

The conceptualisation, status and measurement of technology-based gaming  
behaviour and its correlates

Daniel King, BPsych (Hons)

School of Psychology, University of Adelaide

A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

August, 2009

## TABLE OF CONTENTS

Chapter 1	Introduction and literature review	9
Chapter 2	Exegesis	28
SECTION A: CONTRIBUTION TO THEORY		
Chapter 3	Paper 1: The role of structural characteristics in problem video game playing: A review	44
Chapter 4	Paper 2: Video game structural characteristics: A new psychological taxonomy	65
Chapter 5	Paper 3: The psychological study of video game players: Methodological challenges and practical advice	98
SECTION B: CONTRIBUTION TO RESEARCH		
Chapter 6	Paper 4: Understanding and assisting excessive players of video games: A community psychology perspective	116
Chapter 7	Paper 5: Preliminary validation of a new clinical tool for identifying problem video game playing	142
Chapter 8	Paper 6: Motivational differences in problem video game play	173
Chapter 9	Paper 7: The general health status of heavy video game players: Comparisons with Australian normative data	197
Chapter 10	General conclusion	220
	References	239
	Appendices	267

**NOTE: Chapter numbers are incorrect in  
the main body of the thesis**

## SUMMARY

The present thesis examined the psychological mechanisms of excessive involvement in video games. Through seven manuscripts, including four studies, this thesis has made a contribution to theory and research in an emerging field of technology-based problem behaviour.

In Paper 1, it was argued that the structural characteristics of video games may play a significant role in initiating, developing and maintaining problem video game playing behaviour. The paper noted the lack of quantitative data in this area of research and highlighted the need for theoretically driven research comparable to research on gambling machines.

In Paper 2, a new psychological taxonomy of video game features was proposed, including: (a) social features, (b) manipulation and control features, (c) narrative and identity features, (d) reward and punishment features, and (e) presentation features. The taxonomy was designed to refine the traditional psychological view of video games and guide further research projects.

In Paper 3, the methodological challenges associated with studying video game players were discussed. These challenges included *player-specific factors*, *researcher-specific factors*, and *external factors*. The paper also offered practical advice for researchers in the field of video game play to ensure the practice of ethical and efficient research.

In Paper 4, it was argued that the psychosocial context of video game play may influence problem play behaviour. Thirty eight participants were interviewed. Results showed that video games provide a sense of self-worth and status, emotional safety, a sense of belonging, and personal investment through in-game rewards.

In Paper 5, a new measurement tool of problem video game play, the Problem Video Game Playing Test (PVGTT) was developed. Drawing on two

data sets ( $N_1 = 373$ ;  $N_2 = 416$ ), this paper presented the internal consistency, score distribution, dimensionality and convergent validity of the PVGT. It was concluded that the PVGT demonstrated potential as a continuous measure of problem video game playing.

In Paper 6, the motivations which underlie video game playing were examined. Three hundred and ninety-nine participants were surveyed. It was found that, consistent with gambling research, problem playing is associated with extrinsic motivation factors, including introjected regulation, identified regulation and external regulation.

In Paper 7, the general health status of heavy video game players was examined. It was found that those individuals who reported playing over 30 hours per week scored lower on measures of physical functioning, mental health, vitality, general health and social functioning than normal Australian adults. They also did not meet the national guidelines for weekly physical activity and report some sleep difficulties.

It is concluded that the present thesis provides both a theoretical and empirical account of (i) the psychological mechanisms that drive problem video game playing, and (ii) the consequences of this excessive behaviour. The presented manuscripts provide the necessary foundation for numerous further research projects in this developing field of technological addiction.

## DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material which has been accepted for the award of any other degree or diploma of a university or other institute of higher learning, except where due acknowledgement is made in the body of the text.

I give consent to this copy of my thesis when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968.

The author acknowledges that copyright of published works contained within this thesis (as listed on the next page) resides with the copyright holder(s) of those works.

---

Daniel King

Signed: \_\_\_\_\_

Date: 28/08/09

## LIST OF PUBLICATIONS

- King, D.L., & Delfabbro, P.H. (2009). Motivational differences in problem video game play. *Journal of Cybertherapy and Rehabilitation, 2*, 139-149.
- King, D. L., & Delfabbro, P. H. (2009). The general health status of heavy video game players: Comparisons with Australian normative data. *Journal of Cybertherapy and Rehabilitation, 2*, 17-26.
- King, D. L., & Delfabbro, P. H. (2009). Understanding and assisting excessive players of video games: A community psychology perspective. *Australian Community Psychologist, 21*, 62-74.
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2009). The psychological study of video game players: Methodological challenges and practical advice. *International Journal of Mental Health and Addiction, 7*, 555-562.
- King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2009, in press). Video game structural characteristics: A new psychological taxonomy. *International Journal of Mental Health and Addiction*.
- King, D. L., Delfabbro, P. H., & Zajac, I. T. (2009, in press). Preliminary validation of a new clinical tool for identifying problem video game playing. *International Journal of Mental Health and Addiction*.

## ACKNOWLEDGEMENTS

It is a pleasure to thank the many people who made this thesis a reality.

It would be difficult to overstate my gratitude to my primary supervisor, Dr. Paul Delfabbro. Throughout my candidature, he has been there to nudge me helpfully (and never intrusively) in all areas of my reading, writing, and thinking to become a better academic. With his enthusiasm, candidness, encouragement and sense of humour, he provided not only invaluable feedback on virtually all thesis undertakings but also good company and support. Simply put, the project would have been impossible without him.

I am indebted to Professor Mark Griffiths, for his helpful comments and contributions on multiple manuscripts in this thesis. Our discussions on addiction theory and research in relation to video game technologies were a formative influence in framing the position of the thesis. I have valued his wisdom and humility, his scholarly attention to detail, and the promptness of his feedback that defied our vast geographical distance.

I would like to thank Mary Claire, my wife, who I married in the final months of my candidature. Her support for this thesis over the years can be measured out in thousands of heartening smiles, gentle questions, as well as hot cups of coffee and “treats”. In other ways, her loving support cannot be measured.

There are many who have kindly assisted with data collection in their own way, including Bob Wilson and Lynda Klopp in the School of Psychology, Peter Robson at St. Philip’s College, Paul Utry and the organisers of Valhalla, StreetGeek, Air-Stream Wireless and Overclockers for allowing me special access to survey their patrons. I am sincerely grateful to the hundreds of



participants who responded so enthusiastically and gave their time to the research.

A number of individuals provided significant input on thesis manuscripts. Above all, I would like to thank Ian Zajac for sacrificing time spent on his thesis project to assist me with my own, and always doing so with pragmatism, patience and good humour. Daniel Loton, Jordon Roberts, and Ryan Balzan have also lent a critical eye to various papers and I have appreciated their honest feedback.

Many friends and family members have offered support, in various forms, throughout my candidature. Never underestimate the value of a simple question. Paradoxically, they are often the most difficult to answer.

I want to give special thanks to my parents for supporting me unconditionally in my decision to study at university, and for the support of many years of study that followed that decision. They nurtured my love of knowledge since I was very young, turning a blind eye to the light spilling under the door past bedtime, and instilled the important value of always doing one's best in every pursuit in life.

Lastly, and most importantly, I would like to dedicate this thesis to the memory of my grandfather, Maxwell Dorsett Slade, who passed away on 15/05/2006, during the undertaking of this thesis. Much of his youth was spent in foreign places fighting for our country, without the ones he loved. I dedicate this thesis to him as a heartfelt gesture of appreciation and respect.

## Chapter 1. Introduction and literature review

### *Overview*

The present thesis examines excessive involvement in video games by attempting to measure the phenomenon and examine its correlates. The research program was broad in its focus and led to a series of four studies that are presented in five papers. In addition, a review of the literature and a specialised paper on methods were produced. In total, five of these papers have been published in peer-reviewed journals. The thesis is therefore centred upon these seven papers, which have been presented as chapters in manuscript typeset. These papers have also been book-ended with chapters providing broader context and discussion relevant to the research program as a whole.

Chapter One, the present chapter, provides a summary of the literature related to the field of problem video game play and, broadly, the area of behavioural addiction. Additional information related to the prevalence of video game playing including normative playing data is presented to contextualise the discussion on excessive video game playing patterns. It should be noted that Chapter 2 presents an additional review of literature and therefore the content of this chapter is not repeated in this chapter.

Chapter Two provides an exegesis for each of the seven manuscripts, including the reasoning that links each paper to the next. This chapter also provides a range of information that was outside the scope of the published papers. Some of this information relates to the acknowledgement of various biases that can enter into psychological research on video game playing,

including the significant amount of discourse on the negative aspects of video game within the popular press.

Chapters Three, Four, Five, Six, Seven, Eight, and Nine contain the seven manuscripts together with statements outlining the respective contributions to the papers. These chapters have been presented in two major sections, Section A titled “Contribution to Theory” and Section B titled “Contribution to Research”, to signify that some of the papers deal primarily with matters of theoretical importance, whereas others are intended to contribute to the empirical literature. The manuscripts have been reformatted to match the typeset for the thesis.

Chapter Ten, the final chapter, provides a summary of the findings and a concluding discussion based upon the outcome of the research program as a whole.

Before commencing a review of the literature, it should be noted that each of the succeeding chapters contain short reviews of the literature relevant to the topic of study within that chapter. For this reason, this review endeavours to avoid repeating information that is presented in subsequent chapters. Where applicable, the review will direct the reader to the appropriate section for further reading.

#### *Video game playing: Demographic and playing factors*

The purpose of this section is to overview the literature on the general demographic and playing profile of video game players in order to contextualise later discussion on the subject of excessive video game playing as a problematic activity in its own right. This review is not intended to be

exhaustive; rather, it aims to present a representative cross-section of the research that has been carried out in the last three decades.

A national study by Brand (2007) stated that 79% of Australian households have a device for playing video games. In terms of player demographics, the report stated that the average age of Australian players is 28 years, including 8% of players who are over the age of 55 years, and that 41% of all players are female. In terms of playing patterns, the report stated that 22% of players play every day, 35% play a “few times” each week, and the remainder play less frequently. The report stated that individuals most commonly report playing for an hour (34%), followed by two hours (23%), and half an hour (22%). In summary, Brand argued that: (a) the video game playing population in Australia is demographically diverse, and (b) video game playing in general is a relatively minor leisure activity in terms of the amount of weekly time it occupies in comparison to other pastimes.

Whilst Brand’s research had a number of strengths, including its random sampling method and large national sample ( $N = 3,386$ ), it could be argued that the research in its choice of analysis may have overlooked a segment of players who spend significant periods of time playing video games. In particular, the report does not present data related to total hours spent playing each week, with associated data on the demographic, educational, vocational and general lifestyle profile for those individuals who play very frequently. It is possible that a high-end playing group would not fit within the reports’ conclusions that video game playing in Australia is (to paraphrase p. 2 of the report) “beneficial, educational, fun, relaxing, socialising, and skill-enhancing”. The fact that Brand’s report was funded by Interactive Australia, an organisation sponsored by various video game

publishers and developers like Sony, Nintendo and Microsoft may suggest that identifying high-end users of video games (i.e., including those individuals who may play “excessively”) was outside the parameters specified by the sponsors of the research (See Chapter 5 for a discussion on industry perceptions of psychological research). The report’s focus on a normative depiction of video game playing in Australia does not discredit the general findings of the report. However, this focus may have disguised a particular segment of the playing population: individuals who play video games for excessive periods of time to the detriment of their physical, social and psychological well-being.

In the last three decades, many psychological studies have obtained demographic and playing information about video game players. The impetus for this research was concern expressed by clinicians, educators and parents that some adolescents may be playing video games for excessive periods (Egli & Meyers, 1984; Emes, 1997; Gunter, 1998; Griffiths, 2000a; Shotton, 1989; Suler, 2004a). One of the first studies was conducted by Egli and Meyers (1984), who identified 13% of their sample of 151 adolescents as “heavy” video game users. They reported that heavy players sacrificed the buying of food, clothes, and cinema visits, as well as sporting activities, in order to play arcade video game machines. This initial observation of “excessive” play was followed up by a number of research studies of young players, mainly for confirmation purposes but also to discern, if possible, a specific demographic profile that characterised excessive players.

A study by McClure and Mears (1984) reported that, in a sample of 336 secondary school students, 26% used part or all of their lunch money to finance video game playing. Selnow’s (1984) study of 202 adolescent video

game players identified three different types of players: “heavy”, “moderate” and “light”. Light players typically visited an arcade less than once per week, played for less than half an hour, and spent on average \$1.50 per visit. Heavy players, by comparison, typically visited an arcade three times per week, played for three hours, and spent \$3.00 per visit. Similarly, Morlock, Yando, and Nigolean (1985) surveyed 117 undergraduate students, 44 male and 73 female, about their involvement in video games. In their analysis, they distinguished two types of players: “frequent” and “infrequent”. A frequent player was defined as a player who reported playing video games from one to five times in a typical week, whereas an infrequent player did not play in a typical week but reported having played between two to nine video games in the previous year. A study by Graham (1988) reported that 41% of 980 adolescent players spent half or more of their weekly income on arcade video game machines, and 26% played arcade video games once a week or more. In each of the above studies, players were generally reported to be White, male, and aged between 11 and 17 years.

Studies in the 1990s often conceptualised excessive video game play as a psychological problem similar in form to problem gambling. In Fisher’s (1994) study of 467 secondary school students, she found that 6% ( $n = 28$ ) could be classified as “pathological” players. Pathological players tended to spend more money per week on video games, as well as borrow money almost twice as frequently to play video games, than non-pathological players. In their study of 228 adolescents, Abbot, Palmisano and Dickerson (1995) defined “excessive” players as those who spent more than four hours per week in arcades, spent \$16 or more per week, visited arcades seven or more times per week.

Research has also been conducted on video game playing outside of the arcade environment. Phillips, Rolls, Rouse, and Griffiths (1995) investigated the home video game playing patterns in 429 males and 387 females in a population of 11 to 16 year olds. Of the respondents questioned, 77% played video games. The most common pattern of play was “daily” (31% of the sample), with the majority of respondents playing between one half and one hour per day. Males spent significantly more time playing in a usual sitting than females. Phillips et al. identified an “addicted” subgroup of 50 children (8% of the sample) who (a) played on six or more days per week, (b) played for more than one hour at a time, (c) felt that they played longer than they intended, and (d) reported neglecting homework to play. The majority of this subgroup was male (74%). A study by Griffiths and Hunt (1995) examined 387 adolescents, aged between 12 to 16 years. They found that 27% of respondents played only once a month or less, 8% played once a week, 19% played more than once a week, 15% played four to five times a week, and 31% played on a daily basis. In terms of duration of play in a typical sitting, 10% of respondents played for less than half an hour, 23% played for less than an hour, 33% for played for one to two hours, 18% played for two to three hours, 8% played for three to four hours, and 10% played for over four hours. The researchers reported that 7% of their sample played video games for over 30 hours each week.

In the last decade, there has been speculation among researchers that individuals tend to spend more time playing online video games than stand-alone, offline games. In addition, players of online games tend to be more diverse demographically in comparison to early studies of arcade machine players. Griffiths, Davies, and Chappell (2003) surveyed 11,457 players of the

popular online video game *Everquest*. In contrast to earlier studies, over 60% of the sample was older than 19 years. Thirty-three percent of the sample was 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. In terms of income, 21% of respondents earned less than \$35,000 a year, 20% earned between \$35,000 and \$60,000 a year, and 14% earned over \$60,000 a year. In terms of playing time, 8% of participants played for less than 10 hours per week, 25% played between 10 and 20 hours per week, 25% played between 21 and 30 hours per week, 18% played between 31 and 40 hours per week, 9% played between 41 and 50 hours per week, and 15% played over 50 hours per week.

Further studies have replicated this demographic profile of online video game players. Yee (2006b) surveyed over 30,000 users of MMORPGS, reporting that the average player spends 22 hours per week. In one of his online studies, over 20% of his sample reported spending over 30 hours per week playing an online game. A study by Ng and Wiemer-Hastings (2005) similarly found that 45% of players of MMORPGs played over 30 hours per week, compared with 6% of non-MMORPG players. A study by Griffiths, Davies, and Chappell (2004a) reported that 431 respondents were male (81%) and 99 were female (19%). The mean age of their sample was 27.9 years ( $SD = 8.7$  years), with 33% over the age of 31 years. As with previous studies of online players, 23.9% of respondents reported playing over 30 hours per week.



In summary, the early psychological literature suggested that heavy arcade machine players were typically adolescent males. However, the advent of online video games in the home environment has seen the demographic profile of heavy video game players become more heterogeneous. In particular, it appears to be quite common (i.e., “normal”) for individuals who play video games to be aged over 25 years and to play for over 20 hours per week. Many of these players (although not the majority) are female, university-educated and employed full-time. These observations should be kept in mind when considering the conceptualisation of excessive video game playing as a “problem” activity.

#### *Types of video games*

It has been suggested that patterns of video game playing vary depending on the type of video game played. In particular, it has been noted that the most frequent playing patterns have been observed among players of Massively Multiplayer Online Role-playing Games (MMORPGs) (Ng & Wiemer-Hastings, 2005). These video games differ from other types of games in that they feature a large interactive game world shared by hundreds, even thousands, of other players and the game itself has no endpoint. There have been numerous attempts to classify the many types of video games and explain their impact on the playing experience. For a full review and discussion on video game types and structural characteristics and how they influence the game playing experience, see Chapters 3 and 4.

### *Problem video game playing: similarities to gambling*

Many researchers have noted the similarities between video game arcade machines and gambling slot machines (Fisher, 1994; Griffiths, 1991a, 2005c; Johansson & Gotestam, 2004). Given these similarities, it has been argued that problem involvement in video games resembles problem gambling. For further discussion on the similarities between video games and gambling, see Chapter 7.

### *Video game playing as an addiction*

Recently there has been some debate among the health sciences community as to whether behaviours that do not involve the ingestion of a substance of some kind can be considered as being “addictive”. Repetitive, non-chemically driven behaviours such as excessive shopping, exercising, Internet use, sex (hypersexuality), or stealing (kleptomania) are said to fall into the category of “behavioural” addiction (Orford, 2001). Typically, these problem behaviours are treated as less serious clinically than traditional, chemical addictions like heroin abuse (West, 2006). To date, pathological gambling is the only recognised behavioural addiction within the DSM-IV, although it should be noted that it is classified as an “impulse disorder” rather than an addiction. Griffiths (2008e) has argued that, if the clinical nomenclature can accept problem gambling, then there is no logical reason why it cannot accept other problem behaviours. On the other hand, Shaffer, Hall and Vander Bilt (2000) have argued that repetitive, problem behaviours should not be classified as “addictions” unless the behaviour cannot be explained using existing clinical diagnoses.

It has been argued that it may be premature to consider behavioural addictions as legitimate primary disorders. With specific regard to video game addiction, Wood (2007) has claimed that this so-called addictive behaviour may be the consequence of other clinical problems like depression or obsessive compulsive disorder. According to Walker (1989), addiction involves a person forming a dependant relationship with a chemical substance. Jaffe (1990) has argued that the notion of behavioural addiction trivialises the concept of dependence because there is no chemical substance involved. Accordingly, the purpose of this section is to overview some of the key theories and positions on behavioural addiction, including the ways in which excessive video game playing has been conceptualised as a problematic activity in its own right. It will be evident that much of the debate concerning the “behavioural” addictions, far from representing a denial that many individuals experience adverse consequences as a result of excessive involvement in an activity, hinges upon a general disagreement regarding the definition of “addiction” and the ways in which this definition should be expanded to apply to any given behaviour.

#### *History of the term “addiction”*

The term “addiction” originated from the Latin term *addicere*, meaning to be legally given over to somebody as a bond-slave, or, more broadly, to have given oneself over to somebody or something. The traditional meaning of addiction became compressed during the 19<sup>th</sup> and 20<sup>th</sup> Century, as the term became associated solely with drug use as a form of disease. In the 21<sup>st</sup> Century, Alexander and Schweighofer (1988) argued that addiction refers to the lifestyle of a person who has given himself or herself over to any pursuit

leading to harm. He adds that, whilst this general use of the term is common within the popular press, the term addiction is often dismissed as metaphorical, confused and imprecise by those in the addictions field. Davies (1992) has argued that addiction is a “myth” (i.e., it does not actually exist) but the term serves a number of important functions within society, to the mutual benefit of addicted persons and those around them.

*Addiction: Some clinical definitions*

There have been a number of attempts to operationalise the term “addiction” in the fields of psychiatry and psychology. A recent review by West (2006) reported that there are at least 65 separate theories of addictive behaviour, with their own corresponding definitions of addiction. Recognising these diverse approaches to addiction, Vaillant (1982) suggested that, instead of seeking a strict operational definition, addiction should be thought of as a mountain or a season: something that we know when we see it. It is beyond the scope of this chapter to present each and every theory of addiction in its entirety, including an analysis of its advantages and disadvantages.

Therefore, the following section will present a relatively brief series of definitions and/or models of addiction in order to demonstrate the breadth of the literature on this subject, before introducing the theoretical position that has been adopted in this thesis.

Walker (1989) argued that addiction is primarily characterised by two physiological processes: tolerance and withdrawal. Tolerance refers to the process that involves more and more of the addictive substance being consumed to achieve the same effects. Withdrawal refers to a syndrome of

uncomfortable bodily reactions which occur when the drug is not used. Walker defined addiction as

“a persistent behavioural pattern characterised by a desire or need to continue the activity which places it outside voluntary control; a tendency to increase the frequency or amount of the activity over time; psychological dependence on the pleasurable effects of the activity; and, a detrimental effect on the individual and society” (p. 179).

Marks (1990) argued that addiction can be divided into a number of key behaviours, including: (a) repeated urges to engage in a particular behavioural sequence that is counterproductive, (b) mounting tension until the sequence is completed, (c) rapid but temporary switching off of the tension by completing the sequence, (d) gradual return of the urge over time, (e) external cues for the urge unique to the particular addictive syndrome, and (f) secondary conditioning of the urge to both environmental and internal cues.

Goodman (1990) stated that addiction is a process whereby a behaviour, that can function both to produce pleasure and to provide escape from internal discomfort, is employed in a pattern characterised by: (a) recurrent failure to control the behaviour (powerlessness), and (b) continuation of the behaviour despite significant negative consequences.

Some of the concepts within the above mentioned definitions are presented together in the six-factor “components” model of addiction (Brown, 1997). This model conceptualises addiction as consisting of the following features: (a) salience, meaning the activity is the most important thing in the person’s life, which causes preoccupations and cravings at all times of the

day, (b) tolerance, the process whereby the person must spend increasing amounts of time engaged in the activity to achieve former mood-modifying effects, (c) withdrawal, the unpleasant emotional state or physical effects that occur when the activity is suddenly discontinued or reduced, (d) relapse, the tendency for repeated reversions to earlier patterns of use, and for even extreme patterns of use to be restored quickly after periods of abstinence or regulation, (e) mood modification, the subjective experience (e.g., an exciting “buzz” or tranquilising “numbing”) associated with engaging in the activity, often seen as a coping strategy, and (f) harm, the conflict between the user and those around them, including work, school, social life, or hobbies.

Charlton (2002) reported that the components model of addiction can be applied to computer-related behaviour. He conducted a study of 404 undergraduates using a checklist of problem behaviour based on the components model of addiction. Factor analysis of the items revealed a two-factor structure, comprising of “engagement” and “addiction”. Charlton argued that some of the components of addiction, specifically salience, tolerance and euphoria, are not unique to addiction and also indicate “high engagement” in an activity. Therefore, he cautioned that attempts to measure video game addiction using these criteria may overestimate the number of people addicted to video game activities.

*Addiction: Distal contributory causes*

Problem behaviour primarily concerns the relationship between an individual and the addictive object or activity (Shaffer, 1996). However, it has been recognised that abnormal behaviour is also initiated, developed and maintained by distal contributory causes. For example, it has been suggested

that factors such as social isolation, lack of social support, or pre-existing psychological conditions can increase the risk of addictive behaviour (Davis, 2001). These factors alone do not cause addiction, but they have been shown epidemiologically to increase the risk of addiction (Kraut et al., 1998). It has been suggested that distal contributory causes for video game addiction among youth include lack of parental supervision, lack of structured activities in the home environment, lack of access and encouragement to participate in physical activity, and access to money to spend on video game activities (Griffiths, 2008f).

