooperatively in groups) facilitated by online video games has attracted a large number of players with no previous experience of playing video games. A significant minority of these users report spending over 35 hours per week on video games and may be at-risk of developing dependency behaviours (Griffiths, Davies, & Chappell, 2004; Grüsser, Thaleman & Griffiths, 2007).

The expansion of the video game user base suggests that researchers should look beyond the adolescent demographic in their investigation of who may be at risk of becoming dependent on computer technologies. As Shotton (1991) commented, "in all generations, there have no doubt been object-centred, shy people who have turned away from human relationships, have subjugated their emotions, and have resorted to solitary activities to find satisfaction" (1991: 229). Adolescents are unlikely to be the only vulnerable group of users who fall into this category. Recent research on video game addiction has begun to identify individuals who 'break' the stereotype of the adolescent player (e.g. Griffiths, Davies, & Chappell, 2003), but further work is needed to determine the incidence and prevalence of clinically significant problems associated with video game play in the broader population.

Are some video games addictive?

The concept of video game addiction is often criticised for its lack of an identifiable object to which players are addicted to in video games (Stern, 1999). By comparison, addictive behaviours such as heroin or cocaine use, and even pathological gambling, have clearly defined objects of addiction with associated neurological reward pathways. Therefore, it has been argued that excessive players of video games simply use video games as a way of coping with underlying psychological problems, such as depression and/or social anxiety. The advantage of this argument is it can explain why only a small number of individuals become addicted to video games and most people do not. That is, video games are not inherently addictive, they simply provide an outlet for emotionally vulnerable individuals to deal with, or perhaps escape from, their real life problems.

Studies in the 1980s suggested that some players form a unique relationship with the video games they play. For instance, Selnow (1984) argued that some individuals are drawn to video games because they provide a sense of companionship, or what he referred to as 'electronic friendship'. His study of 202 adolescent video game players identified a small group of players for whom video games were considered more fun and exciting than being with real life friends. These players preferred electronic friendship because it was easier than managing interpersonal relationships and helped to forget feelings of loneliness.

This work foreshadowed Shotton's observation that computer use was an activity "which could give the distinct impression of providing companionship and partnership, to which even the keeping of pets cannot compare" (1989, 229). While Selnow (1984) described the close relationship between the individual and the video game, he did not fully explore the specific features in video games involved in developing this attachment. In fact, many studies conducted in the 1980s did not even differentiate between distinct types of video games, such as action-oriented games, strategy games, or role-playing adventure games, and how these games may impact differently on playing behaviour.

Subsequent studies of arcade video game machine players in the 1990s began to identify specific features in video games that may influence playing behaviour. In particular, comparisons were often made between video game machines and electronic gambling machines (Griffiths, 1991; Fisher, 1994; Fisher & Griffiths, 1995; Johansson & Gotestam, 2004). For example, both types of machines feature colourful graphics and sound effects, in-game rewards and bonuses for winning moves, digitally displayed scores of correct behaviour, and a rapid span of play negotiable to some extent by the skill of the player. Griffiths even stated that the main difference between the two types of machines is that "video games are played to accumulate as many points as possible, whereas fruit machines are played to accumulate as much money" (1991, 54).

In the last two decades, video game machines have evolved from being 'pay-per-play' machines situated in amusement arcades into much more powerful and compact devices often located in the family living room and connected via the Internet to millions of other such devices. The change in the structural design and aesthetic of video game software has lead to much longer and enhanced playing experiences, with more involving stories and complex rewards, as well as more realistic depictions of violence and other adult material. Research suggests that some video games are more psychologically appealing than others. For example, a study by Ng and Wiemer-Hastings (2005) found that 45% of players of Massive Multiplayer Online Role-Playing Games (MMORPGs) played over 30 hours per week, as compared with 6% of non-MMORPG players. In another study, Wood, Griffiths, Chappell and Davies (2004) surveyed 382 video game players about the structural features in video games that kept them 'hooked' or involved for long periods of time. The results showed that the most important

features were realistic sound, graphics and setting, rapid absorption rate, rapid advancement rate, and being able to save one's progress in the game. These findings suggested that the characteristics of video games themselves could influence the initiation, development and maintenance of video game playing, and by extension, problematic video game playing. Similar observations have been made of 'risky' features in electronic gambling machines, such as the use of jackpots, bonus games, and specialist play features, that can influence some individuals' beliefs about gambling and motivations to gamble (Parke & Griffiths, 2007).