#### *Opponent-process model of addiction*

The opponent process model describes the positive and negative affective processes that underlie addiction (Solomon & Corbit, 1973). The model proposed that the central nervous system works to maintain hedonic balance. The primary process (termed the “a-process”) for the hedonic drug effect is aroused by an addictive stimulus. An opponent loop generates a secondary “b-process”, which has the opposite effect to the hedonia aroused by the stimulus. This opponent process becomes strengthened by repeated use of the stimuli and weakened by disuse, although the primary affective process is not affected by use. Therefore, over time, the effects of the b-process will increase in magnitude, creating intense stressful and aversive emotional states following the sudden termination of pleasurable inputs. In summary, the theory states that addiction represents a hedonic misbalance that occurs when internal reward processes are distorted by repeated drug use and drug-induced increases in reward threshold result in compulsive self-administration.

### *Addiction as rational choice*

A number of addiction theories consider addiction as a rational economic process based on viewing addictive objects as “goods” with associated costs and utility. Becker and Murphy (1988) proposed an economic model of addiction that is based on the idea of stable rational preferences. In their theory, rationality is defined as a “consistent plan to maximise utility over time” (p. 675). Addiction manifests as an increase in consumption of a good as a result of past consumption. According to Becker and Murphy, addicts are mostly rational consumers who plan ahead and behave in a way that maximises utilities. Other important facets of this economic approach to addiction include the availability and accessibility of the addictive object, the proximity of the supply chain to the individual and the extent to which the activity is legalised and promoted to the population at large (Griffiths & Delfabbro, 2001). However, this perspective has been criticised by clinicians for its failure to acknowledge that addicts often report an inability to control their behaviour. Further, this approach overlooks the desire among many addicts to minimise their addictive behaviour due to the long term harm it has caused them.

### *Addiction as excessive appetite*

Orford (2001) argued that addiction may be conceptualised as the maladaptive exercise of satisfying an excessive appetite. In his model, addiction can be explained in terms of an appetite for certain experiences or stimuli. The initial pleasure experienced towards the addictive stimulus can develop into a lack of control if the individual has a certain degree of need for it. In this sense, addiction is viewed as “appetitive consumption”. Orford



claimed that there are two ways in which normal consumption can escalate into uncontrollable levels of consumption. First, he posited the law of proportionate effect, which states that the appetite will escalate when the individual perceives the rewards of the activity to be relatively great and the restraints to be relatively weak. Second, he argued that the individual develops a strong attachment to the addictive object over time, which provides a secondary emotional cycle to the appetitive behaviour. This theory has been criticised for its emphasis on description over explanation.

### *Cognitive-behavioural approach to addiction*

A cognitive-behavioural approach to addiction posits that problem behaviour stems from faulty cognitions coupled with behaviours that either intensify or maintain the maladaptive response (Sharpe & Tarrrier, 1993). Among problem gamblers, for example, it has been argued that gambling behaviour is maintained by the irrational beliefs that they can win money from gambling, or “beat the odds” (Ladouceur & Walker, 1996). Faulty cognitions may include a negative or distorted evaluation of one’s self or situation, (i.e., “I am worthless at everything I try” or “There is no way I can overcome this problem”) leading to an emotional response such as psychological distress or anxiety. The individual then engages in an addictive behaviour that that has been conditioned to alleviate this emotional distress. In this sense, the approach views addictive behaviour as a behavioural process initiated and maintained by the individual’s maladaptive cognitions, assumptions and inferences, rather than viewing behaviour as influenced directly by external stimuli.

### *General theory of addictions*

In his general theory of addictions, Jacobs (1986) proposed a two-factor theory of necessary predisposing factors for all types of addictions. The first factor involved the resting state of physiological arousal. Jacobs argued that the addiction-prone individual is either chronically over-aroused or under-aroused at any given time. Thus, there is considerable stress upon the individual to alleviate this condition by altering their physiological arousal level, either by doing something relaxing or exciting. However, an abnormal resting state is not sufficient alone. The second factor is a childhood and adolescence “marked by deep feelings of inadequacy, inferiority, and a sense of rejection by parents and significant others” (p. 21). Jacobs stated that these experiences are likely to lead the individual to engage in wish-fulfilling fantasies which provide relief from the reality of the real world. The addictive activity is pursued on a continuing basis to aid the individual in coping with his or her stressful situation.

### *The Position of this Thesis*

This brief review has shown that the term “addiction” has a number of different meanings. There is also some contention as to whether non-chemical addictions, such as addiction to video games, represent a valid conceptualisation of repetitive problem behaviour. Griffiths (2008b) has argued that an individual is addicted to an activity when he or she meets all of the criteria specified within the components model of addiction. Specifically, an addicted individual is someone who: (a) perceives the addictive activity as the most important thing in their life and is preoccupied with thoughts of the activity at most times of the day, (b) engages in the activity to alter his or her

mood state and suffers negative psychophysical effects if removed from that activity or less time is spent on that activity, (c) needs to engage in the activity for increasingly longer periods of time, (d) attempts to reduce or abstain from the activity and fails, and (e) experiences conflict or harm, both personal and interpersonal, as a direct result of his or her involvement in the activity.

Griffiths (2008b) states that very few people meet all of the criteria for psychological addiction. However, a significant number do experience problems associated with their involvement in an addictive activity (i.e., they meet some, but not all, criteria for addiction). In relation to video game players, he suggested that between 5 and 10% of players are “problem” players (depending on the type of playing population), but less than one percent could be considered “addicts”.

The position of this thesis is that video game playing may be considered along a continuum from healthy to problematic behaviour. The majority of people who play video games are infrequently involved and for whom video games represent a temporary diversion. However, there is also a subgroup who may be termed healthily obsessed with video games, spending over 25 hours per week playing games, and for whom video game playing regularly adds something of intrinsic value to their lives. Charlton and Danforth (2007) referred to this group as “highly engaged”. Finally, there is another subpopulation that experiences a variety of problems, to varying degrees, as a result of their involvement in video games. In some rare cases, individuals may be considered as addicted to video games by meeting all of the criteria within the components model. However, it should be acknowledged that the long standing association between the term addiction and chemical dependency does raise some legitimate concerns that the term

may be linguistically inappropriate. For further discussion on the validity of the concept of video game addiction, see Chapter 8.

Shaffer (1996) has argued that addiction represents the confluence of biological, psychological, and social forces. Thus, in terms of explaining addictive behaviour, it is the contention of many theorists that the best way to conceptualise addiction is the “biopsychosocial” approach (Griffiths & Delfabbro, 2002). This approach states that the complexity of addictive behaviour should not be reduced to any single explanatory factor, but rather attributed to a host of contributing factors. Whilst this approach may be criticised for its lack of parsimony, this weakness is compensated for by its utility in offering a complete explanation of addiction and, in doing so, guiding numerous therapeutic strategies.

The subsequent chapter, the exegesis, will present in greater detail the broad aims of the thesis, including the specific research questions and underlying rationale for each of the seven manuscripts.

## Chapter 2. Exegesis

### *Preamble*

The broad rationale for this thesis originated from my general interest in the rapid and widespread adoption of video game technology in Western society. Specifically, I had formed an interest in the psychological study of video game players, including the investigation of what attracted people to playing video games, and the social, psychological and situational factors which maintained player involvement in the activity over time. Like other popular media pastimes, such as watching television and reading comic books, it had been documented that a minority subgroup of video game players were engaged in the activity up to 50 hours per week. This had sparked a debate in educational, clinical and public media forums on whether this level of involvement in video games represented a healthy obsession or a threat to a person's social stability, physical health and emotional wellbeing.

In support of the "video games as harmful agents" argument, anecdotal reports had described in vivid detail the powerful appeal of video games as a form of escape from real life, and the negative effects of excessive video game use, including broken marriages, lost jobs, and social alienation. In both the academic literature and media reports, there had been numerous arguments put forward that video games may be as "addictive" an activity as gambling. My conversations with friends and colleagues, parents and children, teachers and high school and university students appeared to support the idea that a growing number of individuals led highly media-saturated lifestyles and prioritised time spent in the pursuit of electronic

entertainment. The stereotypical “problem” video game player was often described as a single young male who used disposable time and income to cocoon oneself in a virtual game world to avoid the incumbent responsibilities of the real world. In other versions of the stereotype, the player had lost control over his or her playing time in a similar fashion to the archetypal addict common in Alcoholics Anonymous’ *Big Book*-style addiction narratives. All of this information prompted a number of research questions: Does video game “addiction” actually exist? Does this addiction assume a similar form to other behavioural addictions like gambling? How should video game addiction be conceptualised and measured? What are the aetiological factors underlying video game addiction?

The answers to these questions were not simple. The questions were inextricably related to each other. For example, a person’s perspective on how excessive video game play should be conceptualised as a problem behaviour directly informed how the behaviour should be measured empirically. Thus, it was soon apparent to me upon reviewing the extant psychological literature that the concept of video game “addiction” was fraught with numerous theoretical and methodological difficulties. The two main limitations of the literature were the lack of a clear theoretical model to conceptualise problematic involvement in video games, and the lack of a measurement tool to quantify the phenomenon and gain accurate insights into its prevalence. The first limitation (lack of theory) was rooted in both the shortage of models to explain problematic video game play specifically, and a resistance among some theorists to acknowledge the problem as being “unique”. The second limitation (lack of measurement) followed on as a direct

result of the first. In summary, whilst the notion of technology-based addictions (including addiction to the Internet, mobile phones and video games) had been eagerly endorsed by the popular press and television media as an emerging societal problem, there was certainly less consensus among theorists in psychology as to the formal clinical status of the phenomenon.

There were also barriers to studying problematic video game play that existed outside of academic circles, largely due to the controversy that video games have attracted in the last three decades. On the one hand, the video game industry is highly profitable and the popularity of video games continues to draw a worldwide audience measured in the hundreds of millions.

Education experts have praised the video game medium for its potential in the classroom. New media critics have praised some video games as interactive storytelling works of art. On the other hand, legislators have sought to ban certain video games because of the explicit content they contain. Activist groups have attempted to link violent content in games to school shootings and other antisocial and criminal behaviours among youth. Video game developers and members of the video game playing community have responded that adults should be free to engage in whatever material they choose to in the privacy of their own home. The list goes on.

These various issues and perspectives on video games have raised a general moral question: Are video games “good” or “bad” for society? Obviously, there is no objective answer to this question. The relevant point is that a researcher in the field of video game addiction must be aware of and attempt to minimise the influence of these competing interests and

perspectives on video games to remain objective as a researcher. As Griffiths and Wood (2000) have stated:

Whether video games are inherently “good” or “bad” is not the relevant question. The question we should be asking ourselves is what the longitudinal effects of any activity that takes up 30 hours of leisure time a week has on educational, health, and social development of children and adolescents.

As it has been stated, this thesis originated from a series of observations that some individuals appear to be negatively affected in a range of life areas as a consequence of excessive involvement in video games. Having reviewed the literature on video game addiction and the broader subject of behavioural addiction, including gambling, it was my intention to: (i) make a contribution to current understanding of the psychological mechanisms which underlie problem video game play, and (ii) develop a tool that could quantify aspects of problem video game play as well as identify its motivational and health-related correlates. Put simply, it was my intention to develop a number of theoretical models related to video game addiction, as well as carry out much needed empirical research on the phenomenon. These separate but complementary aims of the thesis necessitated a central divide in its structure.

The first section of the thesis (Section A) has been termed “Contribution to Theory” because its focus is primarily on matters of theoretical importance to the field. It should be noted that some theoretical work, such as the development and/or adaptation of existing models, was also



carried out in the second section, but in Section A this was the primary aim. Included within this section is: (i) a review of the literature on the structural features of video games, that explains both the general appeal of video games and the ways in which video games themselves contribute to excessive playing behaviour, (ii) the development of a new theory-driven psychological taxonomy of video games to aid in the classification of “risky” features in video games (i.e., those features which contribute to excessive playing), and (iii) an overview of the methodological issues associated with studying video game players.

The second section of the thesis (“Section B”) has been termed “Contribution to Research” because its focus is the empirical investigation of problematic video game play and its associated variables. Three separate data sets were used in this section, including a major survey of over 400 participants from video game venues and businesses in the city of Adelaide, Australia. It was argued that carrying out paper-and-pencil survey research using a large survey battery with the intention of obtaining a sample size greater than 400, rather than employing multiple smaller survey batteries in smaller samples (e.g., 100 to 150 persons), was more time and cost-effective. This method also provided larger data sets for analysis. In addition to employing two survey methods, a qualitative interview method was used. The main benefit of utilising a mixed method approach was it clarified and illustrated results from one method with the use of another. For example, the qualitative investigation (Paper 4) provided a description of aspects of problem video game play, such as sleep loss, that were then quantified in the survey studies (e.g., Paper 5). In other words, two methodological approaches

complemented one another and provided contextual detail as well as systematic quantitative analysis.

Seven manuscripts were written over the course of my research program. My original plan was not to produce a thesis using the manuscripts in their original form but I was instead motivated by a desire to publish and receive comment and feedback on the research. I believe that video game addiction is an increasingly relevant area for research and given the standard delay in publication I thought it was beneficial to do this promptly and prior to writing a more conventional dissertation. However, when I came to writing the thesis, I became aware that the manuscripts themselves were the most accurate representation of my diverse thinking and rationale throughout my candidature. Each of these papers will now be briefly discussed with regard to their contribution to the overall thesis.

### *Paper 1*

This paper provides a review of the current psychological understanding of the role of structural features in video games in initiating, developing and maintaining problem video game playing. As stated earlier, the study of structural features in gambling games has provided useful insights into why people gamble to excess (Griffiths, 1993a). It was argued that the adoption of a similar approach to studying problem video game play would provide similarly valuable insights. In relation to video games, the assumption was that there may be features of the video game medium which are more likely to contribute to a problematic pattern of behaviour. To phrase the paper's primary research question in Griffiths' (1993a) terms: What features of video

games themselves influence the initiation, development and maintenance of the playing behaviour?

In the field of sociology and media analysis, scholars had published general impressions about what made video games appealing using often vague and abstract terms like *fun*, *interactivity*, and *immersion*. Other theorists emphasised the relationship between the player and the onscreen game character, and how this relationship was the basis for the player's adopted identity (e.g., Turkle, 1997). Arguably, such terms and conceptualisations were too broad and could be interpreted in multiple ways, and, for researchers, they were difficult to quantify and manipulate in experimental conditions. In the psychological literature, the dominant views on the appeal of video games were based on: (a) operant conditioning theory, including the ways in video games rewarded playing behaviour, and (b) social psychology theory, which suggests that video games satisfy various needs for social interaction and belonging. However, there was a lack of research that had identified specific features in video games that contributed to problem playing in the same way that gambling research had identified features of games of chance that made them "addictive."

It was therefore argued that there was a need to develop an objective "list" of structural features in video games. A review of the relevant literature was undertaken to summarise current understanding on this subject and address specific gaps in knowledge. Prior to undertaking the review, I had reasoned that developing a psychological taxonomy of video games may be too ambitious due to the complexity of video games available on the market. Indeed, video game players I had spoken with often could not agree on how

to classify the video games they played. Upon completion, however, the review paper showed that it was possible to classify video games into various categories and parameters using a new psychological taxonomy of games (see Paper 2).

### *Paper 2*

The previous paper advanced the argument that excessive video game playing behaviour may be influenced by the structural characteristics of video games. Structural characteristics refer to those features inherent within the video game itself that may facilitate the initiation, development and maintenance of problem video game playing. To date, there had been few rigorous attempts to classify and organise the psycho-structural elements of video games in a similar way to gambling (e.g., Parke & Griffiths, 2007). Wood, Griffiths, Davies and Chappell (2004) had published a useful paper on the subject of video game features. Within their paper, the researchers had devised a framework to classify the features of video games. However, there were two main limitations of Wood et al.'s framework: (a) the imprecision and lack of theoretical grounding for some of the key variables in the model, e.g., "elements of surprise" and "surviving against the odds", and (b) the model's narrow focus on player enjoyment in identifying features that could influence a video game player's behaviour.

This paper attempted to address these problems in three ways. First, the new taxonomy's categories would be devised by conducting a more comprehensive review of the psychological and sociological literature. In addition, certain features would be identified by: (i) playing a variety of video

games, (ii) examining and comparing known gambling structural characteristics, (iii) discussing video game features with players of video games, and (iv) examining relevant articles in the area of video game design and technology-related forums. Second, the inclusion criteria required that all features in the taxonomy had to be quantifiable and theoretically grounded.

Rather than addressing a specific research question, the aim of this paper was to fulfil a need for a theoretical framework. At the time of writing, the psychological literature lacked a comprehensive, theory-driven framework for classifying the structural features in video games. It was intended that this framework would aid in, not only assisting psychologists in their understanding of what features in games may promote excessive involvement, but also guide further research in the area of problem video game play. The notion that structural features of video games can influence the psychological experience of video game playing is further discussed in Paper 4.

### *Paper 3*

This paper summarises some of the methodological challenges associated with studying video game players, and offers some practical advice for researchers in the field of video game addiction. As stated earlier, there are a range of mutually opposed perspectives on the benefits and disadvantages of playing video games, and these perspectives are often linked to a moral question of whether video games are “good” or “bad”. The popular discourse on video game addiction in particular often employs non-scientific language to provoke an emotional response and send a message that video game use, in

many forms, is inherently problematic and/or pathological. Thus, when it came to conducting research on video game players, I was regularly asked as many questions by the participants as I was asking them in my surveys.

Most commonly, I encountered individuals of the opinion that: (i) the popular press had overlooked many of the positive aspects of video game playing, such as the social interaction and leadership opportunities, (ii) the health sciences community had “pathologised” the activity unfairly, and (iii) the link between violent video games and aggression and other negative social behaviours was exaggerated, if not spurious. My discussions with video game players (both in-person and in online forums) garnered a number of insights into the gaming population. This information provided the impetus for a paper that addressed some of the major methodological issues in psychology research on video game players.

As a final thought, the paper was also useful in closing the first section of this thesis because it reinforced the notion that, as a researcher, it is not always possible (nor recommended) to divorce oneself from the interests of the population under study. The mistreatment of a research population can have long-term implications on the practice of ethical, efficient and flexible research. It is my hope that the reader of this thesis can hold this thought in mind whilst reading the second section of the thesis.

#### *Paper 4*

This paper presents the first study in Section B (“Contribution to Research”), which is a qualitative analysis of the psychosocial context of excessive video game play. Early in my candidature, I had thought that a mixed methodology

would be the most appropriate approach for the study of video game playing. I also felt that it was important that video game players themselves had a “voice” within the thesis beyond the darkened circles of a numbered Likert scale. The rationale for the study was drawn from early studies in Great Britain that interviewed young gamblers about what made gambling an attractive activity. Such work was often conducted in the field, at venues where gambling machines were freely accessible to youth. There had been studies that employed the “thinking aloud” method (Griffiths, 1994), whereby participants played a gambling machine and verbalised every thought that came to mind. However, a “thinking aloud” method was reasoned to be too difficult to implement given the broad range of video game types available (i.e., it would be hard to control for the effect of particular in-game features on player cognition). In the present study, the intention was to obtain a sample of players who played video games frequently to gain insight into their beliefs and perceptions of video game machines in general.

The primary research questions posed in this paper were: What is the psychosocial context of video game play and how does it influence or contribute to excessive patterns of video game play? By addressing this question, this paper aimed to complement the primary argument put forward in Papers 2 and 3; that is, that features of video games themselves may play a role in the initiation, development and maintenance of problem video game playing. Due to the nature of the open-ended group interview situation, and the participants’ broad range of experiences with video games, the study was in the position to consider additional issues of relevance that arose spontaneously during the interviews.

### *Paper 5*

This paper presents the second study in Section B, the first of three major quantitative studies on problem video game play. The intention of this paper was to address a key limitation in the psychological literature: the lack of a psychometric instrument for measuring problem video game play. Early in my candidature, I had constructed a survey battery for a preliminary online survey of video game players. The literature provided many examples of ways to measure aspects of video game playing (e.g., length of weekly playing sessions, frequency of playing, preference for video game genre, etc.). However, there were few guidelines on how to measure potentially problematic involvement in video games.

To conceptualise problematic involvement in video games, the components model of addiction was employed (Brown, 1997). This model has been used to conceptualise other behavioural addictions, such as gambling. The model is comprised of six core features of addiction (see Chapter 1). As stated earlier, the data used for this paper, as well as the subsequent two papers (Papers 6 and 7), were collected in two stages. First, an online survey of 373 players was conducted, followed by a paper-and-pencil survey of 416 players. These data collection stages took approximately six months from beginning to completion, due to the unique challenges of conducting research on the population (see Paper 3). By undertaking two separate data collection stages, it was possible to compare the performance of the PVGT instrument over time.



## *Paper 6*

In the preamble, it was noted that there is ongoing debate as to whether high levels of involvement in video games represent a healthy obsession or a damaging addiction. The distinction between these two categories is not clear cut. The previous paper established the importance of consulting the components model in considering the adverse psychosocial impact of excessive video game play, as opposed to relying on frequency measures of video game involvement as a global indicator of excessive play. In this paper, it was the intention to develop some additional psychological concepts to guide psychological thinking on what constitutes “problematic” involvement in video games. By extension, this paper aimed to provide insights into the nature of psychologically healthy video game play.

This paper examined the motivational correlates of excessive video game play. The rationale for this study was drawn from previous gambling research that found that there are certain motivation styles that are more likely to be associated with problem involvement in an activity (Chantal & Vallerand, 1996). This research was consistent with the qualitative study (Paper 4) that had identified variations in player motivation in relation to video game involvement. The study had found that the variable-ratio reward systems in video games may condition players to play a video game until a major reward had been obtained (which produced unpredictable playing times). Further, the large number of obtainable rewards in games, including the use of “meta-game” reward systems, motivated players to seek total completion of the game even when they no longer enjoyed the activity. This behaviour was referred to as satisfying the “need for completion” and was related to the belief

that no amount of playing time was ever “enough”. Therefore, it was the intention of the study to identify specific types of motivation that would distinguish excessive players from more casual players. In this sense, the primary research question was: Do excessive video game players exhibit a particular motivational profile?

### *Paper 7*

The final paper in Section B examined the health-related quality of life of individuals who consistently play video games as a major part of their daily lives. The rationale for this study was drawn from various health and epidemiological studies that have investigated the association between digital media use and sedentary and/or poor lifestyle choices, including lack of physical exercise and physical functioning, unhealthy food consumption and irregular sleep patterns. In particular, the “couch potato” hypothesis had predicted that increased time spent engaged in sedentary activities increases the risk of associated health problems, particularly being overweight. To date, the literature has provided mixed results, but has tended to suggest that the relationship between electronic entertainment and various health indicators is clinically insignificant. However, there had been few studies that had examined the health impact of video game use on individuals who play in excess of 30 hours per week.

The specific rationale for this study was that “heavy” involvement may (i) displace regular exercise and minimise other protective health behaviours, and (ii) have associated poor lifestyle choices, such as consumption of fatty foods and/or overeating habits due to the distraction of electronic

entertainment. This paper aimed to complement the previous papers that investigated the *nature* (i.e., Paper 5 and Paper 6) and the *psychological mechanisms* (i.e., Paper 7) of excessive play by examining the *consequences* of excessive video game playing. The primary research question of the paper was: What is the general health status of “heavy” video game players in relation to the normal Australian adult population?

In explaining the rationale for this study, it was important to stress that the obtained results presented only a limited picture of the health-related quality of life associated with high use of video games. It is acknowledged that the methodology employed in this study, like the previous two papers, prohibits the use of explanatory terms that imply causality. As Biddle et al. (2004) have stated, the obesity problem has been the result of a complex constellation of lifestyle and environmental factors, rather than any single factor. It was crucial, therefore, that the findings of this study were considered in the appropriate context.

**SECTION A:**  
**CONTRIBUTION TO THEORY**

Chapter 3. Paper 1

The role of structural characteristics in problem video game playing: A review

Daniel King and Paul Delfabbro

School of Psychology, University of Adelaide

Mark Griffiths

Psychology Division, Nottingham Trent University

Manuscript under review

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of a schema of the paper's main arguments, which included all main body sections of the paper. I prepared multiple drafts of the paper in collaboration with my fellow co-authors. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....28/08/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was to comment on drafts, make suggestions on the presentation and refinement of the material in the paper, and to provide editorial input. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

Mark Griffiths (Co-author)

I was a contributing author to this paper. Mr. King was responsible for writing this paper; my role was to comment on an early schema for the paper as well as offer feedback in the form of annotations on a draft version. I provided suggestions for some additional content in the paper, and some editorial input. I also provided advice on the selection of a journal to which this paper would be submitted for publication.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

## ABSTRACT

Understanding the structural characteristics of video games may play an important role in explaining why some people play video games to excess. This paper provides a review of the literature on structural features of video games. The dominant view of the appeal of video games is based on operant conditioning theory and the notion that video games satisfy various needs for social interaction and belonging. However, there is a lack of experimental and longitudinal data that assesses the importance of specific features in video games. Various challenges in studying the structural features of video games are discussed. Potential directions for future research are outlined, notably the need for a theoretically driven taxonomy of structural features in video games akin to taxonomies developed for slot machines. There is also a need to identify what problem (as opposed to casual) players seek from the video games they play.

## INTRODUCTION

Playing video games is an increasingly popular leisure activity around the world. However, for some people, excessive video game playing has various adverse personal and social consequences. Research to date has identified a minority of players who sacrifice sleep, school and job productivity, household chores, time spent with significant others, and other major responsibilities in order to play video games offline (Egli & Myers, 1984; Keepers, 1990; Griffiths & Davies, 2005) and online (Chappell, Eatough, Davies & Griffiths, 2006; Grüsser, Thalemann & Griffiths, 2007). For some of these players, it is argued, video game playing manifests as a form of behavioural addiction, similar to problem gambling (Fisher, 1994; Griffiths, 2000b; Salguero, & Moran, 2002). This label of 'video game addiction' is not without controversy. Some theorists feel that it does more harm than good to place activities like video game playing, a legal activity enjoyed by millions of people, within a category traditionally linked with substance abuse (Jaffe, 1990; Shaffer, Hall & Vander Bilt, 2000). However, the lack of agreement as to whether video game playing may be considered an 'addiction' has arguably been a distraction to the greater research question: Why do people play video games excessively?

The study of problem video game play is in its infancy. Numerous survey studies have been conducted which examine the general playing population, including demographic information and playing variables (Griffiths & Hunt, 1995; Griffiths, Davies & Chappell, 2004). It is often reported that the typical player is male, aged in the early twenties, and plays approximately 15 to 20 hours per week. However, there is a paucity of research that (a)



attempts to validate video game playing as a primary addiction, like gambling; (b) presents a comprehensive theoretical model for conceptualising problem video game play; and (c) examines the psychological nature and social impact of the activity using quantitative and experimental methods. Thus, the phenomenon of problem video game playing, particularly the psychological context of problem playing, is not well-understood. It is not surprising, then, that the mass media has portrayed video game addiction, problem video game playing, and healthy video game playing as differing only in degree, rather than as qualitatively different psychological phenomena.

In the gambling field, a number of studies have established that persistent gambling is maintained not only by complex biological, social and individual psychological factors (Griffiths & Delfabbro, 2001), but also by features of the gambling environment (Griffiths & Parke, 2003) and the gambling activity itself (Griffiths, 1993a; Parke & Griffiths, 2006; 2007). In particular, 'structural characteristics', defined as those features that facilitate the acquisition, development, and maintenance of playing behaviour irrespective of the individual's psychological, physiological or socioeconomic status (Parke & Griffiths, 2006; 2007), have been shown to play an important role in explaining the appeal of gambling activities. It has been suggested that, like electronic gambling machines, video games have many structural features that may make them psychologically engrossing and "addictive". However, there are very few published studies of the effect of video game structural characteristics on normal and problem players' persistence in video game playing.

Given the apparent social relevance of video game playing, an activity that involves hundreds of millions of players worldwide, the lack of research on excessive video game play is unusual. It may be due in part to: (a) the highly variable nature of video games compared to the standardised format of games of chance, like blackjack and roulette, (b) the lack of a formal tool for identifying “problem” video game players, and (c) researchers’ lack of understanding of what features and content within video games are important to the large community of end users. In addition, the rewards of the video game experience appear to be less tangible and more complex than the rewards of gambling activities (i.e. money or credits) and thus are more difficult to measure empirically. From a more pragmatic perspective, there has (a) been a lack of research funding in the area as a whole, and (b) the psychology of video game playing is viewed by many other psychologists to be a somewhat ‘trivial’ area to study.

The aim of this paper is to present a review of the limited literature to date that has discussed or empirically examined the structural characteristics of video games. In addition, we consider some studies of gambling behaviour that have direct applicability to video game playing. Following this literature review, we refer to the extant gambling literature to identify specific categories of video game structural characteristics that may guide future projects in this emerging field. In addition, this paper provides a brief summary of the prevailing methodological challenges in studying the structural features of video games.

## STRUCTURAL CHARACTERISTICS IN VIDEO GAMES

Loftus and Loftus' (1983), 'pop' psychology book *Mind at Play*, is perhaps the earliest psychological text to examine the appeal of video game features in relation to basic structural characteristics. The authors applied the paradigm of operant conditioning to video game structural characteristics, stating that the variable-ratio and fixed-interval schedules in video games were intended by designers to be "addictive". The researchers observed that (i) players are often reinforced almost immediately for correct play, (ii) often these rewards for good game play are of large magnitude (i.e., the provision of 150 points appearing more significant than 15 points), and (iii) the player can be rewarded on numerous concurrent reinforcement schedules. The authors also referred to the notion of "cognitive regret", the idea that when a player loses in a video game, an "alternative world" is mentally constructed in the player's mind. Video game players are thus motivated to realise this imagined scenario by correcting their mistakes in the video game, and reducing this undesirable cognitive state by immediately playing the game again.

Selnow (1984) theorised that elements of video games may make them attractive as social companions. His study explored the notion of "electronic friendship" in relation to video games, and surveyed adolescent players to determine what types of "gratification needs" video games fulfilled. His survey identified a group of players who preferred playing video games to spending time with human companions. For these individuals, playing video games was reported to be more fun and exciting than being with friends, easier than

managing interpersonal relationships and helped to forget feelings of social loneliness.

The popularity of video arcade machines throughout the 1980s and 1990s led to the identification of a subgroup of adolescent players who appeared to resemble pathological gamblers (Griffiths, 1991a; Fisher, 1994; Gupta & Derevensky, 1996). This comparison was perhaps anchored by the observation that arcade video game machines and slot machines shared a number of distinct structural features. Griffiths (1991a) 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” (p. 54). Consequently, he argued, video game playing may be considered as a “non-financial form of gambling”.

A similar argument was made by Griffiths and Wood (2000), who claimed that the playing philosophy of both arcade video game players and slot machine players was “to stay on the machine for as long as possible using the least amount of money” (p. 209). Their paper listed a number of structural features (first formulated by Fisher and Griffiths [1995]) that arcade video games contained that made them similar to slot machines and, thus, could make them attractive and rewarding to players. These were (a) the requirement of response to stimuli which are predictable and governed by a software loop, (b) the requirement of total concentration and hand-eye coordination, (c) rapid span of play negotiable to some extent by the skill of the player, (d) the provision of aural and visual rewards for a win, (e) the provision of an incremental reward for a winning move, (f) digitally displayed scores of correct behaviour, (g) the opportunity for peer group attention and

approval through competition. The researchers also identified the high accessibility of video games and slot machines as being attractive to players. Numerous other authors have linked video game playing to gambling (e.g., Griffiths, 1991a; Gupta & Derevensky, 1996; Johansson & Gotestam, 2004; Ladouceur & Dube, 1995; Wood & Griffiths, 2000; Wood, Gupta, Derevensky & Griffiths, 2004).

It is evident that the psychology of video games has been largely informed by studies of gambling behaviour. Delfabbro and Winefield's (1999) examination of the within session characteristics in poker machine gambling revealed that large wins often disrupted response rates (i.e., created larger post-reinforcement pauses than smaller wins) and small wins maintained gambler response rates. Further, regular players held "fixed" views about the profitability of given machines, were less likely to vary their wagers, and tended to increase their wagers when winning, and decrease them when losing. Their paper reinforced the notion that patterns of persistent gambling may be increasingly dictated by external factors (i.e., features of the game, rather than the individual), which may explain why some gamblers lose control of their gambling.

Griffiths, Davies and Chappell's (2004b) study of 540 players of the game *Everquest* identified a number of features in video games that participants reported to find enjoyable. The most commonly reported "favourite" reasons for playing the online video game were related to social interaction, demonstrated by positive feedback from players such as "the game is a social game" (24%), "group together with others" (10%), and "being part of a Guild" (10%). Similarly, participants reported their least favourite

features of online games, which tended to refer to the frustrations associated with the community of other players. In terms of the game's structure, their participants reported to enjoy being able to play the game indefinitely but did not enjoy the lack of perceived progress when playing the game infrequently.

In another study, Wood, Griffiths, Chappell and Davies (2004) surveyed 382 video game players about their preferences for various structural features in video games. Participants were asked to rank a list of features from "most important" to "least important" on a 3-point Likert scale. The results showed that the most important features were: realistic sound, graphics and setting, rapid absorption rate, rapid advancement rate, a "medium" duration, and being able to save one's progress in the game. The researchers also examined in depth the dynamics of game play.

Of the 19 characteristics they provided, the five most popular features were "exploring new areas" (rated as "important" by 76.0% of participants), "elements of surprise" (75.2%), "fulfilling a quest" (74.4%), "skill development" (68.1%), and "sophisticated artificial intelligence interactions" (67.1%). The least popular features were "linear game format" (rated as "unimportant" by 44.6% of participants), "mapping" (35.5%), "building environments" (32.6%), "solving time-limited problems" (17.8%), and "avoiding things" (15.4%). In terms of winning and losing features, 81.2% of participants rated the ability to save their game regularly as important, which seemed to be consistent with the finding that only 24% of participants thought "having to restart a level" was important for their enjoyment of the game. However, the researchers did note that:

Other characteristics may be more or less important, over time, due to advances in the design and development of video games and the technologies they utilise. It should also be noted that the importance of such characteristics may vary between individuals, and may vary according to the frequency with which people play video games (Wood et al., 2004; p. 7).

There were also major gender differences in relation to the style of graphics and this may relate to the type of games that males and females seem to prefer. It was evident that although most respondents like realism, overall males preferred the explicit realism of games that involved skill development, violent actions, survival and controlling vehicles. Similarly, males preferred games that were based on factual events. Such games are usually based upon battles or sports events for which males have traditionally had a preference in 'real life.'

The study also found that females were more likely to prefer the non-violent, less competitive, gentler paced cartoon style games, and the types of games that involved a higher degree of fantasy and make believe. This is further demonstrated by the type of game dynamics that females preferred, such as solving puzzles, avoiding dangerous places, characters etc., and finding and collecting things. Similar findings have also been found in other studies examining gender differences in game genres (e.g., Griffiths & Hunt, 1995; Griffiths, 1997).

The competitiveness of males could also explain why more of them rated the multi-player options as more important than did females, as multi-player characteristics offer greater opportunities for beating other players. However, more males than females also reported that they thought building

alliances and multi-player communication were important game characteristics. One reason for this may be that males feel more at ease with online communication. Females' relative alienation to online communication technologies may be something that is redressed over time as such technologies become more commonplace.

As mentioned above, the rate of play of video games was also deemed an important feature by the majority of the respondents. In particular, a rapid absorption rate was rated as important by over three-quarters of the sample with no gender differences evident. Similarly, rapid advancement through the game was also considered to be important by most respondents, with slightly more females preferring rapid advancement to males. Although there will always be individual differences in gaming, this study does at least show that many players like the same kinds of features.

Chumbley and Griffiths (2006) investigated various player responses to the degree of reinforcement in a video game. They conducted an experiment to assess players' affective responses and willingness to continue to play a video game. The level of negative reinforcement in the video game was manipulated between groups. "Negative reinforcement" was operationally defined in terms of the difficulty of the game. The researchers reported no significant relationship between player excitement and type of reinforcement (high or low difficulty). However, there was an almost significant correlation between playing time and excitement. The "low" negative reinforcement group reported a higher level of "playability" or the willingness to continue playing the video game than the "high" negative reinforcement group. This study suggested that, on a basic level, players are generally more motivated to play



a video game that offers frequent rewards and fewer obstacles. However, it should not be inferred that overcoming adversity is an unimportant part of the video game playing experience.

Yee (2006a) examined whether there might be different player typologies who seek out different playing experiences. This theory has implications for considering the importance of video game features (i.e., some features may be more salient for some groups of players than others). Earlier experimental research by Griffiths and Dancaster (1995) showed that when playing the same video game, participants with Type A personality had significantly higher arousal levels (as measured by heart rate) than participants with Type B personality.

Yee surveyed over 30,000 users of online role playing games. He reported that male players were significantly more likely to be driven by the “Achievement” (the desire to obtain in-game rewards) and “Manipulation” (the desire to manipulate and learn about the game world and elements) factors of the game, whereas female players were more likely to be driven by the “Relationship” factor (the desire to initiate and maintain social contacts). Charlton and Danforth (2007) reinforced these basic arguments with regard to massively multiplayer online role playing games (MMORPGs) games, stating that these games are characterised by two main features.

First, in MMORPGs players take-on the role of a character in a virtual environment in which a story line evolves over time and the time frame in which an event will occur is unpredictable. Thus, these games may be addictive because they are particularly good at inducing operant conditioning via variable-ratio reinforcement schedules (p. 1534).

An interview study of 38 video game players by King and Delfabbro (2008) found that players did not necessarily have to enjoy playing a video game to order to play for long periods of time. In their study, participants reported that concurrent reward structures kept them playing for long periods. Examples included two in-game tasks running simultaneously, being given a new “quest” before the current quest was complete, and multiple “experience bars” or other onscreen meters of player progress. Variable-ratio reinforcement schedules also led participants to engage in what was termed “grinding” behaviour. Grinding refers to repeatedly performing an action or series of actions in a video game in order to obtain a reward. Interestingly, none of the participants who “grinded” reported enjoying the process, but felt it was the only way to feel satisfied when playing the game.

## SUMMARY

The literature on video game structural features has a historical link to the gambling literature. The dominant view of the appeal of video games appears to be that they offer rewards on concurrent variable-ratio and fixed-interval schedules that lead the player to respond rapidly and with few post-reinforcement pauses. Specific features in video games have received less attention, perhaps given the sheer number of variables in modern games as well as the difficulty in isolating these features for experimental manipulation. There is also growing recognition of the kinds of social rewards that players obtain from other players of video games, as well as the strong attachment that players form with their in-game characters and items. It has also been

suggested that the game machine may act as an “electronic friend” for some players.

## FUTURE CHALLENGES

There are various challenges, theoretical and methodological, associated with the study of video game structural features that deserve special mention. Most notably, there is at present no established taxonomy for considering the broad range of video game features that exist in today’s market apart from general taxonomies of video game genre (e.g. Griffiths’ [1993b] nine-genre taxonomy of video games by content matter). This lack of a theoretical framework makes the empirical study of video game characteristics difficult to conceptualise known (and emerging) structural features. In addition, it is difficult to directly compare research studies. Given the link between gambling (particularly slot machine gambling) and video game playing in the literature, it is perhaps sensible to adopt an existing gambling framework. In fact, there are now many instances of gambling and gaming converging and blurring the distinction between conventional gambling and conventional video gaming in terms of structural characteristics (see Griffiths, 2008c; DeFreitas & Griffiths, 2008).

A major challenge in studying the importance of structural features in video games is the notion that different players may seek different experiences from the activity. For example, some players may seek out the items and rewards within a video game, whereas others may play the game for its social interaction. Despite the need for experimental research, there are

problems with studying video game features within an experimental setting (Wood, Griffiths & Eatough, 2004). In the same way that some studies of gamblers use tokens in a laboratory setting instead of real money at a casino, there is a danger that player motivation may be contaminated by the demand characteristics and unfamiliar game and setting of the laboratory setting (Anderson & Brown, 1984).

Finally, researchers should be mindful of the empirical definition of structural characteristics (i.e., features that facilitate the acquisition, development, and maintenance of playing behaviour). They should take care not to assume that those features that players simply report to enjoy are the same as those features that may play an important role in maintaining playing behaviour. In the gambling literature, it has been argued that there may be additional factors such as dysphoria and frustration that underlie impaired control and thus distinguish regular and problem gamblers (Dickerson, 1993). This distinction is particularly important when generalising “grinding” behaviours to problem players.

## FUTURE RESEARCH

Whilst a great deal of research has been conducted outside the field of psychology on the importance of various structural features in video games, less is known regarding the influence of game characteristics on problematic play. Previous research has tended to compare video game players based on demographic differences such as age and gender rather than on psychological dimensions. Therefore, there is a need to identify the

importance of structural features among heavier (potentially problematic) players as opposed to casual players. It may be that some features of video games may be more “addictive” for problem users.

The notion of “electronic friendship”, in particular how players can form attachments to their playing machine, is arguably of importance in contemporary video game research. It is undeniable that many recent social utility features in video game software can create a strong sense of attachment for the player. For example, individuals can (a) create personalised avatars and player profiles (from creating a nickname or “handle” to creating a customisable three-dimensional character), (b) purchase special membership accounts with exclusive video game content, (c) personalise various aspects of their video game machine (e.g., the video game browser or “launcher” screen as well as the exterior casing of the video game hardware with familiar characters and logos). In addition, the machine can: (a) act as a “hub” for all kinds of electronically-mediated social interaction and related social functions, (b) include various forms of communication (e.g., text, picture-messaging, recorded speech, real-time speech, webcam, etc.), (c) provide lists of the player’s online friends, (d) track playing behaviour in relation to time spent playing and goals achieved relative to others, and (e) link to support websites which can suggest games based on your stated preferences and previous games played. Future research should investigate the importance of these features for problem players.

Studies of gamblers have found that the type of reward and schedule of reward delivery plays an important role in sustaining player motivation. Applying these general findings to video game players, it may be that

significant in-game rewards (e.g., completion of the game, finding the “best” item in the game) may create post-reinforcement pauses, and small rewards may maintain player involvement until a larger reward is obtained. Similarly, regular video game players may have certain views about the “profitability” of given games, including the advantages of in-game characters, the amount of rewards or “payout” within particular levels.

Accessibility is an important aspect of gambling activities as well as video games. The advent of handheld consoles and online games in the last decade has seen an increase in the accessibility of video games. Video games can be played exclusively within the home environment or on the move (i.e., rather than having to visit an arcade) and therefore have no “opening times” and few “membership rules”. Video games can be purchased fairly inexpensively and games with online worlds are permanent and available to access 24/7 (i.e., 24 hours per day, seven days a week and all year round). The notion that accessibility plays an important role in creating problem playing patterns deserves closer empirical attention.

More specifically, there has been speculation that online gaming may be more problematic and/or addictive than offline (stand alone) games because of the inherent structural characteristics (Griffiths, 2008e). Following on from the early work of Loftus and Loftus (1983), online gaming addiction can be partly explained by the partial reinforcement effect (PRE). This is a critical psychological ingredient of gaming addiction whereby the reinforcement is intermittent, i.e., people keep responding in the absence of reinforcement hoping that another reward is just around the corner. Knowledge about the PRE gives the game designer an edge in designing

appealing games. As mentioned earlier, large rewards lead to fast responding and greater resistance to extinction - in short to more "addiction". Instant reinforcement is also satisfying. Online gaming involves multiple reinforcements in that different features might be differently rewarding to different people. In video gaming more generally, the rewards might be intrinsic (e.g., improving your highest score, beating your friend's high score, getting your name on the "hall of fame", mastering the machine) or extrinsic (e.g., peer admiration). In online gaming, there is no end to the game and there is the potential to play endlessly against (and with) other real people. This can be immensely rewarding and psychologically engrossing.

There is a certain reliance on self-reported data within the field of psychology, and this research area is no different. There are various limitations associated with self-reported data from players, namely that players do not accurately recall information about their playing behaviour, and instead may report socially held facts or idealised impressions about their playing. For example, Charlton (2002) stated that players often overestimate the amount of time that is spent playing video games although losing track of time playing video games is often seen as an important benefit as to why people play excessively (Wood & Griffiths, 2007; Wood, Griffiths & Parke, 2007). Asking participants in a survey to indicate their preference for various structural features in video games as opposed to empirically testing this preference is similarly problematic. However, some researchers have tried to overcome this problem by utilising a mixed methods approach. For instance, Wood and Griffiths research on time loss in video game play utilised a laboratory experiment (Wood & Griffiths, 2007) and an online survey (Wood et

al, 2007). Others have used both an experiment and questionnaire within the same study (e.g., Chumbley & Griffiths, 2006).

There may be some value in identifying those features in video games that players do not enjoy but serve to develop and maintain player involvement over time. It is possible that features that players have indicated to be “not important” in survey research (e.g. Wood et al., 2004) play an important role in lengthening a typical session of playing or maintaining a player’s long term interest in the game. For instance, (unpublished) pilot research carried out on *Tetris* by one of the authors (MG) found that in a self-report questionnaire, players said they found the *Tetris* music annoying when they played the game. However, in an experiment measuring heart rate (as a measure of excitement and arousal) while playing *Tetris* found significantly higher heart rates playing Tetris with the music on compared to playing the game in silent mode with the music off.

Researchers should therefore be cautious of what players claim to be important features in the video games they play and test these statements in ways less fraught with errors of human judgement. There is certainly a lack of research on problem video game playing in general that is conducted in naturalistic settings, such as gaming venues or players’ home environment. Lastly, there is a lack of longitudinal research to assess the long-term relationship between structural features and problem playing patterns.



## CONCLUSION

Video game playing and, by extension, *problem* video game playing, is a phenomenon increasing in prevalence. However, the extant literature on this topic is limited with regard to offering explanations as to why some people play video games to excess. It is likely that the structural characteristics of video games play an important role within a problem player's habitual playing behaviours and therefore these features require empirical attention. This paper suggests that the study of video game structural characteristics requires a theoretically driven taxonomy, similar to those found in the gambling field (e.g., Parke & Griffiths, 2007). This would enable a more rigorous study of the important features within video games, including different reward types and schedules of reward delivery. In addition, it may be worthwhile investigating the social utility functions of video games that foster a sense of community and "electronic friendship" between the player and video game machine. By understanding the structural features in video games that promote excessive playing behaviour, psychologists may be better equipped to manage clients with problem playing behaviours and players themselves may be empowered by their knowledge of those video game features and can minimise the risk of playing video games to excess.

Chapter 5. Paper 2

Video game structural characteristics: A new psychological taxonomy

Daniel King and Paul Delfabbro

School of Psychology, University of Adelaide

Mark Griffiths

Psychology Division, Nottingham Trent University

Published manuscript

International Journal of Mental Health and Addiction

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of a schema of the paper's main arguments, which included all main body sections of the paper. I designed the psychological taxonomy described in the manuscript. I prepared multiple drafts of the paper in collaboration with my fellow co-authors. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....28/08/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was to comment on drafts, make suggestions on the presentation and refinement

of the material in the paper, and to provide editorial input. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

Mark Griffiths (Co-author)

I was a contributing author to this paper. Mr. King was responsible for writing this paper; my role was to comment on an early schema for the paper as well as offer feedback in the form of annotations on a draft version. I provided suggestions for some additional content in the paper, and some editorial input. I also provided advice on the selection of a journal to which this paper would be submitted for publication.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

## ABSTRACT

Excessive video game playing behaviour may be influenced by a variety of factors including the structural characteristics of video games. Structural characteristics refer to those features inherent within the video game itself that may facilitate initiation, development and maintenance of video game playing over time. Numerous structural characteristics that influence gambling frequency and expenditure have been identified in the gambling literature, and some researchers have drawn comparisons between the rewarding elements in video gaming and those in slot machine gambling. However, there have been few rigorous attempts to classify and organise the psycho-structural elements of video games in a similar way to gambling. In order to aid current psychological understanding of problem video game playing and guide further research questions in this area, a new taxonomy of video game features is proposed, which includes: (a) social features, (b) manipulation and control features, (c) narrative and identity features, (d) reward and punishment features, and (e) presentation features. Each category is supported with relevant theory and research, where available, and the implications of these features for excessive video game playing are discussed.

## INTRODUCTION

The question of whether excessive video game playing constitutes a problematic activity in its own right is a current subject of debate. In numerous studies, researchers have identified a subgroup of video game players who report adverse consequences of playing video games excessively (Fisher, 1994; Griffiths & Davies, 2005; Grüsser, Thalemann, & Griffiths, 2007; Ladouceur & Dube, 1995; Salguero & Moran, 2002). It has been suggested that a heavy pattern of video game usage that is sustained over time may represent a technology-based addiction. Griffiths (2008e) has argued that, if the clinical nomenclature can accept pathological gambling, then similar compulsive behaviours should be recognised as “addictive”. However, the concept of technology-based addictions has been criticised on a number of grounds. Blaszczynski (2008) has argued that the primary features of addiction are dependency and lack of control, but the prevailing literature on problem video game play has overlooked these psychological features in favour of highlighting the adverse consequences of excessive playing. Similarly, Wood (2007) and Shaffer, Hall and Vander Bilt (2000) have argued that excessive video game use may be symptomatic of other primary disorders, like depression, and/or the result of poor time management skills, rather than a bona fide addiction. Jaffe (1990) has claimed that researchers may inadvertently trivialise the concept of addiction by prematurely accepting so-called “behavioural” addictions, including computer-based ones.