Despite growing research interest in the role of structural characteristics in problematic video game play, until recently there was no framework for conceptualising the variety of features found across the broad spectrum of video game software. To address this limitation, King, Delfabbro and Griffiths (2010a) proposed a taxonomy of video game features, which included: (a) *social features* (i.e. the socialising aspects of video games, such as communication features that facilitate social networking), (b) *manipulation and control features* (i.e. the ways in which a player can interact with and control in-game properties using a physical control scheme and create a sense of mastery and control over the game), (c) *narrative and identity features* (i.e. the ways in which the player can take on another identity in the game and become a part of an interactive storytelling experience, (d) *reward and punishment features* (i.e. the ways in which players are reinforced for skilful play and punished for losing), and (e) *presentation features* (i.e. the aesthetic qualities of a video game, such as how the game looks and sounds to the player). Recent empirical research has begun to examine this taxonomy in more detail (e.g., Westwood & Griffiths, 2010; King, Delfabbro & Griffiths, 2010b).

For instance, in a study of 421 regular video game players, King, Delfabbro and Griffiths (2010b) found that the reward and punishment features, such as earning points, finding rare game items, and fast loading times, were rated by players as the most enjoyable and important aspects of video game play. Using multivariate statistical methods, the researchers found that preferences for certain structural characteristics in games were more strongly related to problem playing behaviour than factors such as gender, age, and time spent playing games. This research, though preliminary in nature, showed that some features of video games may be inherently more psychologically appealing than others to problem players. Understanding the experiential process of problematic video game play, including the relationship that can develop between player and machine, as well as the psychological outcomes of video game playing is important to developing a comprehensive knowledge base on video game addiction. Further research in this area may shed light on the psychological mechanisms that underlie problematic video game playing behaviour.

How do we study video game addiction?

Shotton's (1989) research design involved administering a battery of questionnaires and conducting a series of semi-structured interviews. Her sample had responded to a newspaper advertisement seeking persons who considered themselves to be 'computer-dependent'. This methodological approach is not uncommon in the field of addictions and psychology in general. However, there are a number of limitations of this approach that can affect the overall integrity of the research.

Firstly, the recruitment of participants who are inclined to label themselves as 'dependent' may have introduced a sampling bias toward a particular type of dependent user (i.e., one that is willing to admit that there may be a problem). Additionally, while surveys and interviews often provide highly detailed information, they can be hindered by a number of methodological constraints. These include self-report error arising from participants misestimating the amount of time typically spent playing video games (especially for time-scales such as weeks or months), social desirability bias (i.e., participants wanting to give the appearance of playing

video games in moderation or having control over their playing behaviour), and/or participants' lack of self-awareness of the severity of their problem behaviour and how it affects others. Survey data can be particularly restrictive when the data are obtained at a single point in time rather than longitudinally in a prospective manner. These potential limitations raise concerns not only about the validity of aspects of Shotton's (1989) study, but also the vast majority of self-report survey-based studies conducted on video game addiction to date.

Two recent studies of problematic video game play have utilised innovative research designs to circumvent the limitations of survey-based research. A study by Smyth (2007) randomly assigned 100 individuals with minimal gaming experience to play one of four different video game activities, including arcade, console, solo computer, or online video games. Participants were instructed to play their allocated video game for a minimum of one hour per week, but they could play more if they so chose. Participants' playing behaviour and general disruption to life activities were monitored over a four-week period. Smyth reported that, after four weeks, participants who played the online video game reported the highest weekly hours of video game play, as well as worse health, worse sleep quality, and greatest interference in real life socialising and academic work. Smyth concluded that online video games represent a gaming experience with more negative consequences than other types of video games. While some survey studies had previously highlighted these risks associated with online gaming, this study was capable of monitoring and quantifying these effects prospectively and with greater validity.

A similar study by Weis and Cerankosky (2010) examined the impact of having a video game system in the home environment on young boys' academic and behavioural functioning. The researchers randomly assigned their sample of 64 boys, aged 6 to 9 years, to one of two groups: the experimental condition (video game-ownership) or the control group (no video game). The two groups' academic performance and behavioural functioning (i.e. attention and learning problems) were assessed at baseline and at a four-month follow-up period. The researchers reported no significant change in behavioural functioning in each group, but found that video game-ownership was associated with decreased academic performance in the areas of reading and writing.

While Smyth (2007) and Weis and Cerankosky (2010) did not specifically examine video game 'addiction', their studies provide valuable insights into the process by which excessive video game play behaviour can rapidly develop and have negative consequences for the individual. This work has implications for understanding the onset and early warning signs of addictive behaviour. These studies also demonstrate the merit of using experimental methods to consolidate extant knowledge on addictive behaviour drawn from correlational and qualitative research approaches. There are relatively fewer ethical considerations incumbent on experiments involving the manipulation of video game playing behaviour as compared to other types of addictive behaviour, and the field benefits greatly from statements of causality on the range of potential effects of playing video games.

What are the risk factors for video game addiction?