Regardless of whether video game playing may be termed an “addiction”, it is generally agreed that some individuals’ video game usage

may be considered problematic (Griffiths & Davies, 2005). Griffiths (2008e) has argued that researchers still face the task of identifying the mechanisms - biological, psychological and/or social - that underlie problematic involvement in video games. One further explanation for excessive playing has been drawn from the gambling literature, and states that there may be various structural characteristics of video games that make them “addictive” (Brown, 1989; Johansson & Gotestam, 2004). This explanation has followed the many observations that both gambling machines and video game machines share a number of structural elements in common. Fisher and Griffiths (1995) argued that both video game machines and (gambling) slot machines feature (a) the requirement of response to stimuli that are predictable and governed by a software loop, (b) the requirement of total concentration and hand-eye coordination, (c) rapid span of play negotiable to some extent by the skill of the player, (d) the provision of aural and visual rewards for a win, (e) the provision of an incremental reward for a winning move, (f) digitally displayed scores of ‘correct’ behaviour, and (g) the opportunity for peer group attention and approval through competition. In a recent review, Parke and Griffiths (2007) outlined a comprehensive list of structural features that have been shown to influence problem gamblers to risk larger sums and bet more frequently. However, a similar taxonomy for video games has not yet been developed and subjected to extensive empirical scrutiny. King, Delfabbro and Griffiths (2008) have attributed this fact to (a) the more variable nature of video games compared to the standardised format of games of chance, (b) the lack of a recognised standard for identifying “problem” video game players, and (c) a lack of knowledge among researchers of which specific

features and what kind of content within video games are important to the large community of end users.

Wood, Griffiths, Davies and Chappell (2004) were the first to publish a framework of the psycho-structural features of video games. They sought to identify the features of video games that made them appealing to players. They devised a list of structural features by (a) playing a variety of video games, (b) examining and comparing known gambling structural characteristics, (c) discussing these features with players of video games, and (d) examining relevant research in the area of video game design. Their framework included:

- *Sound*, including sound effects, speaking characters and background music.
- *Graphics*, including high-quality realistic or cartoon-style graphics and full motion video (FMV).
- *Background and setting*, including whether the game is based on a story, film, or television program, and the use of realistic or fantasy settings.
- *Duration of game*, referring to how long the game usually takes to complete.
- *Rate of play*, referring to how quickly the player “absorbs” or “gets into” the game.
- *Advancement rate*, referring to how quickly the game play advances.
- *Use of humour* in the game.
- *Control options*, referring to what the player can control in the game (including sound, graphics, and skill settings, choice of control methods, and physical feedback).
- *Game dynamics*, including exploring new areas, elements of surprise, fulfilling a quest, skill development, AI interactions, collecting things, avoiding things, surviving against the odds, shooting, different ending

options, different modes of transport, solving puzzles, beating times, cheats/Easter eggs, solving time limited problems, building environments, mapping, and linear/non-linear game format.

- *Winning and losing features*, referring to the potential to gain or lose points, finding bonuses, having to start level again, and ability to save regularly.
- *Character development*, referring to character development over time and character customisation options.
- *Brand assurance*, referring to brand loyalty and/or celebrity endorsement.
- *Multiplayer features*, referring to various multi-player options, communication methods, building alliances, and beating other players.

Wood et al.'s (2004) framework covers a range of video game types and player interests. As the researchers themselves noted, for some video games, some features may be more important than others in influencing a player's enjoyment. However, some revisions and improvements can be made to their framework. For example, a number of features in the section named "game dynamics", such as "elements of surprise" and "surviving against the odds" are difficult to operationalise. The model would also benefit from more distinct, conceptual groupings akin to gambling structural characteristics models (Parke & Griffiths, 2007), and further explanation of the importance of specific features in influencing player behaviour. There is an underlying assumption to Wood et al.'s framework that only those features that players report to enjoy are important in initiation, development and maintenance of playing behaviour. It is possible that this perspective overlooks a number of key features that play an important role in the development of excessive involvement in video games.



The aim of this paper is to expand upon Wood et al.'s (2004) list of psycho-structural features in video games by reorganising some features into new categories as well as suggesting additional features in light of recent theory and research findings. Given the paucity of psychological literature in this area, this framework draws on gambling research and includes some preliminary observations based on informal discussion with players and exploratory research by the authors (e.g. Chappell, Eatough, Davies, & Griffiths, 2006; King & Delfabbro, in press; Wood et al., 2004). This paper is organised in five main sections that cover the (a) *social features* (i.e., social aspects of video game playing), (b) *manipulation and control features* (i.e., the role of user input in influencing in-game outcomes), (c) *narrative and identity features* (e.g., the role of character creation and interactive storytelling), (d) *reward and punishment features* (i.e., the ways in which players win and lose in video games), and (e) *presentation features* (e.g., the visual and auditory presentation of video games). The intention is to demonstrate the ways in which the psychological effects of these features may contribute to the development of problematic styles of video game playing. In addition, it is intended that this framework will aid in guiding further research questions in psychology concerning those structural characteristics that influence problematic video game play. It was not the intention of this paper to challenge or minimise dominant frameworks for games in the fields of computer game design, video game semiotics, and ludology (e.g., Bartle, 2004; Crawford, 1982; Myers, 1990; Salen & Zimmerman, 2004).

Summary of the five-feature model of video game structural characteristics

Feature type	Sub-features	Example
Social features	Social utility features	In-game voice and text chat
	Social formation/institutional features	Guilds/clans in MMORPGs
	Leader board features	“Hall of fame” high score list
	Support network features	Internet forums, strategy guides
Manipulation and control features	User input features	“Combos”, “hot keys”
	Save features	Checkpoints, “quick-save”
	Player management features	Managing multiple resources
	Non-controllable features	Scripted events, loading screens
Narrative and identity features	Avatar creation features	Choice of sex, race, attributes
	Storytelling device features	Cut-scenes, mission briefing
	Theme and genre features	“Role-playing”, “shooting”
Reward and punishment features	General reward type features	Experience points, bonuses
	Punishment features	Losing a life, restarting a level
	Meta-game reward features	Xbox 360 Achievement points
	Intermittent reward features	Increasing difficulty of levels
	Negative reward features	Gaining health, repairing items
	Near miss features	Difficult “boss” at end of level
	Event frequency features	Unlimited replayability of game
	Event duration features	MMORPGs have no endpoint
Payout interval features	Rewarded instantly for playing	
Presentation features	Graphics and sound features	Realistic graphics, fast music
	Franchise features	Trademarked names, e.g. Mario
	Explicit content features	Violence, drug use, nudity
	In-game advertising features	Real-life brands, sponsors logos

## SOCIAL FEATURES

Social features refer to the socialising aspects of video games, such as how players can communicate with other players in both online and offline (“stand-alone”) games, and the features that create a cooperative and competitive community of players. In addition, this category considers the role of social support networks that assist players in learning about video games, and enable experienced players to pass on their knowledge of games to others and receive social recognition rewards.

### *Social utility features*

Computer-mediated communication (CMC) features enable players to engage in social interaction with other players before, during, and after video game play. Interaction may include expressions of encouragement, excitement or frustration, or the exchange of strategies and tips about games, all of which can be highly reinforcing. Players can also use text-based messaging where experienced players have developed an idiosyncratic language, employing a range of “emoticons” (animated expressions), acronyms (e.g., “lol”: laugh out loud) and slang language (e.g., “l33t”: elite, meaning skilful). Social utility features play a role in forming a player’s video game identity in virtual worlds and games (i.e., creation of a name or “handle”, with associated attributes like images and signatures), and this identity can make the player feel more personally invested in the game. Avatars are the most sophisticated kind of CMC, enabling a digital representation of the player (without necessarily resembling the player in any way). Players can communicate using gestures

and other means available to the avatar. For example, players in *World of Warcraft* can wave, laugh and tell jokes to other players. In games with less emphasis on non-verbal social interaction, like the first-person shooter *Counterstrike*, players have developed a gesture-based communication system using combative features like crouching, jumping and pointing weapons.

### *Social formation and institutional features*

Baumeister and Leary (1995) have argued that people have a fundamental need to belong to a social group. Within massively multiplayer online role-playing games (MMORPGs), a number of social institutions have emerged which can satisfy this need (Cole & Griffiths, 2007). Guilds are the primary institution to which players belong, mainly for the purpose of playing the game cooperatively and sharing the rewards of playing (“loot”) among members of the guild. Ducheneaut, Yee, Nickell and Moore (2006) reported that 66% of all *World of Warcraft* players belong to a guild, and this figure increases to 90% for advanced players. Guild members (belonging to groups of varying size) are often requested to meet at specific times to play the video game. However, rather than being close-knit groups of friends, Ducheneaut et al. (2006) reported that fewer than one in four players personally know their fellow guild members. Nevertheless, players feel a sense of social obligation to play the game, which may include playing until an in-game event such as a “raid” is complete. The player may be penalised in a number of ways for not meeting these social obligations, including losing respect or rewards in the guild, and/or being asked to leave the guild. Studies have shown that the

negative emotional effects of being ostracised within an online environment can be as powerful as in the real world (Williams, Cheung, & Choi, 2000; Williams et al., 2002). Thus, social formations and institutions within a video game can be highly rewarding and provide additional incentives for playing the game, but they may also place inflexible time commitments on players, that may cause conflict with other responsibilities.

#### *Leader board features*

Vorderer, Hartmann and Klimmt (2003) argued that the competitive elements in video games are the most important determinant of enjoyment from playing video games. They identified *social competition* as a process that develops by competitive actions performed by individuals or social entities in order to maintain their own interests to the disadvantage of others. A major feedback mechanism for social competition in video games is the player leader board that can be found both offline (e.g., 'Hall of Fame' screen on arcade video games) and online (e.g., multiplayer leader boards). In online gaming as well as stand-alone gaming, multiplayer leader boards use player tracking systems to monitor a player's statistics and progress in the game in relation to other players. The leader boards give players an overall rank that is usually a position number (but can sometimes be a title rather than a rank position). Leader boards are updated regularly, which may encourage players to play continuously over long periods to compete with other players for higher, more prestigious ranks and the associated feelings of increased self-efficacy.

### *Support network features*

Online relationships are a relatively new phenomenon, but they have become a large part of adolescent culture. Wolak, Mitchell and Finkelhor (2002) reported that 25% of Internet users aged 10 - 17 years had formed casual online friendships in the last 12 months, and 14% had formed close online friendships or online romances. Similar findings have been found within MMORPGS. For example, Cole and Griffiths reported that 10% of online gamers met a sexual and/or romantic partner in-game. Suler (2004b) has argued that individuals are more likely to self-disclose or act out more intensely when online because online settings are highly disinhibiting. Despite the apparent richness of communication styles available in online settings, it has been shown that high levels of CMC without comparable levels of face-to-face communication are associated with loneliness and decreased social well-being (Moody, 2001). As Castronova (2005) has suggested, online worlds may appear to be the best available place for some individuals, and increased participation within them provides fewer opportunities for connection with people in the real world. In addition to player-to-player relationships, there are numerous sources of support that can assist the player to play a video game, including the Internet (e.g., forums and websites), television, magazines and strategy guides, as well as telephone help-lines. These support networks can provide advanced knowledge of the video game, enabling the player to optimise their playing strategy in order to overcome various difficult obstacles or find hidden game features. In addition, these networks provide an outlet for expert players to relay their own knowledge of the game when not playing and receive appreciation and recognition from other players.

## MANIPULATION AND CONTROL FEATURES

Manipulation and control features refer to the ways in which a player can interact with and control in-game properties using a physical control scheme. This category also considers various functions in a video game that directly relate to the player's sense of mastery and control over the game, such as being able to save progress in order to correct mistakes, and the ability to manage simultaneously numerous resources in the game. There are also features in video games that the player has no direct control over, and these may also affect the video game playing experience.

### *User input features*

Players must think and react to objects on the screen but the experience of playing a video game is also highly tactile. For instance, video games may be played using a keyboard and mouse configuration on a personal computer. For handheld and dedicated games consoles, the control set-up may include some combination of assorted buttons, triggers, analogue joysticks, touch-screens, and motion-control. Arcade machine games may employ further additional features. To be proficient at some video games, players may require good hand-eye coordination and the use of "combos" (a sequence of timed input that has special in-game effects) and "hot keys" (an optimised control scheme for greater efficiency). Video games may be thought of as predominantly "deterministic", meaning that all the major elements of the game are essentially held constant from one game to the next. This enables players to compare their performance in a video game to other players.

Cognitive psychology research has found that players rapidly develop a mental model of in-game elements that qualitatively shifts with experience to accommodate insights into the functional qualities of these elements (Graham, Liyazheng, & Gonzalez, 2006). A study of video game playing children aged 10 to 11 years noted that they displayed “expert” behaviours such as self-monitoring, pattern recognition, principled decision-making, qualitative thinking, and superior memory (VanDeventer, 2002). In this sense, the appeal of a video game lies in the variation of users’ ability to use the control scheme to learn new information about game elements and thereby maximise their rewards and enjoyment of the game. An interpretive phenomenological analysis by Chappell, Eatough, Davies and Griffiths (2006) suggested that excessive playing may be linked to an obsessive need to master the user interface, control scheme and game mechanics of the video game.

### *Save features*

Cognitive regret may occur when a player makes a mistake in a video game that results in a losing outcome (Loftus & Loftus, 1983). However, by their design, video games allow players numerous chances to rectify (i.e., correct) their mistakes. For example, the game may feature “lives” or “turns” which give the player another attempt at the game’s challenges. Furthermore, video games are the only kind of games that enable the player to “save” their progress, and subsequently revert to this earlier point in the game if desired. Save features allow players to replay a losing scenario, thereby minimising



cognitive regret incurred by losing. For this reason, video games perhaps offer a higher degree of control and freedom to the player than any other game. There are two main types of save features. The first type enables the player to save at any point in the game (some games have a “quick-save” function that enables the player to save without interrupting play). The second type of saving is a “checkpoint” system that requires the player to reach predetermined parts of the game in order to save their progress. It is possible that checkpoint systems contribute to longer playing sessions because players may decide not to quit the game until a checkpoint is reached.

#### *Player management features*

Onscreen video game elements are generally represented to the player in a clear and quantified way. Most games have a HUD (“heads up display”) that details all of the player’s available resources. In shooting games, this is usually the health and remaining ammunition of the player’s character. In role-playing games, this may be a complex inventory system of assorted weapons, apparel, magic spells, and miscellaneous items. The player’s role is to decide how these resources are to be managed in order to complete the various goals of the game. These features provide feedback on how well the player is doing in the game (e.g., having plenty of resources suggests competency). Gambling research has identified problem gamblers are often unable to quit a gambling session when they are down, instead choosing to “chase” losses until all money is lost (Breen & Zuckerman, 1999). Similarly, it is possible that excessive players of video games are less likely to end a playing session when their in-game resources are low, and will continue to play until

resources have been replenished or spent completely. Chasing within a video game can occur within and between playing sessions. For example, a player may continue to play a game until the game character is on 100% health (i.e., “within session” chasing). Alternatively, if the player is for some reason unable to keep playing, there may be an urge to return to the game sooner (i.e., “between session” chasing).

### *Non-controllable features*

Some features in video games are out of the player’s control, either by design or by technical necessity. Whilst these features may appear to be relatively minor to the actual playing experience, it is possible that they contribute to longer playing sessions. For example, in some games there are non-interactive or “scripted” events that occur each time the game is played. The player cannot influence the outcome and usually cannot “skip” these events. Similarly, all games feature “loading” screens that usually occur in between levels, or when the player wants to access something new in the game. Loading screens can range between a few seconds to a few minutes. Loading also occurs in multiplayer games, when the player must wait in a “lobby” for other players to connect or for a map to download before playing a game. The waiting times in multiplayer can vary greatly. In MMORPGs, there can also be waiting periods associated with travelling long distances in the game world. It is important to note that these loading periods are not always tracked by a video game’s clock or timer, which means that the player may think they have played for less time than is the case. From another perspective, video games with scripted events, loading times and turn-based action may be attractive to

some players because they enable a player to more easily play the game whilst doing something else, like drinking, eating, or smoking a cigarette. Video games that can be played in this way may be more conducive to long, uninterrupted playing sessions than more involved and attention-demanding games without natural breaks in the action.

## NARRATIVE AND IDENTITY FEATURES

Narrative and identity features refer to the ways in which the player can take on another identity in the game (as a fictional character or a construction of the self). This section also considers the role of storytelling as a means of immersing the player in the video game. In addition, certain video game genres and themes may broadly relate to player's expectations and attitudes about the video game.

### *Avatar creation features*

Most video games feature a single character (in the form of a person, creature or non-living thing) that the player controls throughout the entirety of the game. In some games, like *Sim City*, the player controls multiple "characters" and objects at once. Most games offer a range of customisation options to suit the player's preferences. For example, in role-playing games, players can select their character's race, sex, background, physical appearance, class and skills. The manipulation of identity within a video game can be an important part of the reason for playing games as demonstrated by studies on gender swapping in MMORPGs (Hussain & Griffiths, 2008). Furthermore, a

large number of customisation options may encourage the player to play the video game multiple times as different characters. It is the intention of video game designers to give players these different choices so that they can form an attachment to their personalised character, and feel more invested in their character's development. Selnow (1984) argued that some players formed "electronic friendships" with their game machines; it is possible that avatar attachment represents a more sophisticated form of this attachment. A study by Blinka (2008) found that adolescent players' relationships with their game avatars were largely characterised by "identification", referring to a sense of unity with the character, accompanied by the desire to master the game through the avatar, and "immersion", an emotional connection with the avatar, including daydreaming about the character. Thus, a player who has a strong attachment to the game character may have the short-term effect of the player ensuring that the character has "levelled up" or has plenty of resources before ending a playing session, and the long-term effect of playing the video game through to completion with that character.

### *Storytelling device features*

Psychological research has largely overlooked the role of narrative in video game playing except perhaps in the area of educational applications of online gaming (de Freitas & Griffiths, 2007, 2008). Storytelling may be limited to simplistic "survival against the odds" scenarios or, in longer games, the storytelling may involve multiple characters and complex storylines. A narrative in a video game is likely to play an important role in facilitating a sense of escape or immersion for the player. The most common storytelling

device is the “cut-scene” (e.g., a short full-motion video or “machinima” sequence) or a written/oral briefing to segue between game levels. An example is historical footage of World War II in a war action game. Storytelling devices are also incorporated into the player-controlled experience of the game. Players may find books, notes, recordings, messages, or hear dialogue or narration from in-game characters. Some of these storytelling devices are incorporated into the game’s reward system, others are additional information designed only to “flesh out” the game world. Some video games feature multiple endings depending on player’s in-game choices, which may encourage the player to complete the game multiple times.

#### *Theme and genre features*

Unlike film or literature, there are few agreed upon genre classifications for video games although some researchers have attempted such classifications (e.g., Griffiths, 1997). Nevertheless, there are some groupings of video games that are commonly recognised by game designers and the video game playing community. Many of these are derived from Crawford’s (1982) taxonomy of video games. These include “first-person shooting” games, “role-playing” games, “real-time” or “turn-based strategy” games, casual “puzzle” games, etc. These classifications are not discrete but continuous, as some games are a “cross-over” (e.g., a first-person shooting role-playing game). Each video game genre usually has particular conventions in terms of game dynamics, such as game length, linearity of level format, and character development. For example, a first-person shooter typically takes 10 to 15 hours to play, whereas that duration may be considered too short for a role-

playing game. Video games also attempt to present specific stylised themes, such as a post-apocalyptic wasteland, a “*Lord of the Rings*”-style fantasy, or a futuristic space station setting. There are usually associated design and game-play conventions within the theme of the game. It may be speculated that themes and genre features have a broad influence on players’ decisions to begin playing video games, and guide consumer choices in terms of choosing new games to play (Yee, 2006b). In addition, players may form positive attitudes toward certain video game genres based on previous experiences with games of that kind.

## REWARD AND PUNISHMENT FEATURES

Reward and punishment features refer to the ways in which players are reinforced for skilful play (i.e., winning) and punished for losing. This section covers the many types of rewards in video games, and explains that these rewards are often delivered intermittently on random and fixed ratio schedules. Player motivation may also be influenced by a more recent feature in games known as “meta-rewards”. This section draws on previous models of gambling structural characteristics by applying the concepts of near miss, payout interval, event frequency and event duration to the playing of video games.

### *General reward type features*

Some video game systems deliver physical force feedback via vibration in the game controller. A car racing game, for example, may use force feedback to

reward the player for driving skilfully at high speeds. However, for most video games, the rewards are primarily psychological in nature. Some games reward the player with in-game currency (e.g., gold coins) that also provides a system to judge the objective value of all other items in the game. A similar type of reward is points that usually accrue without being converted or exchanged into some other kind of reward. Similarly, depending on the type of game, players gather experience points (“XP”) as they complete objectives and defeat enemies in the video game. Once the player has collected a sufficient amount of XP, the character “levels up” and becomes stronger in various ways. The XP requirements generally increase for each subsequent level. Players can also earn assorted items and upgrades that make their character more proficient within the game (however, many games are also designed to scale the difficulty to compensate when this occurs). Some in-game items are extremely rare or “unique” (i.e., the only such item in the game) and these rewards may require a significant amount of time in order to be obtained. Fulfilling a video game’s objectives within certain game parameters can also unlock “bonus” game content, including short videos, concept artwork, and additional game modes. The key point is that games often take a “kitchen sink” approach to rewarding the player, meaning that the player are often playing to obtain multiple types of rewards concurrently (Griffiths, 2008f).

### *Punishment features*

Video games in general are positively reinforcing because video game developers want to reinforce a player’s decision to play a video game.

However, some elements of failure and punishment in video games are perhaps essential in order to establish the contextual worth of in-game rewards (i.e., that rewards can prevent the player from losing) and show the player that making progress is not simply inevitable but skill-based. Historically, game developers incorporated rather severe failure scenarios in video games, such as having to completely restart a video game when the player's character "died" (Kent, 2001). Since the advent of in-built system memory, players have been able to save their progress in a game and simply "reload" when a playing error is made. Video games have also become longer and more complex, making a punishment like permanent character death an unappealing feature, particularly for a less committed, casual playing audience. Common forms of punishment in games include having to restart a level, failing an objective, or losing resources of some kind, like items, XP or points. Recently, the emphasis on storytelling in games has led some designers to remove significant punishments from their game to maintain story progression, instead incorporating the failure scenario into the game's story. For example, in *Prince of Persia* (2008), the main character cannot fall to his death by a player's mistimed jump, and instead reappears on the screen without penalty.

#### *Meta-game reward features*

A study by King and Delfabbro (in press) has identified the potential influence of meta-game rewards on excessive playing behaviour. Meta-game rewards are designed to give players an overall assessment of their mastery over a video game. In some games, this has been represented by a single



percentage rating that indicates how much of the game the player has completed. The purpose of this feature is to encourage the player to continue playing until total completion is reached. King and Delfabbro reported that meta-game features often set large goals for the player, which keep a person playing longer than intended and contribute to the belief that no amount of time spent playing is “enough”. Recent advanced examples of meta-game rewards include the *Xbox 360*’s Achievement Point system and the *Playstation 3* Trophies system. On the *Xbox 360* system, a player is awarded “achievement points” for accomplishing the varied requirements on a game’s list of achievements. Most games on the *Xbox360* have between 35 to 50 achievements that require the player to either accomplish a difficult feat or perform a certain number of actions in succession. Achievement points are designed to keep the player involved with the video game after the game has been completed, either by replaying the game or playing the game online. For example, the game *Ghost Recon: Advanced Warfighter* has achievements for finishing the game on all three difficulty levels, for playing eight consecutive hours of the game, and for getting 10,000 kills when playing online. To obtain these achievements, players may have to play the game for many weeks, or even months.

#### *Intermittent reward features*

According to operant conditioning theory (Ferster & Skinner, 1957), the way in which a player is rewarded for playing a video game is more important than the rewards themselves. Like gambling on slot machines, video games reinforce correct or skilful play on variable and fixed ratio reinforcement

schedules (Chumbley & Griffiths, 2006). For example, in role-playing games, once the player has collected enough XP, their character “levels up”. The XP requirements per level usually increase each level, meaning the player has to play for increasingly longer periods in order to make progress in the more advanced stages of the game. Item rewards in games are also delivered on variable ratio schedules. For example, a video game may be programmed to reward a particular item 5% of the time. It is well known that variable ratio reinforcement produces the most consistent and steady responding and is the least susceptible to extinction. In addition to rewards delivered on variable ratio schedules, video games also use fixed ratio reinforcement schedules. For example, a player may earn a particular reward for killing 10 creatures. Due to the variable nature of reward, Yee (2006c) has stated that players often report that the later stages of a video game can be a “labour of fun” (i.e., more tedious and time-consuming than exciting), and playing can become more like a second job than entertainment. It is possible that video game players may employ irrational logic similar to the gambler’s fallacy or hold superstitious beliefs about the reward schedules in games (e.g., they may overestimate or otherwise mistake the probability of certain items being awarded during play). In summary, video games commonly feature fixed and variable schedules of reinforcement that can sustain a player’s motivation to play a video game for long periods because the next reward is “just around the corner.”

### *Negative reward features*

Perhaps to a lesser extent than positive reinforcement, video games employ negative reinforcement techniques to keep players involved (Chumbley & Griffiths, 2006). For example, in a shooting game, the player's character may be become injured by enemy fire. This is represented by a decreased "health" statistic on the 'heads up display' (e.g., 65%). The player's character has been placed in an unwanted or unpleasant state. By finding an item that will increase the character's health (e.g., bandages), the unwanted character state is removed and the player feels a sense of relief. Similarly, when a player is given difficult objectives to complete urgently, the player may be negatively reinforced by completing the objective and relieving a feeling of tension or pressure.

### *Near miss features*

It has been argued that slot machine gamblers are not constantly losing, but are constantly "nearly winning" (Griffiths, 1990). This statement refers to the principle of the "near miss", the psychological construal of a losing event as being very similar to a winning one. Near misses occur frequently in video games and can be highly exciting. For example, in a platform jumping game, a player may execute three perfect jumping manoeuvres in a row and then misjudge the final obstacle and lose the game. In this example, the player may not perceive the loss purely as a loss, but as an attempt that came very close to winning. Video games may also provide some tutorial-like feedback to guide the player so that they do not repeat their mistakes, which reinforces to the player that the game's challenges are designed to be overcome. In this

sense, a video game can be reinforcing even in “losing” situations because the player is often on the verge of winning and knows what needs to be done in order to win.

### *Event frequency features*

Event frequency refers to how often a player is able to play a game in a given time period. It has been argued that gambling on slot machines is more reinforcing than a bi-weekly lottery game because people can play a slot machine as often as they like but the lottery is drawn only twice a week (Parke & Griffiths, 2007). In this example, assuming the player places only one bet on each type, a higher event frequency therefore enables a greater amount of play. To the authors’ knowledge, most video games have a high event frequency. In casual puzzle games, the player may be able to play hundreds of games over the course of an hour. Similarly, in a shooting multiplayer game, a player can kill numerous opponents in a short time. Whilst there are goals in some games, such as MMORPGs, which may require hours, even months, to complete, often these goals are broken down into smaller tasks along the way, such as ‘mini-games’, checkpoints, levels, etc. In very few games is the player required to play continuously (without interruption) in order to earn a reward. Thus, the high event frequency of video games may explain why some individuals lose track of their video game playing and experience feelings of escape, immersion and dissociation. However, it should also be noted that time loss in this situation may be something that is positively valued by video game players and should not necessarily be

pathologised by the research community as something that is negative (Wood, Griffiths & Parke, 2007; Wood & Griffiths, 2007).

#### *Event duration features*

Event duration refers to how long a video game event takes to finish. This may be difficult to predict in video games. For example, in an online shooting game, the host of the match may define the game length as 15 minutes, and players will compete to get the highest score in that time whereas, in the puzzle game *Tetris*, the game ends when the player is unable to solve the increasingly difficult challenges of the game. In MMORPGs, players can participate in “raids” which range in duration but may take many hours to complete. Further, MMORPGs do not feature a definitive end point and thus they essentially have “unlimited” event duration. The key point is that video game event durations are highly variable and, for those games without save features, it may be difficult for some players to play only within an intended time period.

#### *Payout interval features*

Payout interval refers to the delay between the end of a game event and the subsequent reward. In video games, there is virtually no payout interval, meaning that players are rewarded immediately. In a shooting game, the player is instantly awarded points for shooting an opponent. Similarly, when a player is shot by an opponent, the loss is recorded immediately. A rapid event frequency and short event duration has been shown to increase gambling behaviour because the loss period is brief so the player has little time to

reflect on losses before a new game begins (Delfabbro & Winefield, 1999). The fact that video games are structurally similar to gambling slot machines in terms of payout interval also enables a player to reinvest the rewards earned in the game into more video game playing (e.g., using coins collected in a level to purchase an item in the game's shop). In this way, short payout intervals may explain why some individuals play to excess.

## PRESENTATION FEATURES

Presentation features refer to the aesthetic qualities of a video game, such as how the game looks and sounds to the player. Included in this category are explicit content and in-game advertising that also influence the presentation of a video game. Some video game properties may be considered as "franchises", and the psychology of familiarity may explain the broad appeal of these games.

### *Graphics and sound features*

Few would disagree that the visual and auditory features of video games can make them highly exciting and appealing. Game scholars have argued that the graphics and sound effects in games enable a more realistic and immersive context for the video game's reward and storytelling design (Salen & Zimmerman, 2004). Earning points or achieving a goal in a video game is often accompanied with particular sounds and visual displays. According to classical conditioning theory, players will form associations with various stimuli within the video game and the pleasurable feelings associated with

positive reinforcement. Over time, the sounds and graphics of a video game may provoke the pleasurable feelings associated with reward in the absence of the reward. For example, the player may associate the background music of the game with the excitement of winning, such that the player feels excited as soon as the video game begins. Music has been suggested to play an important role in slot machine gambling by inducing a “romantic” affective state that makes the player overestimate the chances of winning and disregard previous losses (Griffiths & Parke, 2005). Other studies have found that players gamble more quickly when the music is ‘high tempo’ (i.e., high number of beats per minute) (Dixon, Trigg, & Griffiths, 2007). In relation to video games, an unpublished study by Griffiths found that the music of *Tetris* significantly increased players’ excitement and arousal compared to playing the game in silent mode with the music off (cf. King et al, 2008). Thus, it is possible that sound and visual elements play a major role in boosting player confidence and arousal, and may facilitate the subjective perception of time loss.

#### *Franchise features*

Like the Hollywood film industry, major video game “franchises” have emerged over the last few decades, such as *Halo*, *Mario*, *Tomb Raider*, *Grand Theft Auto*, *Resident Evil*, and *The Sims*. Video game developers understand that particular properties of a game may constitute recognisable brands associated with various playing experiences. Gambling researchers have noted that slot machines that employ franchise elements, like characters from *The Simpsons*, may be more inviting to players because of their

familiarity (Parke & Griffiths, 2007). The psychology of familiarity would suggest that previous positive experiences with certain video game elements may transfer to other activities featuring those elements. Similarly, players may form strong positive feelings, like trust, with certain video game brands and prefer to play these games over others, even persevering with the game when it becomes too complex (Griffiths & Dunbar, 1997).

### *Explicit content features*

Explicit (“adult”) content in video games has been examined with regard to its potential negative effects on young children (Anderson & Dill, 2000), but the notion that players enjoy and choose to play video games primarily to engage with explicit content has received little attention. Brand (2007) reported that 88% of adult players in Australia support a common classification for video games and film, including a restricted classification (18 years and over). In addition to puzzle and sports simulation games, violent shooting games have been among the most commercially successful games for decades. The consumer demand for explicit content may possibly be linked to demand for more complex, adult storytelling in games (Atkins, 2003). Some players may choose games that feature depictions of explicit language, violence and/or sex for the unique thoughts and emotions that this content can provoke in the form of an interactive video game. For example, the game *Bioshock*, in which the player is faced with the moral decision to “save” or “kill” young girls, was critically acclaimed and very popular among the gaming community. Another explanation is that players seek out explicit content because of the cathartic



effects of playing (Dill & Dill, 1998), which points to an explanation of excessive play based on the mood-modifying effects of play (Jacobs, 1986).

#### *In-game advertising features*

Some video games receive corporate sponsorship and feature advertisements within the game (e.g., a virtual billboard advertisement), whereas some game developers pay for a license to use certain brands in their game, (e.g. the use of the name “*Ferrari*” in a driving game). The effect of in-game advertising on playing behaviour is relatively unknown. It may be speculated that video games with official licensing may be more popular among players because of their greater authenticity (e.g., the official *FIFA* soccer games have been more commercially successful than other soccer games). However, inappropriate use of in-game advertising may intrude on the playing experience and decrease player enjoyment.

## SUMMARY AND CONCLUSION

The field of technology-based addictions is new and faces many theoretical obstacles before being accepted by traditional addiction theorists. Nevertheless, it is important that research is conducted to identify the psychological mechanisms that underpin the excessive or problematic use of video games. The gambling literature suggests that the structural characteristics of video game playing may play a role in the initiation, development and maintenance of problem video game playing. This paper presented a five-feature framework to conceptualise many of the known

features of video games that may influence video game playing behaviour. This paper attempts to speculate how these features apply to problem playing, however the extent to which these features contribute to excessive playing of video games requires further investigation. It is hoped that this taxonomy acts as a catalyst for future research into excessive video game play, particularly in those areas that the psychological literature has not explored in detail. The question of whether these features are as clearly demarcated as we suggest deserves further attention, as does the prospect that this framework is indicative of different player typologies.

The study of structural characteristics in video games is of benefit to multiple parties, including (a) psychologists, who stand to learn more about the dynamic role of technology in the emergence of new problematic human behaviours and how this knowledge can assist problem users, (b) video game players, for whom education on potentially harmful structural features may be a good preventative measure, and (c) the video game industry, who aim to develop games to include more appealing and rewarding features to increase long-term consumer loyalty. As video games become increasingly complex and interwoven into the cultural landscape, it is important that researchers can recognise and understand the psychological effects that these new technologies can bring for players, for better or worse.

Chapter 6. Paper 3

The psychological study of video game players: Methodological challenges  
and practical advice

Daniel King and Paul Delfabbro

School of Psychology, University of Adelaide

Mark Griffiths

Psychology Division, Nottingham Trent University

Published manuscript

International Journal of Mental Health and Addiction

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of a schema of the paper's main arguments, which included all main body sections of the paper. I prepared multiple drafts of the paper in collaboration with my fellow co-authors. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....28/08/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was to comment on drafts, make suggestions on the presentation and refinement

of the material in the paper, and to provide editorial input. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

Mark Griffiths (Co-author)

I was a contributing author to this paper. Mr. King was responsible for writing this paper; my role was to comment on an early schema for the paper as well as offer feedback in the form of annotations on a draft version. I provided suggestions for some additional content in the paper, and some editorial input. I also provided advice on the selection of a journal to which this paper would be submitted for publication.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

## ABSTRACT

Video game playing has received increased academic interest over the last few decades, particularly with regard to the psychological understanding of addiction. Based on the many studies carried out by the authors, this paper summarises some of the methodological challenges which may arise when studying video game players, including obstacles associated with various aspects of the research population, the knowledge and attributes of the researcher, as well as external factors often out of the researcher's control. This paper is based on the experience of conducting empirical studies of varying methodologies, including group interview, experiment and survey methods. Practical advice is also suggested, to assist researchers in building effective relationships between the research discipline and the gaming industry and community, as well as conducting their research in the most ethical, flexible, and efficient manner possible.

## INTRODUCTION

Over the last three decades there has been growing interest in the psychological study of video game players. Given this academic attention, it is important to recognise some of the methodological challenges associated with studying video game players as distinct from other research populations.

Since the early 1980s, two significant branches in video game-related psychological research have emerged: (a) the study of video game excess and “addiction” and (b) the study of the effects of playing violent video games (particularly among adolescents and college students). In the former category, the predominant method for identifying potentially “problem” video game players has been by using survey methods, specifically, and more recently the use of online web-based surveys advertised on video game-related sites.

Wood, Griffiths and Eatough (2004) have examined the advantages of using online methods for collecting data from video game players, specifically their high degree of accessibility, affordability and convenience for researchers.

However, they have also highlighted some of the problems including self-selection bias.

This paper extends upon this work by outlining some of the methodological and ethical issues associated with studying the video game playing population using offline data collection methods. In addition, this paper offers some practical advice for researchers towards overcoming some of the problems and dilemmas typically encountered when surveying video game players. This paper is based largely upon our experience of collecting data for a number of studies, including administering group interviews, paper-and-pencil surveys in

a range of video game-related milieus, and laboratory-based experiments, as well as informal discussions of online surveys with participants in online forums. The framework for this paper has been drawn from Parke and Griffiths' (2002) examination of the methodological problems associated with studying slot machine gamblers. Their paper considers those *player-specific*, *researcher-specific*, and *external* factors which can influence the data collection process.

## RESEARCH CHALLENGES IN THE STUDY OF VIDEO GAME PLAYERS

### *Player-specific factors*

The following factors refer to methodological challenges which arise as a result of particular psychological attributes and behaviours among some video game players.

**Activity engrossment.** When surveying video game players at video game outlets and playing venues (such as local area network [LAN] businesses), it can often be difficult to get participants to fill out surveys or interview them for the simple reason that they are too busy playing video games to want to participate in research. Aside from any apparent lack of enthusiasm on behalf of the participant, it should also be noted many online games (as opposed to offline 'stand alone' games) do not typically feature 'pause' features which enable an interruption of play. Because of this, players may incur a 'cost' to progress in their game by participating in research, which may present an ethical dilemma.

**Threat responses.** Psychological research often provokes many different reactions, and, for some players, it can be perceived as threatening. A common perception among some video game players we have surveyed and interviewed was that psychologists do not understand video game culture, and seek to label the activity using clinical terms and/or pathologise excessive behaviour. Whilst many players supported all kinds of research into video games, some video game players can be quite defensive and speak in derogatory terms of psychological research, sometimes even before the purpose of the research had been revealed. The following comments posted online that we collected are typical of this perception:

- *“Let’s just say I don’t think they have a particularly positive view of the gaming community”*
- *“I bet that psychologists are secretly blaming video games for all the world’s problems.”*
- *“Next week there’ll probably be one of those reports about how video gamers are all lazy and borderline psychotic.”*

**Dishonesty and social desirability.** Deliberate dishonesty by participants has been identified as a major problem within gambling survey research (Doughney, 2007). Therefore, researchers should be conscious of participants who misreport their video game playing activities out of denial of the negative consequences or feelings of guilt and embarrassment. Secretive behaviours are a common feature of behavioural excess, as individuals develop habits and techniques to ‘disguise’ or ‘play down’ their excessive and/or problematic involvement in the activity from others. This misreporting may also relate to



social desirability issues, such as (i) not wanting to admit that there is (or may be) a problem with their video game playing and (ii) other people's pathologising of excessive behaviour even though the player has no negative detrimental effects in their life as a result of their video gaming.

**Lack of awareness.** For many individuals, particularly those who play over 50 hours per week, their involvement in video games may be the most important part of their lives and central to their sense of personal identity and self-esteem. Of course, there may be nothing inherently problematic with a high level of involvement. As Griffiths (2005b) has pointed out, if the excessive behaviour does not conflict with anything else in that person's life, can it be said to be an addiction? Griffiths goes on to assert that the difference between an excessive (healthy) enthusiasm and an addiction is that healthy enthusiasms add to life whereas addictions take away from it. However, some of these 'high engagement' players may find it difficult to objectively examine the potentially adverse consequences of video game playing due to any cognitive dissonance it may produce. In the midst of excessive playing habits, they may not be aware or may be in denial, with awareness only coming later when a problem has subsided. Further, some players may find it difficult to delineate the complex motivations that lead them to play video games for excessive periods from their own perception that video games are their main source of positive reinforcement and identity formation.

**Infringement of player anonymity.** Many players report to play video games for the feeling of "escape" that it produces. Therefore, when surveying players

in video game settings, some players can feel as though researchers intrude on their right to be anonymous while in their place of escapism. Some players prefer not to have to report the extent of their playing behaviours to others, as doing so may remind them of their responsibilities outside of video games. This can heighten self-awareness and therefore distract from the pleasurable feelings of escaping from one's self in the video game. Another perception, perhaps among 'heavy' players, is that they will be individually identified within any data obtained, which may also lead to a refusal to participate.

**Lack of incentive.** In many studies, there is often little or no tangible incentive for the individual to participate in the research process. When surveying or interviewing players at video game-related milieus, some participants have reported as feeling as though their participation is a one-way transaction, especially when they are giving time that could be otherwise spent playing games and their participation is not rewarded with personalised feedback.

#### *Researcher-specific factors*

These factors refer to methodological obstacles related to characteristics of the researcher and/or chosen research design.

**Blending.** A potential obstacle in conducting group interviews and other face-to-face research is the researcher simply not 'fitting in' with the research sample due to various personal characteristics or other barriers, such as demographic or socio-cultural differences. When interacting with video game

players, particularly in observational research, it is important that the researcher appears to 'blend in' with other players. Any perceived imbalances in researcher-participant status or group identity may prevent the effective establishment of rapport and may 'turn off' some participants from actively engaging in the research process (Wood & Griffiths, 2002).

**Subjective sampling.** When gathering participants from video game venues, the time of the day can influence the obtained sample. We have observed that the demographic nature of players can often change over the course of a day, particularly at those video game playing venues that operate on a 24-hour basis. For example, some older players may not arrive at a video game venue until after 8pm due to family commitments at home. It should also be noted that video games represent a highly diverse entertainment medium, and that some types of players (e.g. players of first-person shooting games) may be over-represented compared to their proportion in the total game-playing population (Wood & Griffiths, 2002).

**Lack of video game knowledge.** Video game culture, like all cultures, has its own unique conventions, attitudes and idiolects. Researchers who are not familiar with at least some aspects of video game culture may experience difficulty in establishing rapport and opening an effective dialogue with video game players. Whilst objectivity in research is fundamentally important, we have observed that participants are much more likely to place confidence in and disclose information to a researcher whom they feel understands their activity. Some participants we have encountered expressed resentment

towards researchers who deliberately distanced themselves from the gaming community. As one respondent commented, *“If you don't game, it becomes hard to understand what gamers do”*.

**Lack of ecological validity.** Like many areas of psychological research, much of the experimental study of video game players lacks ecological validity. Playing a video game under laboratory conditions – even when the laboratory is designed to be similar to a home playing environment – is a very different psychological experience for the player. Furthermore, experiments are usually time-bound and may not lend themselves to the empirical testing of particular aspects of every day game play. For instance, time loss (i.e., players losing track of time while playing), is very common among gamers and is seen as something very beneficial by most of them (see Wood, Griffiths & Parke [2007]). However, experimental research by one of the authors (MG; Wood & Griffiths, 2007) found it hard to demonstrate time loss experimentally during a period of 45 minutes of game play. It was argued that to show the existence of time loss needed a much longer period of time (i.e., hours of play rather than 45 minutes) with a game chosen by the player rather than one chosen by the researchers. Even though players were given practice sessions pre-experiment, it may be that players are most likely to experience time loss on their favourite games, playing in their favourite playing environment (e.g., their bedroom), playing at a favourite time (e.g., late at night), over a prolonged period of time. In essence, to study gaming properly, it should ideally be carried out in ecologically valid settings, with players choosing the game, the setting and the time and length of play.

### *External factors*

These factors refer to methodological challenges associated with external factors, often out of the researcher's control.

**Gaming establishment design.** For practicality, the layout of most video game playing venues feature computer systems arranged in close proximity to each other. This presents a problem of privacy with regard to some participants who wish to complete surveys, be interviewed, or participate in a psychology experiment at their computer terminals. There is also a risk that participants who complete surveys under these conditions will do so in the company of other players and, in this way, survey or interview responses may be homogenised due to in-group pressures and verbal exchanges.

**Gatekeeper issues.** To survey players at video game venues, researchers must obtain permission from various management and/or organisation personnel. In our experience, obtaining permission is not typically a problem although there can be cross-cultural differences depending upon the type of venue. For instance, one of the authors (DK) asked 13 Australian venues for permission to carry out research on the premises and 12 granted access (with one not replying). However, another of the authors (MG), was often denied permission by UK amusement arcade owners to speak to gaming clientele inside the premises. Researchers must therefore respect the rules of management to avoid causing any disruption to the operation of business. Research can often be a very time-consuming process because only limited periods of time at some venues may be allotted for research purposes.

**Industry perceptions.** Baumeister, Bratslavsky, Finkenaur and Vohs (2001) argued “bad is stronger than good”; that is, negatively framed information is more salient and thus processed more thoroughly than positive information. To date, psychological research has attempted to link video game playing with “addiction” (Griffiths, 2000a), aggressive thoughts and behaviour (Anderson & Dill, 2000), and social isolation (Ducheneaut, Yee, Nickell, & Moore, 2006). Therefore, there may be a general perception among the video game industry that psychological research is “anti-gaming” or at least more highly focussed on the negative aspects of video game playing. Arguably, this view may be, in part, compounded by the skew towards negative video game-related news in the popular press and other forms of mass media. For instance, one of the authors (MG) has published as much on the positive aspects of video game play (e.g., Griffiths, 2005b; Cole & Griffiths, 2007; DeFreitas & Griffiths, 2008) as the negative consequences (e.g., Griffiths & Hunt, 1998; Grüsser, Thalemann & Griffiths, 2007; Griffiths, 2008f). However, he estimates the mass media devote ten times as much airtime and column inches to the negatives. For this reason, researchers in psychology may experience some difficulties in seeking assistance from the video game industry for studies into the negative aspects of gaming.

## PRACTICAL ADVICE FOR RESEARCHING VIDEO GAMING

**Become a gamer.** For researchers, becoming a “gamer” has many benefits. By being directly involved with video games, learning the various types of different video games on the market, meeting video game players in social settings, reading video game-related material (in its many print and online forms), attending local video game events, and even working in a video game establishment (e.g., an amusement arcade), researchers will benefit in learning more about gaming culture, gaining contacts for research purposes, and developing a more critical perspective on video game-related literature. However, the benefits of becoming a gamer should be weighed against ethical concerns that the researcher may lose objectivity about video game playing, and perhaps become an excessive gamer in the process. Alternatively, it may be useful to enlist research assistants who play video games and have special access to research populations and other resources.

**Keep up-to-date with media news.** The mass media has linked video game playing to a number of extremely violent and anti-social behaviours, such as the Columbine high school shooting and the Virginia Tech massacre. Even for those researchers who do not investigate video game playing in relation to such destructive social phenomena, it is important that they keep up-to-date with the topical debates on the subject. In our experience, many participants have informally queried our own position on various debates concerning the purported negative influences of video games with regard to highly publicised tragedies. Therefore some knowledge of these (and other) events is useful in

answering these questions, developing rapport, and maintaining an open dialogue.

**Treat the gaming community with respect.** Researchers investigating the negative aspects of video game playing, such as excessive video game playing, should be open about their research aims (i.e., do not misrepresent the research using vague language). In our experience, many video game players were more than happy to cooperate and discuss their experiences of playing video games to excess when the aims of the research project were presented in a fair, objective, and balanced manner. Because the topic of excessive video game play may be sensitive to some individuals, it is advisable that it is presented openly, without emotionally laden language and without deception.

**Open a dialogue with the gaming community.** Contributing to online forums on video game-related websites enables an open dialogue with the gaming community. This dialogue may provide feedback on research theory and design, including insights into any unforeseen biases in the research being undertaken. In addition, it boosts the researcher's accountability, credibility and transparency within the discipline.

**Give prompt feedback.** It is important that participants feel that their time is valued and that some feedback is provided in due course. The format of this feedback should be concise, relevant and easily comprehended. There exists a temptation in online survey research to obtain a large number of anonymous



responses without providing some avenue for feedback. One of the authors (DK) can attest to participating in numerous online studies of video game playing without receiving requested feedback. The risk of conducting research into video game playing populations without giving adequate feedback is that it could lead to a relationship breakdown between the greater participant pool and psychology researchers. Over time, this could harm the reputation of the discipline, leading to future researchers experiencing difficulties in establishing trust and rapport with video game players and obtaining sufficiently large target samples. The reporting of results to the research sample should be considered as equally important to reporting results to the scientific community, especially given the reputation of psychology within some parts of the mass media as being 'anti-gaming'.

**Network with the gaming industry.** It is suggested that researchers make contact with local businesses and other gaming industry insiders. Knowledge of upcoming video game-related events (e.g., gaming tournaments, midnight launches of video game titles, video game exhibitions, etc.) may be useful for recruiting potential participants. There may also be opportunities for research collaboration or other assistance with large video game associations, whose interests in the gaming community may align with the aims of the intended research. For example, obtaining demographic information regarding certain types of video game players may be useful market research. Another strategy used by one of the authors (MG) is to write short articles for the computer game trade press on a wide range of psychological gaming issues. This

strategy has led to the author being contacted by industry representatives asking if they can help with his research.