Some individuals appear to be more susceptible than others to developing problems with their computer use. Shotton (1989) identified early child-caregiver relationships as an important factor in determining an individual's personality traits, including propensity for forming a dependent relationship with computers. Based on in-depth interview data, she reported that authoritative, emotionally distant, and unsupportive parents raised children at risk of developing an attachment to computers to satisfy friendship and self-esteem needs. This observation aligns closely with Jacobs' general theory of addictions, that states the fundamental ingredient for addiction is a childhood and adolescence "marked by deep feelings of inadequacy, inferiority, and a sense of rejection by parents and significant others" (1986,

21). Jacobs speculated that these experiences are likely to lead an individual to engage in activities that facilitate an emotional escape from the stressors of the real world. Over time, the individual becomes dependent on this activity to relieve stress, and arranges other life commitments to revolve (often unsuccessfully) around this activity.

Recent case studies of users of video games and other technologies highlight several other risk factors for problem involvement. The most common risk factors include social isolation, lack of social support, or pre-existing psychological problems, such as depression or social anxiety (Griffiths, 2000; Davis, 2001). An interview study by Chappell, Eatough, Davies and Griffiths (2006) found that some users who move to a new place (i.e. to pursue a new job or attend university) may develop a sudden and intense video game playing habit as a way of maintaining existing real-life friendships or making new social contacts.

However, the positive feelings associated with playing the video game, and the fewer opportunities to engage with others in the real world, can foster the belief that the video game offers the best place available to the player. An individual who spends all of their available time involved in a video game may find it difficult to relate socially to others who do not play the video game. Disengagement from the video game can also create negative mood states that confirm the expectation that time spent away from the game is unpleasant or unrewarding.

Among children and adolescents, risk factors include lack of parental supervision, lack of structured activities in the home environment, lack of access or encouragement to participate in physical activities, and unrestricted access to money to spend on video game activities (Griffiths, 2008). Children with video game machines in their bedroom are also more likely to play video games unsupervised and for more hours each week than those children with supervised and restricted access. In relation to dispositional factors, recent research studies have identified a range of factors linked to increased risk of video game addiction, including neuroticism (Mehroof & Griffiths, 2010), trait anxiety (Rehbain, Kleimann, Mößle, 2010), sensation seeking (Lin & Tsai, 2002), low self-esteem (Colwell & Payne, 2000), and depression (Ng & Weimer-Hastings, 2005). It is thought that these factors moderate the effects of self-regulatory mechanisms on an individual's behaviour.

Future directions

While there have been several innovations in video game addiction research and theory in the last two decades, it is apparent that there exist a number of gaps in current understanding. In particular, there is a need for epidemiological research to determine the incidence and prevalence of clinically significant problems associated with video game play in the broader population. Some small-scale prevalence studies have been conducted in the US and the UK, but there has been no attempt to determine the prevalence of problem video game playing in the Australian general population. There are also few clinical studies that describe the unique features and symptoms of video game addiction. Some studies have investigated the role of structural characteristics of video games in maintaining problem playing behaviour, but there is little empirical research that examines why some individuals may be protected from developing excessive playing habits, or simply 'age out' of their problem playing behaviour.

As a general observation of the psychological literature on video games, it may be argued that there has been a distinctly 'negative' slant, emphasising the harmful aspects of video game playing, such as increased aggression or risk of addiction. Researchers should consider some of the possible benefits of playing video games, such as improved mental health and well-being, increased opportunities for social interaction, and enhanced cognitive development. Shotton's (1989) study reported that computer-dependent individuals tended to be highly intelligent, independent, interested in science and philosophy, practically minded, and effective problem-solvers. Unfortunately, empirical investigation of these positive attributes and experiences

associated with video game playing has, with some rare exceptions, been largely neglected (Durkin & Barber, 2002; Green & Bavelier, 2003; Subrahmanyam, Greenfield, Kraut, Gross, 2001).

Conclusion

Since Shotton's (1989) pioneering study of computer dependency, a number of advancements have been made in the field of video game addiction. However, this research area is still in its infancy and several gaps in the knowledge base currently exist. Nevertheless, the available literature is useful in returning to the question posed at the beginning of this paper: "Are contemporary anxieties about the amount of time some individuals spend using computer technologies justified?"

At the conclusion of Shotton's study, it was reported that, far from being emotionally fragile, 'dependents' were in fact intelligent individuals empowered and personally fulfilled by their computer use. In this sense, Shotton's use of the term 'dependent' appears, on reflection, to be an inaccurate characterisation of these individuals and their relationship to computer technology. The extant psychological literature on video game play suggests that it is now quite common (i.e. normal) for individuals to spend 20 hours per week or more playing video games. Many players (although not the majority) are female, university-educated, and employed on a full-time basis. Some individuals may be classified, according to certain criteria, as 'addicted' to video games, and these individuals deserve a measure of sympathy and attention from the health community.

However, empirical evidence shows that the majority of individuals appear to experience little to no disruption to their psychosocial functioning from playing video games. As compared to other addictive behaviours, as well as many other known causes of psychological distress, an involvement in video games appears to pose relatively few risks to a person's health and psychological well being. The lack of research attention on the positive aspects of video game playing also leaves open the possibility that, to paraphrase Shotton (1989), the potential for harm resulting from video game play may be outweighed by the many positive aspects of the activity.

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