**Be flexible with fieldwork.** It has been noted that a large pool of video game players are easily accessible using online surveys (Wood, Griffiths, & Eatough, 2004). However, for non-survey research designs, researchers will need to obtain participants elsewhere. Video game players can be found at large LAN gatherings (typically on weekends) and video game businesses after hours. Thus, to survey a large number of players in the general population, a degree of flexibility is required. In addition, as researchers learn more about aspects of video game culture, they should be flexible with certain research hypotheses as misconceptions about gaming will often require revisions to the guiding principles of the study.

**Introduce incentives for feedback.** Many research projects are not funded and therefore rely on samples of convenience and other cost-saving resources. However, a small incentive, in the form of raffle (e.g., to win shopping vouchers for national video game retailers) or light refreshment, can significantly boost participant response rate and general enthusiasm to participate. In our fieldwork, we observed that a large number of participants (typically those over the age of 25 years) declined the incentive. An incentive is still useful for attracting younger participants who may not otherwise take the time away from playing a video game to be involved in the study. However, for ethical reasons, the incentive should be appropriate in value or size, to avoid coercion or condescension.

## CONCLUSIONS

As the global video game playing community continues to grow, psychological research on the subject of video games (in its many forms) becomes increasingly relevant to the scientific community, and the players themselves. For many researchers, online methodologies are the optimal approach to recruiting and administering research surveys to video game players (e.g., Fleming & Kraut, 2007; Griffiths, Davies, & Chappell, 2004b; Yee, 2005). However, for some research projects (including experimental research), these methods are not always tenable. Therefore, it is important that researchers are aware of the many methodological obstacles that can obstruct the study of video game players in both online and offline settings. Among other recommendations, this paper suggests that psychology researchers should consider becoming 'gamers' themselves, developing a better understanding of the population in general. This will also assist to build rapport and trust between the discipline and the gaming community. By conducting research in this more ethical manner, psychology as a discipline can create productive relations with the gaming industry and community and thereby minimise the stigma of being simply an 'anti-gaming' establishment.

**SECTION B:**  
**CONTRIBUTION TO RESEARCH**

Chapter 7. Paper 4

Understanding and assisting excessive players of video games: A community  
psychology perspective

Daniel King and Paul Delfabbro

School of Psychology, University of Adelaide

Published manuscript

Australian Community Psychologist

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of the paper's main research question. I formulated the study's interview questions, contacted multiple research participant pools to obtain permission to carry out research and subsequently conducted the group interviews. I transcribed the recorded interviews and interpreted the data using thematic analysis. I prepared multiple drafts of the paper in collaboration with my primary supervisor. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....28/08/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was

to comment on drafts, make suggestions on the presentation and refinement of the material in the paper, and to provide editorial input. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

## ABSTRACT

Research has shown that a small but significant minority of video game players play excessively. Excessive play has been linked to fatigue, diminished productivity in work and school, and poor social relationships. The present study investigated the psychological and social context of video game playing in order to understand the phenomenon of excessive video game play. A group interview method was employed using a sample of 38 participants, including 23 adolescents and 15 adults. The analysis of results revealed several salient themes, including those related to player empowerment, recognition (feeling recognised for skilful playing), control (mastery of the game mechanics), and completion (obtaining all in-game rewards). The implications for community psychologists attempting to help excessive video game players are discussed.

## INTRODUCTION

The question of why some people play video games excessively is a current subject of debate among mental health professionals. Over the last decade, studies have investigated the role of players' personality and other individual factors in explaining why some players play to excess (Douse & McManus, 1993; Griffiths & Dancaster, 1995; Black, Belsare & Schlosser, 1999; Yang, 2001). These studies have tended to approach the study of excessive video game play from a person-focussed, clinically-oriented perspective, referring to addiction and social learning models, rather than examining the psychological context of video game playing. This study takes an alternate approach by adopting a community psychology perspective, and considers the psychosocial context and the role of structural elements of video games which may lead a person to play video games to excess.

Before attempting to explain why some individuals play video excessively, it is necessary to qualify what it meant by the term "excessive" and how this definition fits within the current discourse on technological addictions. The notion that video game playing may be considered a form of behavioural addiction, like problem gambling, has been an ongoing subject of debate for over twenty-five years (Fisher, 1994; Griffiths, 2008f; Griffiths & Davies, 2005). Some theorists argue that the construct validity of technological addictions, including dependency on video games and the Internet, has yet to emerge and thus the term "addiction" should not be used (Jaffe, 1990; Shaffer, Hall & Vander Bilt, 2000). On the other hand, it has been argued that any activity may be considered as potentially addictive if an



individual presents with all six criteria of the “components” addiction model: salience, mood modification, withdrawal, tolerance, relapse, and conflict (Griffiths & Davies, 2005). Charlton and Danforth (2007) have argued that salience and euphoria associated with video game playing should not be considered as inherently problematic because these symptoms may simply characterise “high engagement” in video games (i.e., a healthy enthusiasm for playing video games).

Given these conflicting views on “problem” video game playing or video game “addiction”, there exists some degree of conceptual confusion regarding excessive video game playing as a problematic activity in its own right. For the purpose of parsimony, this paper employs a simple definition that considers video game playing to be “excessive” when it creates adverse personal and social consequences in a person’s life. This definition allows for some flexibility in its interpretation, as well as the capacity to identify persons whose playing may be more excessive than others. It is not intended as a tool for the diagnosis of “excessive” players, but as a general guide for considering issues that may relate to excessive video game play in significant ways.

Community psychology is concerned with the study of people within the context of their own settings and social systems. Orford (1992) has argued that individuals are in a state of continuing transaction with the various settings in which they spend time as part of their everyday lives. This transaction is characterised by reciprocity: the individual’s participation within their social system affects the system at large, and the various characteristics of the system also affect the individual. This interplay between person and context, it is argued, cannot be broken down into smaller units of analysis, but

must be considered as a “gestalt” entity. Video games are often considered as complex social contexts or social spaces (Fisher, 1995; Jansz & Martens, 2005; Valentine & Holloway, 2002), therefore a community psychology approach may offer a new perspective on why some individuals become excessive players, and may offer some practical solutions for helping these individuals.

A reanalysis of Allen and Britt’s (1983) feedback model of social class and psychological disorders may be useful in understanding excessive video game playing. In their model, there is a relationship between stressful life events and psychological problems which is mediated by social class. Social class acts in two main ways: it affects the likelihood of stress, and the speed with which the feedback between the psychological problem and stressful life events occurs. For excessive video game players, it may be useful to consider the role of social class in this model in an additional way. There is a great deal of literature that shows how a player can take on a “new” social class (i.e., status as defined by the video game context, most notably within online games but this is also applicable to offline, ‘stand alone’ games) and can become an integral part of the social network associated with the video game (Engelberg & Sjoberg, 2004; Jansz & Tanis, 2007; Valentine & Holloway, 2002). A social role in the video game may grant a person a temporary release from stressful life events. As a player’s video game status increases (i.e., becomes more powerful and recognised by others), it may be perceived as more important than the player’s social class in the real world (which may be less upwardly mobile). It is important to note that the resources – personal, social, economic - available to the player in the video game may far

outnumber those available in the real world. In this way, the model predicts that a large divide between a player's video game status and real life social class, in conjunction with stressful life events, will increase vulnerability to playing video games to excess.

Research into excessive video game playing is limited in the Australian context. However, there have been a number of studies overseas which have examined the importance of structural characteristics in video games in explaining the appeal of video games (Chumbley & Griffiths, 2006; Johansson & Gotestam, 2004; Wood, Griffiths, Chappell, & Davies, 2004). Other studies have emphasised the importance of the social nature of video games in explaining why some individuals become highly involved (Griffiths, Davies, & Chappell, 2004a; Ng & Wiemer-Hastings, 2005). Charlton and Danforth (2007) stated that many video games may be attractive because "players take-on the role of a character in a virtual environment in which a story line evolves over time and the time frame in which an event will occur is unpredictable...[and] they are particularly good at inducing operant conditioning via variable-ratio reinforcement schedules" (p. 1534). Despite this literature that highlights the importance of the social and structural features in video game playing, there have been few published studies which examine the role of these factors in excessive video game playing.

This qualitative research set out to examine in greater detail how individuals become excessively involved in video games, by exploring the relationship between player, video game machine and the social context of player-machine interaction. It was hoped that this approach would enable a broad and coherent explanation for the phenomena of excessive video game

playing, particularly in relation to the structural characteristics of video games, the video game player and the wider social network of players.

## METHOD

### *Participants*

Seven semi-structured group interviews were conducted (three groups of four participants and four groups ranging from three to eight participants in size). The total sample was 38 participants, including 23 adolescents (15 males, 8 females) and 15 adults (11 males, 4 females). The mean age of the adolescent group was 16.2 years ( $SD=0.7$ ) and the mean age of the adult group was 30.4 years ( $SD=6.7$ ). In terms of video game play, the adolescent group reported playing between three and 40 hours per week ( $M=14.5$ ,  $SD=12.3$ ) and the adult group reported playing between two to 35 hours per week ( $M=18.1$ ,  $SD=11.2$ ). By conducting the interviews in small groups, participants felt comfortable discussing their experiences playing video games. Previous work has noted that group interviews may minimise any perceived power imbalance between researcher and participants (Wood & Griffiths, 2002).

### *Materials*

A pilot interview study was carried out using four adult video game players. These players' input assisted in the construction of a group interview protocol, including the development of a set of interview questions (see Appendix 1). These questions were designed to enquire about players' motivations for

playing video games, including what features of games were attractive or rewarding, and what characteristics of video games would keep them playing in a typical playing session. These general questions led into a discussion of excessive video game playing behaviour. Given the participants' broad range of experiences with video games, participants were encouraged to discuss related areas that they considered to be of relevance to the question. The interview protocol was flexible enough to accommodate responses that deviated from interview questions. Prior to taking part in the study, all participants were asked to fill out a short questionnaire concerning the frequency of their video game playing. The audio of all group interviews was recorded.

### *Procedure*

Adolescent participants were obtained by contacting the principal and secondary psychology teacher of a high school in a regional city. Three classes of students were selected for participation in the study. An adult sample was obtained by word of mouth requests at a local non-business internet gaming group. Interviews were conducted in a separate room at the gaming venue. Given that this study was concerned with video game-related experiences, potential participants were checked for eligibility to participate by employing the screening question: "Do you consider yourself a gamer?". A "gamer" is a commonly used term for a person who plays video games. The mean reported amount of experience playing video games was 11.7 years ( $SD=7.7$ ), so this screening method appeared to be successful. Food and drink refreshments were provided for all participants following the interview.

Establishing rapport was a critical part of the data collection process, especially when interviewing the adolescent participants. To ensure that all participants felt comfortable, there was a brief period of friendly conversation (approximately five minutes) prior to the interviews. The first researcher being a “gamer” helped to make participants feel more comfortable referring to specific video games when discussing their playing experiences. Participants consented to having their responses recorded and were informed that these responses would be kept anonymous.

#### *Data analysis*

Interview data were analysed using thematic analysis (Braun & Clarke, 2006). This process involved three steps. First, the recordings were transcribed and then the transcripts were checked against the tapes for accuracy. Second, the most salient themes were identified. Each data item was given equal attention in the coding process to ensure an inclusive and comprehensive process. A separate document was created to store a list of all identified themes, as well as record a series of relevant extracts which illustrated each theme. The third step involved using this initial set of themes as a framework to reanalyse the transcripts. All transcripts were reread multiple times to ensure a good fit of the data, as well as to ensure that themes were internally coherent, consistent, and distinctive.

## RESULTS

The results have been presented in five sections. The first section discusses the notion of “empowerment” in relation to the video game playing experience; the second section discusses the role of social networks and social responsibility in video games; the third section examines video game rewards and reward delivery in relation to player motivation; the fourth section discusses the player’s belief that no amount of time spent playing is “long enough”; and the final section explores the adverse consequences of excessive play. Direct quotes from the participants will be used to highlight the various themes that arose during the group interviews, but these quotes do not represent all of the quotes related to that theme. To ensure participant confidentiality, each quotation has been assigned a coding reference relating to (a) which group the participant was in, and (b) the age and gender of the participant. Therefore, a coding of “G1, F, 32” indicates a 32-year-old female participant who participated in the first group interview.

### *Player empowerment in relation to player recognition and control*

This section explores two main ways in which video games can be argued to empower the player. Empowerment refers to a heightened sense of power or authority (Rappaport, 1987). This notion will be explored in relation to participants’ experience of feeling a sense of mastery over the virtual properties of the video game environment as well as a sense of contextual status or rank, either from feedback within the video game or in relation to

other video game users. These two ideas are represented by the themes of “control” and “recognition”.

“Control” was a dominant theme throughout the interviews. This theme refers to the notion that video games grant a player a strong sense of personal agency within the game context. The majority of participants expressed enjoyment at being able to manipulate and interact with features of the video game environment, or exert some influence over the outcome of in-game events. As one participant stated, “You can test what these things do when you input them. You’d hit a combination of keys and activate a booster for health or speed or all these tools that would come in really handy” [G4, M, 21]. Participants also reported a sense of personal freedom in being able to choose how a video game’s story would be resolved or controlling the outcome of in-game events using personal strategy (“In the game you can follow whatever path you want to, and you control it” [G3, F, 18]).

Some participants felt that video games were more immersive than film or literature because they were able to participate actively, rather than be only passively involved. One structural feature of video games related to player control was the ability to “save” one’s progress in the game. This feature enables the player to “reload” an earlier part of the game if they wish to correct an error or otherwise repeat a previous game section (“I like being able to replay it over and over, getting a part done just right” [G2, M, 22]).

“Recognition” was another important theme related to empowerment. Many participants reported a sense of fulfilment associated with being rewarded or “recognised” for having invested tens to hundreds of hours playing some video games. Examples included being given a special title or



rank within the game, earning unique items for in-game characters, like weapons or armour, or even an in-game timer that recorded time spent playing the game. Part of the value of these items related to the difficulty in acquiring them (“The best sword in the game is hard to come by. But that’s good and bad, bad because I don’t get a sword really quickly but that’s good because everyone else doesn’t” [G2, M, 17]).

“Meta-game” features also recognised players’ effort and time commitment. A common example was online player “leader boards”, where players could compare their progress in a video game with their friends or other players. The “achievement point” system for a popular video game console system (Xbox360) was also mentioned. Achievement points are similar to loyalty rewards programs; they reward players for not only completing the game but also for performing rather esoteric or unusual actions, such as playing a game non-stop for eight hours, or playing a game with 16 other players at once. Another example was “playing 1000 games so you can get the Elite achievement points” [G2, M, 23]. Recognition features were very appealing to male participants, but were less interesting for female participants.

### *Social networks have associated social responsibilities*

It is undeniable that modern video games feature numerous advanced social utility functions, which coalesce to connect the individual to many others within a large social network. In this study, all participants reported to enjoy playing video games with “multiplayer” support. The social nature of video game playing was the primary appeal of the activity for some players.

Common experiences included helping friends to earn in-game rewards or other achievements, cooperating together to finish a video game, or competing in a team against other players. These experiences were sometimes framed as a type of social “responsibility” within the network (one participant even referred to the video game as his “second job”). Some participants reported that video games enabled a type of online community which shares a common space for the anonymous exchange of personal information as well as information about the video game.

Players reported to adopt an identity within this online “space” that is associated with the names, titles, language and/or motifs within the video game (“I have this friend who’ll ask me what I’m doing and I’ll say “I’m the Hero of Cyrodiiil”. He’s a super, fantastical hero” [G6, M, 17]), which reinforces a sense of “togetherness” when working together to achieve various goals within the game. A video game community is composed of a number of social institutions and groupings which exist in the online world, which have the functional purpose of linking certain kinds of players together. Often these social groups hold organised events in the video game that can run for unpredictable periods of time. These events require the participation of a network of players and thus create a social “responsibility” to each player within that network (“You are part of the playing group and they rely on you” [G6, F, 27]).

This responsibility makes it very difficult for participants to stop playing a video game prematurely (i.e., before other players have “finished”) and also encourages the player not to spend too long away from a video game. As one participant stated, “We’re in a team of eight, and you can’t really stop if only

one person wants to stop so you're locked in" [G4, M, 16]. Players also noted the reciprocal nature of social responsibility in the video game world ("If they've helped you out before, then you just have to keep playing" [G2, M, 15]).

#### *Rewards and reward delivery in relation to player motivation*

Video games may be conceptualised as a system that delivers many different rewards based on players' actions. For participants, it was important how a video game presented a reward to the player in response to "correct" or skilful behaviour. Some common notions of what constituted a "good" reward were evident through analysis. "Good" rewards tended to challenge the player's skill level i.e., not too easy or hard to obtain, were novel in nature and commensurate to a player's effort ("If you can beat it without any challenge, then that's no fun" [G2, M, 16]; "It's great so long as it's not always the same reward over and over" [G2, M, 16]).

Rewards in video games were particularly salient to the male participants aged between 16 and 25 years, and were reported to motivate repeated plays of the video game ("I think your achievements or rewards are what keep you coming back to games" [G1, M, 24]). The rewards in video games were often reported to be the primary motivation for playing ("I think more about the achievements and rewards over anything else" [G1, M, 23]).

Participants stated that many video games have complex reward structures that demand multi-tasking management skills and a great deal of player concentration. Many participants felt that concurrent in-game goals (i.e., playing to earn more than one reward at a time) constantly renewed their

motivation to play the video game. This was described as a kind of “reward cycle”, in which one goal would be close to completion just as another was completed, so the player would be motivated to obtain or finish off the partially completed goal (“I always want to get to the next level, or you want to just finish that bit off. But you find that you’ve got five other bars that are really close to the next level” [G4, M, 15]). Participants also discussed video games with variable ratio reinforcement schedules, wherein players are rewarded frequently in the early stages of the game, and then less often in later stages. Participants reported spending long periods of time in the later stages of these reward schedules (i.e., when rewards were delivered highly infrequently), not wanting to leave the video game until a major reward was obtained. If a playing session were interrupted before a major reward was obtained or human error caused a game to end prematurely, then participants reported feeling anxious to return quickly to the video game to obtain the associated reward (“Sometimes when I have to exit the game to go to work, I keep thinking about how I haven’t finished the bit of the game I was working on. It can make you feel impatient for work to finish so you get back on it” [G1, M, 23]). This experience of needing to return to game quickly was referred to by a number of players as satisfying the “need for completion”.

The variable-ratio reinforcement schedules in video games and participants’ need to complete goals often produced what was termed “grinding” behaviour. Grinding refers to the repetition of an action or series of actions in a video game in order to obtain a reward. In this way, grinding is a mathematically optimal method of acquiring in-game rewards, but the player is sacrificing variety of game play (“Building up skills means doing the same stuff

over and over, like working a really repetitive second job” [G5, M, 33]).

Grinding may involve hours of playing, sometimes uninterrupted, in order to yield the desired rewards (“Like you get 10 points and you need 3000 so you’ve just got to keep farming them for a long, long time before you can get what you’re after” [G4, M, 16]).

None of the male participants reported enjoying the process of grinding, but many felt that there was no other way to satisfy their personal sense of completion concerning a video game (“Trying to finish something or unlock something and not necessarily enjoying the game, but just wanting to get it done. Satisfying the need for completion” [G1, M, 24]; “I played the same level 10 times to get the full set of armour. So that gets frustrating but you have to do it if you want the items” [G6, M, 27]). There were no data in the study to suggest that female participants had experience or interest in using grinding strategies.

#### *Belief that no amount of time spent playing is “long enough”*

Many participants reported to continue playing a video game even when the experience ceased to be fun or pleasurable. This led to a discussion of when players felt they had played for “long enough” and whether any features of video games prompted the player to end a playing session. The majority of female participants indicated that they usually quit a video game when they had finished a level in the game, or felt bored by the game. In contrast, many of the male participants reported that they never felt they had played “long enough” in a typical playing session. The desire to continue playing when the game was no longer fun was attributed to the variable reward structure of the

game (i.e., the notion that the next reward might be “right around the next corner”), and also to the fact that many of the games they played had no definitive “end point”. As one participant stated, “I never really feel like I’ve played a game for long enough. There’s always something more because I don’t really get games that have an end” [G3, M, 16]).

Online role-playing games, such as Blizzard Entertainment’s *World of Warcraft*, are known for their lack of a conclusion and can be played indefinitely. The virtually unlimited quantity of rewards in some video games can lead some players on an interminable effort to obtain as many rewards as they can. Concurrent reward structures like two in-game tasks running simultaneously, multiple “experience bars” or other onscreen meters of player progress, and completing one goal and being close to the next kept many participants from taking breaks. For this reason, some participants reported that they only stopped playing a video game when they felt too physically sore or fatigued to continue (“When my arms and hands are getting sore” [G6, M, 32]; “When my fingers aren’t moving fast enough or my hand is asleep” [G4, M, 16]), or when an external event like meal times or a partner’s request to stop forced them to exit the game (“Some other external factor, like tea time, that drives you away” [G7, M, 30]). The key point is that, for some players, the video game playing session does not terminate itself naturally through play.

#### *Excessive playing has negative psychosocial consequences*

It is clear that video games can offer a distinct and rewarding experience to the end user. Therefore, it is not surprising that many of the respondents reported that it was difficult to regulate video game playing and sometimes

played video games for excessive periods. The fact that the video game machine is located in the home environment appears to make it difficult for players to take time away from the game (“The only thing I don’t like is that you can get so involved that you just want to keep going and you can’t get away from it because it’s always there” [G2, M, 16]). Some participants referred to some video games as being “addictive”, but this term was employed to emphasise both the positive and negative aspects of the game. A common consequence of long playing sessions was conflict with important life responsibilities. Participants identified a range of life commitments which had been sacrificed or compromised in some way in order to prioritise a video game playing experience (“Another aspect that I don’t like about video games is that it can impact on your family life if you’re not careful. It starts to conflict with other important things, like money, jobs, and normal relationships” [G5, M, 49]). These experiences included neglecting real life social relationships, diminished school and work productivity (“I have played all night, had a shower and then went to work” [G5, M, 49]), ignoring household duties and irregular sleep patterns (“None of us had slept for about 24 hours. I don’t think anyone of us wanted to stop but certainly the game kept us engaged and playing for longer than any of us bloody well wanted to” [G7, M, 30]).

## DISCUSSION

The present study employed qualitative interviews to explore the psychosocial context of excessive video game play. The results showed that a video game can be an empowering agent that gives a player a sense of mastery as well

as a sense of status within the context of the game. Video games are also highly rewarding because of the social networks that the player can connect to, enabling them to take on various social responsibilities which provide a sense of identity and belonging within a large community of other players. There are also reward systems within video games which play an important role in sustaining player motivation. The nature of these systems is similar in many ways to gambling machines insofar as delivering rewards on variable-ratio and fixed-interval schedules. The relevance of these factors for community psychologists who seek to help excessive video game players will be discussed.

This study suggests that people play video games excessively because of the strong feelings of empowerment associated with video games. It is possible that one reason why people play video games to excess may be the lack of empowerment that they have in the real world. Durkin (1995) has stated that video games are designed to facilitate and reward player control and eventual mastery over the video game environment. By comparison, the real world can be an uncertain place that may not treat the individual fairly. For some players, the “real” world may in fact be the video game’s setting, as it is within this interactive space that the player has developed a sense of mastery and feels recognised by others. Castronova (2005) has stated that some people view video game worlds as the “best place” available to them. In this sense, there may appear to be little incentive for some players to leave the world of the video game. For community psychologists, addressing this notion of empowerment is crucial for helping an excessive player bring their video game playing habits into balance with other life responsibilities. One approach is to help the player to develop strategies and/or life skills to regain



control and feel socially rewarded in other areas of their life, such as school, work and relationships. This approach may be complimented by rallying social support for the player as he or she spends more time in non-video game activities.

McMillan and Chavis (1986) have stated that membership to a group is defined by boundaries, emotional safety, a sense of belonging, personal investment and a common language. This study has explored some of the ways in which group membership operates in the social context of video game play. The interview data suggested that: (a) there are boundaries in games indicated by the status of the player's in-game character, among many other factors, (b) there is a sense of emotional safety in terms of the video game world offering an anonymous space for the exchange of personal information, (c) there is a sense of belonging through teamwork and competitive pursuits, (d) there is personal investment in terms of players spending long periods of time to acquire in-game rewards, and (e) there is a rich language and symbol system within video games that players develop and use (this paper could not formally address these in detail but there were many examples of video game-related 'jargon' in the transcripts). These are normal and healthy features of group membership; however, these characteristics also provide useful units of analysis for community psychologists in dealing with excessive players of video games. For example, excessive video game play may be characterised by an intense personal investment in the video game. The difficulty for the player in reducing time spent playing is reconciling the personal dilemma that spending less time in the game enables more free time in the real world, but time spent away from the game means fewer video game-related rewards (i.e., abandoning a large personal investment).

Some players appear to form a strong relationship or bond with the video game machine. Selnow (1984) referred to this attachment as “electronic friendship”. At its extreme, excessive players may prefer to play the game over spending time with real life friends because it is easier than managing interpersonal relationships and helps to forget feelings of social loneliness. The implication of “electronic friendship” is players who reduce time spent playing video games are, for all intents and purposes, reducing time spent with a “friend”. This perspective offers a sensitive insight into the player’s negative mood state (that may be termed “withdrawal” in clinical psychology) that may accompany a decrease or cessation of time spent playing a video game. Sarason (1974) conceptualised social belonging as an acknowledged interdependence with others, and a willingness to maintain this interdependence by giving or doing to others what one expects from them. The problem of electronic friendship is that a machine has no shared values, no emotions, places no expectations on the player as a friend, and offers no social rewards. The implication is that community psychologists may need to assist the excessive player in understanding the quality of the attachment that has been formed with his or her video game machine. A possible strategy to reduce the player’s dependence on the machine is to integrate the person into new social networks that can gratify needs for social belonging.

Player motivation appears to be heavily influenced by the variable-ratio or fixed-interval reward delivery systems in video games. In terms of the nature of rewards, participants reported to prefer video game goals that are not too easy or difficult to obtain. Csikszentmihalyi’s (1990) theory of optimal experience, termed “flow”, states that people reach a motivational peak when

engaged in a challenging task that is optimally difficult. This study identified male players who do not seek out optimally challenging video game situations, and instead use “grinding” tactics, which involves performing an easy and repetitive series of actions in a game in order to maximise reward payout. These participants did not always enjoy the process of grinding but felt it was necessary to satisfy a personal sense of achievement or completion. Video games with concurrent reward schedules that do not have definitive endpoints may also condition the player to think that no amount of time spent playing is “long enough”. These findings are in line with research that has shown that gamblers will continue to gamble even when they are bored by or no longer enjoy the activity, and report irritation on winning because it sustains a session of play (Blaszczynski, McConaghy, & Frankova, 1990). Helping an excessive player may involve education about the never-ending nature of some video games and how this can influence motivation to play for periods longer than intended.

Rather than adopting a traditional, person-focussed therapeutic approach aimed at addressing various intra-psychic deficits of the individual, such as depression or anxiety, it may be worthwhile to attend to the environment which maintains a problem video game playing habit. In community psychology, this intervention is called “second-order change” and involves addressing aspects of the environment which support problem behaviour (Rappaport, 1977). A community psychologist may work together with the player to identify specific environmental factors which promote, develop and maintain unhealthy playing patterns. For example, a community psychologist may recommend that: (a) the player does not have a video game

machine in the same room as the person sleeps, to avoid poor sleep hygiene practices, (b) the player has a clock in the same room as the video game machine to monitor playing times (and the player could also set an alarm when playing video games to prompt the end of a playing session), (c) the player plays in a well-lit room to minimise the subjective experience of time loss, (d) the player eats meals in a different room of the house as the playing machine, and (e) the player unplugs and stores away the video game machine when it is not in use, and/or arranges furniture so that it is not facing the video game machine.

The interview data suggested that some video games may be more 'addictive' than others due to the structural features of the game. For example, a person is less likely to spend as long playing a "casual" puzzle game than an online role-playing game. The latter game type contains potentially "risky" structural characteristics which make playing more difficult to self-regulate. Broadly, risky features include the requirement of the player to spend increasingly longer amounts of time in order to make progress, and the lack of a definitive endpoint to the game. It is important that parents of younger players are knowledgeable about the kinds of video games which are often associated with excessive playing. The classification labels on video games refer only to explicit content, like violence and language, but they do not contain information on elements like how long the game takes to complete, and other features which may influence the "addictiveness" of the video game. Parents should take an active role in their children's media choices and playing patterns, and open a dialogue to discuss what gratification needs the video game fulfils in their life. For adult players, friends

and partners who suspect that a person is playing video games excessively should also follow this strategy. Given that some adults play video games to escape or dissociate from the real world, it is possible that these players may not be aware of the extent of their playing habit. It may be beneficial for the player's real life social support network to point out to the player (in a non-threatening and non-judgemental manner) his or her high level of involvement and how it negatively affects their psychosocial wellbeing. Making the consequences of excessive playing more salient may serve to initiate that player's desire for positive self-change.

Players may benefit from discussing their experiences on online message boards related to excessive video game play. They can receive factual information, including guides to healthy playing styles and ways of managing stressors that trigger the desire to play video games. In addition, players can provide and receive support and feedback from others, including those individuals who formerly played excessively. Support services can also help people who are close to an excessive player, such as a parent or spouse, because they can provide support and practical advice, such as suggesting alternative activities during times when the player would usually play video games. In tandem with these support services, community psychologists should consider the role of introducing excessive players of all ages to other social, non-sedentary (and, importantly, time-limited) activities, such as sport and recreation groups, which can offer a sense of achievement and belongingness within a team-based environment.

This research offers additional support for the notion that excessive video game playing is largely influenced by the ways in which video games deliver rewards to players for skilful behaviour, and the nature of social

networking within video game environments. This paper was intended to provide specialist information about the general appeal of video games to mental health professionals who may be unfamiliar with video game technologies and, more importantly, explain how these technologies relate the phenomenon of excessive video game play. Community psychology can assist excessive video game players by helping them to develop a sense of belonging outside of the world of video games, and educating them about the features of video games which keep them playing excessively. As video games become increasingly complex and appealing, it is also important that players are aware of the psychosocial context of video game play and how it can affect their video game playing motivations, for better or worse.

Chapter 8. Paper 5

Preliminary validation of a new clinical tool for identifying problem video game  
playing

Daniel King, Paul Delfabbro and Ian Zajac

School of Psychology, University of Adelaide

Published manuscript

International Journal of Mental Health and Addiction

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of the paper's main research question. I adapted the Internet Addiction Test to create the Problem Video Game Playing Test (PVGTT). I contacted multiple research participant pools to obtain permission to carry out survey research and subsequently collected the survey data. I entered the raw survey data and conducted the necessary statistical analyses with assistance from Mr. Zajac. I prepared multiple drafts of the paper in collaboration with my primary supervisor. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....2808/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was to comment on drafts, make suggestions on the presentation and refinement of the material in the paper, and to provide editorial input. I had an advisory role with respect to the direction and specifics of the data analyses. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

Ian Zajac (Co-author)

I was a contributing author to this paper. Mr. King was responsible for writing this paper; my role was to assist in conducting part of the statistical analysis using computer software, specifically, the confirmatory factor analysis of the PVGT detailed in the section entitled "Dimensionality" in Study Two of the manuscript. I provided advice on the presentation of the interpretation of this analysis.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....



## ABSTRACT

Research has estimated that between 6 to 13% of individuals who play video games do so excessively. However, the methods and definitions used to identify “problem” video game players often vary considerably. This research presents preliminary validation data for a new measure of problematic video game play called the Problem Video Game Playing Test (PVGT). Two studies were conducted: an online survey of 373 university student video game players, and a paper-and-pencil survey of 416 video game players from video game outlets and LAN businesses. This paper presents the internal consistency, score distribution, convergent validity and dimensionality of the PVGT. The PVGT demonstrates potential as a continuous measure of problem video game playing. Future research should investigate the use of the PVGT as a clinical instrument for screening individuals whose video game playing may be considered excessive or personally detrimental.

## INTRODUCTION

Millions of people play video games in moderation as part of a normal healthy lifestyle. However, there is mounting concern that a significant minority of video game players jeopardise their school and work commitments, social relationships, and emotional health to play video games to excess. It has been suggested that, for some such players, their involvement in video games should be classified as problematic, even an “addiction” (Griffiths & Davies, 2005). However, the question of how problem video game play should be measured remains a subject of debate. Until recently, it had been assumed that playing 30 hours of video games or more may be considered as “unhealthy”, particularly for younger players (Griffiths, 1997; Subrahmanyam, Greenfield, Kraut, & Gross, 2001). Using this approach, early studies of video game players were largely guided by the measurement of frequency and duration of individuals’ video game playing sessions. However, there currently exists no empirically validated test for measuring problem video game playing. The purpose of this paper is to present the results of two empirical studies which attempt to validate a new tool for measuring problem video game playing.

## VIDEO GAME ADDICTION

The concept of non-chemical “addiction” has been debated by many experts within the addiction field. Marks (1990) defined addiction as “repetitive actions that aim to obtain chemicals and, less often, routines without that aim” (p.

1389). The latter part of his definition referred to “behavioural” addictions, those addictions with no chemical basis. He argued that the two types were conceptually similar ‘dependence syndromes’, characterised by the repeated urge to engage in behaviour known to be counterproductive, mounting tension until it was completed, rapid temporary switching off of the tension by the behaviour, gradual return of the urge, and so on. Jaffe (1990) argued that categorising as addictions those compulsive behaviours which have no associated chemical ingestants, such as obsessive-compulsive disorder, gambling, and overexercising, may lead to a trivialisation of the concept of addiction. Nevertheless, many theorists have employed this basic definition, and behaviours as diverse as overeating, overspending, kleptomania, workaholism, and hair-pulling have been termed “addictions” (Bradley, 1990). Recently, the advent of computers and video games with advanced online capabilities has led researchers to identify another subset of addictions, termed “technological addictions” (Griffiths, 1995). Technological addictions, such as Internet and video game addiction, refer to those individuals with a dependant relationship upon a machine, specifically those experiences associated with using the machine. However, many theorists have openly criticised the application of the addiction label to these computer-based activities.

Shaffer, Hall and Vander Bilt (2000) argued that there exists scholarly confusion with regard to whether excessive computer use causes or reflects psychopathology. They claim that the lack of a distinct operational definition of addiction may have misled some researchers into classifying “secondary” problems as fully fledged addictions, whilst overlooking underlying primary

problems. Further, they argued that the construct validity of computer addictions has yet to be demonstrated, and warned that clinicians should avoid doing inadvertent harm to the field of addiction by overeagerly employing the addiction term. Recently, Wood (2007) criticised the notion of video game addiction, and, like Shaffer et al., theorised that problem video game playing may simply be a 'secondary' addiction (i.e. the addictive behaviour is symptomatic of pre-existing problems). Citing case study examples, Wood posited that excessive video game playing may occur as a result of ineffective time management skills, or underlying personal problems, "rather than any inherent addictive properties of the actual games". Despite these criticisms of technological addictions, numerous research articles from the U.S., Great Britain, Australia, China, Taiwan, and South Korea have been published which claim to identify an "addicted" subgroup of the video game playing population.

Griffiths (2008b) has consistently argued that behavioural addictions, such as problem gambling, are no different from any other addiction in terms of the "core components" of the addiction. He argued that, if the scientific community can accept problem gambling within the clinical nomenclature, in theory the "floodgates open" for all other types of compulsive behaviours, including the technological addictions. Griffiths defined video game addiction according to the following criteria: "Salience", referring to the video game being the most important activity in the person's life, which causes preoccupation at all times of the day; "Mood modification", referring to the person using video games to alter their mood as a form of coping strategy; "Tolerance", referring to the person requiring increasing amounts of time

playing video games to achieve former mood-altering effects; “Withdrawal”, referring to the unpleasant physical and psychological states caused by reduced or discontinued use of video games; “Conflict”, referring to the conflicts between (a) the use of video games and other activities, like school or work, (b) the use of video games and interpersonal relationships, and (c) the use of video games and personal negative emotions, like guilt; and “Relapse”, referring to the person’s failed attempts to control or reduce patterns of video game playing. Griffiths has stated that video game addiction does exist, but claimed that the number of individuals who meet all of the components criteria would represent a “very small minority”. Similarly, West’s (2006) comparative analysis of all known addictive activities ranked users of video game technologies as one of the least likely to become addicted. Nevertheless, Griffiths (2008b) maintained that there are numerous users of video game technologies who experience some adverse consequences as a result of excessive playing. However, at present there exist few validated methods of identifying problem video game players. Thus, the field of technological addictions would benefit greatly from the addition of a theory-based clinical instrument of problem video game play.

#### MEASURING EXCESSIVE GAMING: HOURS SPENT PLAYING

Early research into excessive video game play was guided by the assumption that the longer a person spends playing video games, the greater at risk that person becomes of (a) neglecting other responsibilities, such as work or

school, and (b) suffering resultant physical, social or emotional problems. As Griffiths and Wood (2000) noted,

Whether video games are “good” or “bad” is not the relevant question. The question we should be asking ourselves is what the longitudinal effects of any activity that takes 30 hours of leisure time a week has on education, health and social development of children and adolescents.

Research has also been influenced by numerous anecdotal accounts of individuals who fail school or university studies, suffer marriage breakdowns, and who become psychologically distressed and socially alone as a direct result of excessive video game play (e.g., Griffiths, 2000b). The key explanatory factor apparent within such anecdotal reports was the individual spent too many hours each week playing video games, thus preventing proper attention to other life commitments. Whilst some researchers have labelled this kind of behaviour a psychological “dependency” (Graham, 1988; Griffiths & Hunt, 1998), the criteria for determining excessive involvement has been largely framed by time spent playing the machine.

Early studies of video game players employed rather arbitrary definitions of “heavy” gaming which seemed to imply excessive involvement in the activity. Selnow’s (1984) study of 202 adolescent video game players employed a formula expressed as “visits per week x average duration of visits x money spent per visit” to classify three subgroups of players: “heavy”, “moderate” and “light”. Light players typically visited an arcade less than once per week, played for less than half an hour, and spent on average \$1.50 per visit. Heavy players, by comparison, typically visited an arcade three times per

week, played for three hours, and spent \$3.00 per visit. Egli and Meyers's (1984) study identified 13% of their sample of 151 adolescents as "frequent" video game users, i.e. individuals who played video games for 12 or more hours per week. Frequent players were much more likely to report that they felt "addicted" to playing video games than did less frequent players. However, the researchers cautioned that this apparent "compulsiveness" may not be necessarily associated with video game-related personal problems. Morlock, Yando, and Nigolean (1985) identified two types of players: also termed "frequent" and "infrequent". A frequent player was defined as playing video games from one to five times in a typical week, whereas an infrequent player did not play in a typical week but reported having played between two to nine video games in the previous year. In Abbot, Palmisano and Dickerson's (1995) study, subjects who spent more than four hours per week in arcades, spent \$16 or more per week, visited arcades seven or more times per week and answered "often" or "always" to four choice items were labelled as "excessive" players. Given the broad range of definitions of heavy and/or excessive video game playing in the literature, it is not surprising that there exists some confusion as to how problem video game playing should be conceptualised. The use of frequency data has been criticised as misleading too, as Griffiths, Wood and Davies (2004) argued that what people sacrifice to play video games is of tantamount significance to the amount of time spent playing video games.

Recent studies of Massively Multiplayer Online Role-playing Games (MMORPGs) suggest that video game playing for upwards of 50 hours per week is a highly prevalent activity. Griffiths, Davies, and Chappell (2003)

surveyed 11,457 players of the popular online game *Everquest*. Over forty percent of their respondents reported playing for over 30 hours per week and some individuals played up to 80 hours per week. Yee (2006b) has surveyed over 30,000 users of MMORPGS, reporting that the average player spends 22 hours per week. In one of his online studies, over 20% of his sample reported spending over 30 hours per week playing an online game. A self-selected online survey study revealed that 45% of players of MMORPGs played over 30 hours per week, compared with 6% of non-MMORPG players (Ng & Wiemer-Hastings, 2005). However, Wood, Griffiths and Eatough (2004) cautioned that self-selected online samples may not be representative of the general playing population, and many individuals may overestimate their playing habits. Nevertheless, these studies portray online video game playing as a highly prevalent and time-consuming pastime. Presumably, many of those individuals who report playing the game for over 30 hours per week are what may be termed “healthily obsessed”. Castronova (2005) has even suggested that online games may represent the best available place for some individuals to live their lives. Hence, the reliance on frequency data as a type of global indicator of excessive involvement should be treated with some degree of caution.

#### MEASURING EXCESSIVE GAMING: SIMILARITIES TO GAMBLING

Some research studies have conceptualised excessive video game playing by using the DSM-IV clinical criteria for problem gambling. This approach emerged from the numerous comparative analyses of arcade machines and



fruit machines (Griffiths, 1991a; Gupta & Derevensky, 1996; Johansson & Gotestam, 2004). Griffiths (1991a) stated that arcade machine players share a general playing philosophy with fruit machine gamblers, that is, they did not play to win, but to forestall losing for as long as possible. Like problem gamblers, Griffiths (1991b) observed that arcade machine players displayed “chasing” behaviour (i.e. playing to recover ‘losses’ in the game or to beat one’s high score). Further, some players have been reported to engage in criminal acts, such as theft, to finance their playing (Keepers, 1990). Fisher and Griffiths (1995) emphasised that arcade video games and slot machines share the following structural features: (a) the requirement of response to stimuli which are predictable and governed by a software loop, (b) the requirement of total concentration and hand-eye coordination, (c) rapid span of play negotiable to some extent by the skill of the player, (d) the provision of aural and visual rewards for a win, (e) the provision of an incremental reward for a winning move, (f) digitally displayed scores of correct behaviour, and (g) the opportunity for peer group attention.

Based on the growing literature which has compared arcade machine playing to gambling, Fisher (1994) developed a problem video game playing scale based on the ten clinical criteria for pathological gambling. In Fisher’s sample of 467 secondary school students, she found that 6% (n = 28) could be classified as “pathological” players. Sixty percent of her sample who played video games without conflict was termed “social” players. Pathological players tended to spend more money per week on video games and borrow money almost twice as frequently to play video games than social players. In a similar study of arcade machine players, Phillips, Rolls, Rouse, and Griffiths

(1995) identified an “addicted” subgroup of 50 children (8% of their sample) who (a) played on six or more days per week, (b) played for more than one hour at a time, (c) felt they played longer than they intended, and (d) reported neglecting homework to play. Most recently, Salguero and Moran (2002) reviewed the DSM-IV criteria for pathological gambling and substance dependence and designed a nine-item survey for identifying problem video game play. Their instrument purportedly measured preoccupation, withdrawal, loss of control, tolerance, escapism, lies and deception, disregard for negative consequences, and family or school disruption. The researchers administered the instrument to 223 high school students (of which, 57% played video games at least once per week). They reported that the instrument demonstrated modest internal consistency (Cronbach’s alpha of .69) and factorial analysis revealed that the nine items appeared to measure a single construct. However, the researchers cautioned that “the presence of apparent non-chemical addiction cannot simply be taken as an evidence of the addictive character of the syndrome” (p. 1605) and advised that more clinically-oriented research (employing samples of “heavy” players) should investigate the nature of problems with video games in greater detail. The instrument in the present study was devised to fulfil the need to investigate the nature of problem video game play, by addressing the “core components” of addiction, as well as exploring in detail the various negative personal and social consequences of excessive play.

## STUDY ONE

The first study surveyed 373 university students from South Australia. Because university students have flexible class hours and numerous disposable periods of time allocated for study purposes, it has been suggested that they may be especially vulnerable to misusing time to play video games (Young, 1998). Participants were recruited using two main methods: (a) all students enrolled in core psychology subjects at the University of Adelaide were emailed an electronic link to the survey, and (b) the study was advertised on the public forums of four Australian video game-related websites specifically requesting participation from university students in South Australia. These websites were *Internode Games Network* (<http://games.internode.on.net>), *Overclockers Australia* (<http://www.overclockers.com.au/>), *Valhalla* (<http://www.valhalla.net.au>), and *StreetGeek* (<http://www.streetgeek.com.au>). The following measures were included in the survey:

*Frequency of Video Game Play Survey.* This nine-item survey measured a person's frequency of play across different video game systems (e.g. How many days per week do you play *console* video games?), as well as the duration of play for that video game system, (e.g. How many hours do you usually play *console* video games in one sitting?). This measure yielded an overall number of hours spent each week playing video games. This survey also asked participants how many different video games they were concurrently playing, and how long, in years, they had played video games.

*Adapted DSM-IV Criteria for Pathological Gambling.* This measure contained an adapted set of eight of the ten DSM-IV diagnostic criteria for Pathological Gambling (American Psychiatric Association, 1994). Each criterion was modified to accommodate video game playing activities. For example, one item asked “Do you often find yourself thinking about *videogames* at odd times of the day and / or planning the next time you will play? [Italics: edit]”. Participants indicated either “yes” or “no”. One additional question asked if the participant was worried about the amount of video games he or she typically played.

*Problematic Video Game Playing Test (PVGT).* The PVGT is an adapted version of the Internet Addiction Test, a 20-item questionnaire designed by Young (1998) to measure clinical features of Internet use. Each item was scored on a five-point Likert scale, ranging from “1 = Never” to “5 = Always”. Thus, total scores ranged from 20 to 100. Young (1998) suggested that a score between 20 and 39 indicated an average user; a score between 40 and 69 indicated frequent problems associated with using the Internet; and a score over 70 indicated significant problems associated with using the Internet.

Prior to data collection, the 20-item Internet Addiction Test (IAT) was adapted to measure problem video game playing. This process involved the substitution of the word ‘Internet’ for ‘video game’ for most items, as well as modifying the specific wording of some items. For example, the original item “Do you find yourself saying “just a few more minutes” when using the

Internet?” was changed to “Do you find yourself saying “just a few more minutes” when playing video games, and ignoring this reminder to stop?” because the revised phrasing emphasised to a greater extent the concept of lack of control. Once all items were modified, PVGT items were grouped and given a label that characterised their meaning. These groupings were based on the components model of addiction, i.e. salience, mood modification, withdrawal, tolerance, relapse and conflict (Griffiths, 2005b). Table 1 presents the results of this process.

The items of the PVGT cover various aspects of behavioural addiction, including conflict, preoccupation, tolerance, and lack of control. Notably, all six components of the classic addiction model are covered in the test. The PVGT measures many of the same aspects of addictive behaviour covered within the DSM-IV criteria for Pathological Gambling (American Medical Association, 1994), with the exception of engaging in criminal behaviours to fund the activity. It was reasoned that excessive video game playing does not generally demand the same degree of financial investment as problem gambling. The “Conflict” section of the PVGT contains half of it’s items. Given the higher number of items within this category, the danger is that these category items may inflate problematic video game playing scores more so than other categories. However, it should be noted that “conflict” refers to a variety of different behaviours, including interpersonal conflict in a number of different contexts as well as intrapsychic conflict behaviours, including secrecy and negative emotions associated with excessive use. Given the lack of empirical data on the negative consequences of excessive video game playing, these “conflict” items were considered to be useful for measuring the

negative effects of excessive play, i.e. Is “conflict” typically confined to the home context for most players, or does it extend to school or work context?

The PVGT appears to correspond well with the components model of addiction, which suggests that the test has good face validity insofar as measuring aspects of problematic involvement with video games.

Table 1

Content analysis of the PVGT using the components model of addiction

Components	Definition	Item
Saliency	This occurs when the activity is the most important thing in the person's life, which causes preoccupations and cravings at all times of the day.	3 Do you fear that life without video games would be boring, empty and joyless?
		4 Do you feel preoccupied with videogames when not playing?
		5 Do you block unwanted thoughts about your life with thoughts about videogames?
		14 Do you find yourself anticipating when you can play video games again?
		15 Do you play video games before something else you need to do?
Tolerance	The process whereby the person must spend increasing amounts of time engaged in the activity to achieve former mood-modifying effects.	9 Do you often find that you stay playing video games longer than you intended?
		18 Do you find yourself saying "just a few more minutes" when playing video games, and ignoring this reminder to stop?
Withdrawal	The unpleasant emotional state or physical effects that occur when the activity is suddenly discontinued or reduced.	8 Do you feel depressed, moody, or nervous when you are not playing video games, which goes away when you are back playing video games?
Relapse	The tendency for repeated reversions to earlier patterns of use, and for even extreme patterns of use to be restored quickly after periods of abstinence or regulation.	16 Do you try to cut down the amount of time you spend playing video games and fail?
Mood modification	The subjective experience (e.g. an exciting "buzz" or tranquilising "numbing") associated with engaging in the activity, often seen as a coping strategy.	20 Do you play video games as means of changing your mood, either to relax tension or to feel more excited?
Conflict	The conflict between the user and those around them, including work, school, social life, hobbies. The conflict within the individual themselves, such as feelings of shame or loss of control.	1 Do you choose to spend more time playing video games over going out with others?
		2 Do you snap, yell, or act annoyed if someone interrupts you while playing videogames?
		6 Do you neglect household chores to spend more time playing video games?
		7 Do you lose sleep due to late night video game playing?
		10 Do you try to hide how long you've played video games?
		11 Does your work suffer (i.e. homework or job-related) because of the amount of time spent laying video games?
		12 Does your job performance or productivity suffer because of video games?
		13 Do you become defensive or secretive when someone asks you about how much you play video games?
		17 Do others in your life complain to you about your video game playing?
19 Do you avoid spending time with a partner or non-video game playing friends to play video games?		

## RESULTS

### *Demographics*

A total of 373 people were surveyed in the first study, including 279 males and 94 females. This gender ratio is consistent with other online studies of video game players (Griffiths, Davies, & Chappell, 2004a). The average age of the sample was 20.6 years ( $SD = 4.8$  years) which is slightly lower than the reported average age of 25 years for players in Australia (Brand, 2007). The majority of participants were single (61%), Caucasian (92%) and spoke English as their primary language (95%). As to be expected with a university student sample, over 60% of the sample had completed high school, and 70% worked on a part-time or casual basis. In terms of video game playing variables, there were a wide variety of responses. Participants reported playing up to 80 hours of video games per week ( $M = 21.0$ ,  $SD = 17.4$ ). The average playing session duration was 1.5 hours ( $SD = 2.0$ ) and the average number of days per week spent playing was 2.7 days ( $SD = 4.6$ ).

### *Performance of the PVGT*

Some of the participants provided feedback in the form of an online forum and none of the participants expressed any difficulties in comprehending all PVGT items. However, it should be noted that the majority of the sample were at least high school educated. In terms of reliability, the PVGT demonstrated high internal consistency ( $\alpha = .93$ ). Correlations between individual items and the total PVGT score were sufficiently moderate ( $>.54$ ). In terms of score distribution, PVGT scores ranged from 20 to 88. The mean score was 42.9 ( $SD = 14.9$ ) and the distribution was slightly positively skewed (Skewness =



.63, Standard Error of Skewness = .13). This distribution is consistent with the literature which states that only a minority of players experience significant disruption as a result of excessive video game playing.

In line with research that suggests problem players tend to play more frequently than normal players, there was a significant relationship between PVGT score and time spent playing each week,  $r = .45, p < .01$ . Total PVGT score was also significantly positively correlated with average session duration time,  $r = .28, p < .01$ . The average PVGT score of those who reported being worried about their video game playing ( $N = 33$ ) was 55.8 out of 100. PVGT score was significantly positively correlated with adapted DSM-IV criteria,  $r = .40, p < .01$ . It was concluded that the PVGT demonstrated potential as a screening tool for excessive video game playing and that an additional study should further investigate the psychometric properties of the instrument. A second study was devised which included (a) clinical measures of psychopathology for assessing convergent validity, (b) a more sensitive measure of video game playing to minimise error associated with self-report, and (c) a sample of video game players from the general population for better representativeness.

## STUDY TWO

The second study aimed to assess the internal consistency, convergent validity and factor structure of the Problematic Video Game Playing Test (PVGT). The study surveyed 412 video game players from various video game retail outlets, Internet cafes, and LAN gaming businesses. Potential

participants were approached by the researchers and invited to participate. In total, four people declined to participate. This sampling method was based on previous research that has investigated excessive gambling among patrons of gambling venues (e.g., Griffiths, 1991b; Ladouceur & Dube, 1995). This approach was particularly useful for identifying frequent players of video games (i.e. those players who play every day of the week). In addition to the measures used in the first study, this study included the Depression Anxiety Stress Scales (DASS) (Lovibond & Lovibond, 1995) to assess general psychological distress.

### *Demographics*

A total of 416 participants were recruited for this study from the general population. The gender breakdown was consistent with the first survey, with 81% of participants being male. A broader age range was identified in this sample, with ages ranging from 15 to 47 years, but a similar mean (20.3) and standard deviation (5.0) was reported. Similarly, 62% were single, 71% had completed high school, 51% worked on a part-time or casual basis, 94% were Caucasian and 93% spoke English as their primary language at home. These findings suggest that self-selected online samples of university students may not differ greatly, at least demographically, from participants recruited from urban video game-related milieus.

In terms of video game playing variables, the main study employed a measure which assessed video game playing in a typical week (i.e. from Monday to Sunday), including typical playing duration on each type of video game system (i.e. home computer, home console, portable hand held

console, etc.) in the last three months. This increased precision may have enabled participants to reflect more accurately on their playing time, and also identified those individuals who played heavily only on weekends as distinct from those individuals who played for over eight hours every day of the week. In the obtained sample, the mean number of hours spent playing video games per week was 17.5 ( $SD = 13.1$ ). The average playing duration on a weekday was 2.0 hours ( $SD = 1.4$ ) and 2.9 hours ( $SD = 2.2$ ) on the weekend. Participants tended to play either on a home computer or a games console, and reported playing a variety of different game types, from first-person shooters (the first preference of 46% of the sample), role-playing games (23%), real-time strategy (18%), sports games (17%), and MMORPGs (16%). Participants reported playing an average of 3.3 video games concurrently ( $SD = 3.1$ ) and having played video games for 10.7 years ( $SD = 5.7$ ).

## RESULTS

### *Internal consistency*

Consistent with the first study, the PVGT demonstrated high internal consistency ( $\alpha = .92$ ), which reflects its coherence and uni-dimensionality. Similarly, correlations between individual items and the total PVGT score were sufficient ( $>.48$ ).

### *Score distribution*

The distribution of PVGT scores featured at least two distinctive peaks that may suggest subgroups of video game players. Young (1998) suggested that

a cut-off score of 40 for the Internet Addiction Test (the test on which the PVGT was based) indicated frequent problems associated with the Internet. Inspection of the distribution suggests that a similar score may distinguish two groups of participants.

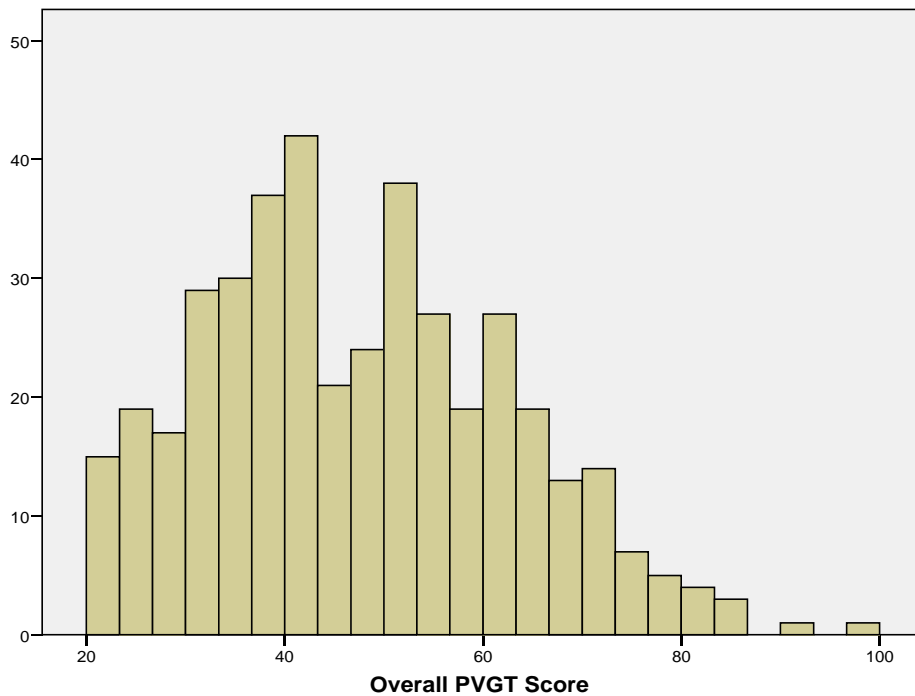


Figure 1  
Distribution of total Problem Video Game Playing Test scores (N = 416)

### *Construct validity*

In order to ascertain whether an instrument measures what is intended to measure, some external criterion is usually required. For example, it is common procedure when validating screens of problem gambling to compare a test score with an in-depth clinical assessment conducted by a psychologist. An alternative method involves comparing test scores with other well-known correlates to assess convergent validity. In the present study, the PVGT was

significantly positively correlated with average weekday session duration ( $r = .41, p < .01$ ) and average weekend session duration ( $r = .44, p < .01$ ). Total hours spent playing video games per week was also significantly correlated with PVGT scores ( $r = .50, p < .01$ ). The overall PVGT score was significantly but weakly correlated with DASS depression ( $r = .18, p < .01$ ), DASS anxiety ( $r = .29, p < .01$ ) and DASS stress ( $r = .22, p < .01$ ).

### *Dimensionality*

In order to establish whether the PVGT is an effective measure of problem video game playing, it is necessary to assess its dimensionality. First, an exploratory factor analysis using the sample from study one was conducted. Second, confirmatory factor analysis was used to test the stability of this solution in the sample from study two. Factor analysis was conducted using MPlus 4.21 (Muthén & Muthén, 1998) with Unweighted Least Squares estimation for the exploratory analysis, and the recommended Weighted Least Squares Mean and Variance Adjusted estimation for confirmatory analysis. These estimation methods are considered superior to Maximum Likelihood (ML) when the data are categorical; in this instance ordered Likert scales. In order to evaluate model fit we report three fit indices: Chi Squared ( $\chi^2$ ), the Standardised Root Mean Square Residual (SRMR), and the Tucker Lewis Index (TLI). Values of  $\leq .08$  for SRMR and  $\geq .95$  for TLI indicate a good fitting model (Hu & Bentler, 1999).

Using sample one, measures of sampling accuracy were assessed to determine whether the data were suitable for factor analysis. Bartlett's test of sphericity showed the variables were suitable for analysis [ $\chi^2(190) = 3660.6, p$

< .001]; Kaiser-Meyer-Olkin measure of sampling adequacy was .94.

Following this, a scree plot was generated to determine the number of factors to extract. An inspection of the plot (see Figure 2) showed clear evidence for at least one or possibly two factors. Therefore one and two factor solutions were extracted, with promax rotation applied for the two factor solution.

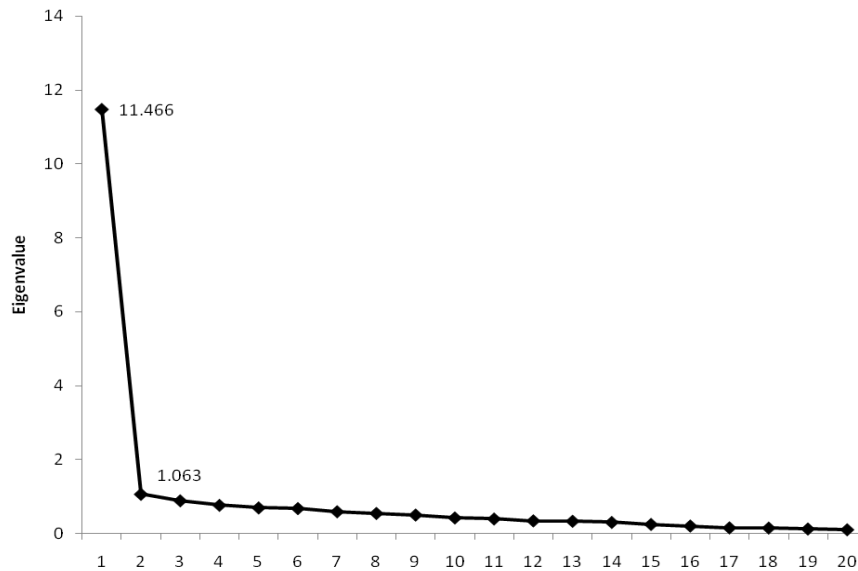


Figure 2  
Scree plot of eigenvalues for study one data

Item loadings for the two factor solution were examined first. It was apparent that half of the 20 items loaded moderately across both factors and these factors were not interpretable (see Table 2). The correlation between the factors for this solution was high ( $r=.74$ ). After the one factor solution was selected, all of the PVGT items were found to load highly on this general factor with an average loading of .74 ( $SD=.06$ ).

Table 2

Item loadings from the one and two factor exploratory solutions

Item	Single Factor	Two Factor Solution <sup>1</sup>	
	Solution	F1	F2
1	0.74	*	0.84
2	0.63	0.40	0.28
3	0.71	*	0.58
4	0.83	0.36	0.53
5	0.81	0.35	0.52
6	0.72	0.85	*
7	0.72	0.66	*
8	0.87	0.25	0.69
9	0.72	0.78	*
10	0.72	0.47	0.31
11	0.73	0.67	*
12	0.80	0.55	0.30
13	0.78	0.35	0.49
14	0.76	0.29	0.53
15	0.77	0.72	*
16	0.70	0.37	0.38
17	0.73	0.46	0.31
18	0.67	0.73	*
19	0.64	0.45	0.22
20	0.77	*	0.91

\* Loadings  $\leq$ .20 omitted

<sup>1</sup> Promax Rotation

The single factor solution was adopted and tested in sample one using confirmatory modelling. All of the PVGT items were constrained to load on a

single general factor. The fit of this model to the data was good [ $\chi^2(63) = 368.67$ ,  $p < .001$ ; TLI = .978; SRMR = .056]. Following this, the single factor model was tested with study two data to assess its stability across different groups. Again, all items were constrained to load on a single general factor. The fit of this model to study two data was similarly good [ $\chi^2(73) = 422.65$ ,  $p < .001$ ; TLI = .964; SRMR = .065]. In both samples all items loaded strongly on this single factor (see Table 3).



Table 3

Loadings of items on the general factor for single factor confirmatory solutions

Item	Sample One	Sample Two
1	0.76	0.65
2	0.64	0.62
3	0.72	0.69
4	0.84	0.79
5	0.82	0.76
6	0.73	0.65
7	0.73	0.65
8	0.87	0.78
9	0.74	0.65
10	0.74	0.66
11	0.74	0.70
12	0.80	0.78
13	0.80	0.74
14	0.77	0.71
15	0.77	0.73
16	0.70	0.65
17	0.72	0.69
18	0.68	0.70
19	0.64	0.75
20	0.80	0.33

## DISCUSSION

This research contributes to the field of technological addictions by conducting preliminary validation of a new theory-based instrument for measuring

problem video game play. The Problem Video Game Playing Test (PVGT) measures the core aspects of behavioural addiction, including salience, mood modification, tolerance, withdrawal, conflict and relapse. In two empirical studies, the PVGT was found to be highly internally consistent. Confirmatory factor analysis suggested a single factor solution of the PVGT. Item loadings on this general factor were strong for both study data sets. This result suggests that each of the 20 test items appear to tap a general 'problem play' construct. The PVGT also showed moderate convergence with known correlates, including frequency and duration of video game playing sessions, as well as total number of hours spent playing video games each week. This finding provides some early assurance that the PVGT tends to target "heavier" players, in line with the notion that "excessive" video game play is more or less linearly related to time spent involved in the activity. However, it should be cautioned that there exists no definite weekly time period at which point video game playing becomes "excessive". The question of what individuals sacrifice to play video games or how much personal enjoyment is derived from playing video games is not captured by frequency measures. The latter point is particularly relevant to those players of video game who may be termed "healthily obsessed" in the activity.

The PVGT was significantly but only weakly associated with measures of psychological distress. This result suggests that "problem" players may be at low risk of anxiety or depression; however this relationship is not clear cut. A number of participants who scored highly on the PVGT reported normal scores on the Depression Anxiety Stress Scales. It is possible that the predominantly male sample did not feel comfortable reporting any emotional

difficulties. Alternatively, this result may reflect the fact that, like problem gamblers, there may be distinct subgroups of problem players. For example, Blaszczynski and Nower (2002) have argued that there are different types of problem gamblers, such as those gamblers considered “behaviourally conditioned” and who report no pre-existing psychopathology, and “emotionally vulnerable” gamblers, who tend to score highly on measures of psychological distress. Therefore, the lack of a strong relationship between PVGT score and DASS subscales may suggest that a major subgroup of players who play video games excessively do so without associated emotional problems. The possibility of distinct groups of problem video game players deserves further empirical attention, as identifying typologies has implications for assisting excessive players.

Whilst Young (1998) has suggested that the Internet Addiction Test has two cut-off scores (to identify “moderate” and “significant” problems”), we would caution against the application of a similar scoring system for the PVGT at this stage. At this early stage, the PVGT is best employed as a continuous measure, with higher scores indicating more significant “problems”, rather than as a strict classificatory tool. This research contributes some normative data with accompanying demographic information for comparisons with future studies. In this sense, the present study should be viewed as laying the foundations for further validation work, particularly establishing the classification validity of the test by comparing PVGT scores with clinician’s ratings of the severity of video game-related problems in a clinical population.

It is common in studies of video game players to utilise online survey methodologies, typically involving participant self-selection (e.g. Griffiths &

Davies, 2003; 2005). This research employed both Internet-based surveys and paper-and-pencil surveys. The latter approach endeavoured to obtain a representative sample of video game players by surveying all players at video game-related milieus. This method yielded a high number of responses, as well as a very high participation rate (i.e. over 98%). Demographic similarities within the two samples suggest that, despite increasing awareness of the broad demographic nature of players (Griffiths, Davies, & Chappell, 2004a) video game playing in general may be largely dominated by male adolescent and young adults. However, it is possible that the employed methodology was biased towards identifying younger players (i.e. those aged 16 to 25 years), because older players may play video games predominantly in the home environment, and may purchase or otherwise acquire video games through other channels of distribution (e.g. mail, digital distribution, gifts, etc.). Therefore, despite sampling bias associated with self-selection, older players may be more readily accessed using online methods.

Like the majority of studies of behavioural addiction, this research relies on participants' self-reported data. This approach is often criticised for failing to account for the inherent problems that problem users, as well as people in general, may not be able to accurately recall their past behaviours. The present study attempted to minimise this problem by designing a highly detailed measure of video game playing, specifically by employing a "weekly schedule" labelled with days of the week. However, we acknowledge that this technique still has limitations. An alternative method proposes administering a diary to participants to keep track of their behaviours over the course of many weeks. Whilst this method may be suitable for individuals in therapy, it is less

tenable for large survey studies. Ideally, an objective measure in the form of computer tracking software could be used in future research; however, this method may not be able to correctly distinguish between a person playing a video game, and a person leaving a video game idling during sleep or meal times.

The PVGT demonstrates positive early signs as a new instrument for measuring problem video game playing. The test appears to be clear and readable for adolescents, shows high internal consistency and moderate convergent validity, and the measure corresponds well with the components model of addiction. A notable strength of the test is its attention to the “conflict” aspects of behavioural addiction, including adverse personal and social consequences of excessive video game play, which make the test suitable for studies of the negative consequences of problem video game playing. Future research should trial the test in other video game playing populations, especially known problem users of video games in tandem with clinical assessment by trained psychologists, to provide much needed classification validity data on the instrument. At this stage, it is recommended that the PVGT be used as a continuous measure of problem video game playing, rather than as a classificatory tool. Despite the limitations of the present research, the PVGT appears to be a worthwhile instrument for measuring problem video game playing, being a much-needed yardstick in the field of technological addictions that is so often characterised by conceptual confusion.

Chapter 9. Paper 6

Motivational differences in problem video game play

Daniel King and Paul Delfabbro

School of Psychology, University of Adelaide

Published manuscript

Journal of Cybertherapy and Rehabilitation

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of the paper's main research question. I contacted multiple research participant pools to obtain permission to carry out survey research and subsequently collected the survey data. I entered the raw survey data and conducted the necessary statistical analyses. I prepared multiple drafts of the paper in collaboration with my primary supervisor. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....28/08/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was to comment on drafts, make suggestions on the presentation and refinement of the material in the paper, and to provide editorial input. I had an advisory

role with respect to the direction and specifics of the data analyses. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

## ABSTRACT

Self-determination theory states that motivation plays an important role in initiating, developing and maintaining involvement within an activity. The present study applied this theory to video game playing, and surveyed 399 video game players (82% male, with a mean age of 20.3 years) on measures of video game playing involvement, motivation to play video games and problem video game play. Participants were obtained from various video game retail outlets, Internet cafes, and LAN gaming businesses. The results showed that extrinsic motivations to play video games (i.e., tension release, social approval and external regulation by in-game rewards) and amotivation (i.e. playing without a sense of purpose about the activity) were significant predictors of problem video game playing. The results were discussed in terms of their application to identifying and assisting young people with potentially problematic levels of video game playing.



## INTRODUCTION

The notion that excessive video game playing may represent a problematic activity in its own right has received increased academic attention (Griffiths, 2008e; Griffiths & Davies, 2005; Salguero & Moran, 2002). In the last decade, researchers have identified a subgroup of players, particularly players of online role-playing games like *World of Warcraft*, who report playing over 50 hours per week (Griffiths, Davies, & Chappell, 2003). Numerous other studies have identified high users of video games, although the methods used to classify heavy or excessive use have varied greatly (Charlton & Danforth, 2007; Christakis, Ebel, Rivara, & Zimmerman, 2004; Chui, Lee, & Huang, 2004; Fisher, 1994; Fleming & Kraut, 2007; Ladouceur & Dube, 1995; Ng & Wiemer-Hastings, 2005; Phillips, Rolls, Rouse, & Griffiths, 1995; Salguero & Moran, 2002; Yee, 2006b). Nevertheless, it is generally agreed by a number of researchers that such very high levels of involvement are likely to have deleterious effects on individuals if they are maintained over time. In addition to having impacts on a person's psychological and physical functioning (lack of sleep and exercise, limited mobility), excessive playing may also compromise work and study commitments and decrease opportunities for other social activities. However, the more controversial element of this area of research is whether excessive playing should be treated as having a similar status to recognised behavioural addictions such as pathological or problem gambling (Griffiths, 2008b).

In a number of papers Griffiths advances the view that video-game playing is a form of addictive behaviour because it shares much in common

with gambling (Griffiths, 1991a, 2008a, 2008c; Griffiths & Wood, 2000). As with gamblers, video-game players find it difficult to resist the urge to participate, find it difficult to cease the behaviour, become preoccupied with playing, and, as indicated above, can experience psychological, physiological and social harm if they participate excessively. However, this view has been challenged on a number of grounds by several authors. For example, Jaffe (1990) has argued that the application of the term addiction to non-chemical repetitive behaviours may be too indiscriminate, which may de-emphasise the importance of identifying specific mechanisms which maintain certain problem behaviours. Similarly, Blaszczyński (2006) has argued that researchers must avoid the trap of accepting self-reported accounts of addiction from computer-users as a basis for the validity of technological addictions, and suggested that the field needs empirical evidence of neuro-adaptive changes in addition to psychological dependency and lack of control before these appetitive behaviours may be accepted as bonafide addictions. Schaffer, Hall & van de Bilt (2000) and Wood's (2007) reviews of the literature on computer and video game "addiction" have each concluded that there is insufficient evidence to suggest that so-called computer-based "addictions" exist as a singular, primary disorder, and they posit that excessive involvement may instead reflect an underlying psychopathological condition. Warden, Phillips and Ogloff (2004) also warned of the various legal consequences of formally recognising technological addictions such as Internet addiction, particularly with regard to how these technologies could be subject to various legislative controls, and the greater admissibility of technological addictions as a valid form of psychological evidence in the legal system.

Despite the controversies concerning the term addiction when applied to video-games, most researchers including the critics are nonetheless willing to accept that excessive video-game playing can have deleterious consequences and is therefore a topic worthy of research. For this reason, it is likely that useful advances in this area might be best served by an approach that examines excessive VG play, not as an identifiable diagnostic category, but as an endpoint of a continuum of playing that has an extensive normal range, but a potential to become problematic (i.e., for harm to develop). Accordingly, to understand the phenomena requires the identification of predictors, correlates, or risk factors that covary with higher levels of involvement and, in particular, those which typically lead to reports of harm. In light of this, the aim of this paper was to examine the extent to which recent developments in motivation and self-determination theory previously applied to gambling, might reasonably be extend to examine video-game play. The strength of this approach is that does not make the possibly unfounded assumption that excessive video-playing is a bona-fide addiction. It also provides a way in which to conceptualise how normative and healthy video-game playing might be differentiated from behaviour that has a greater likelihood of leading to harm.

## SELF-DETERMINATION THEORY

A theory which has yielded some useful insights into variations in other repetitive and potentially harmful behaviour is self-determination theory. Self-determination theory attempts to explain why some individuals demonstrate highly committed, autonomous and self-motivated behaviour, i.e. high self-determination, whilst others engage in passive, indolent and apathetic behaviours, i.e. low self-determination (Deci & Ryan, 2000). The theory conceptualises all human behaviour as a motivational consequence, and suggests that an individual is self-determined when he or she is intrinsically motivated. In contrast, a person lacks self-determination when their behaviour is primarily extrinsically motivated. Self-determination has been associated repeatedly with increased psychological functioning in a number of contexts, including education (Vallerand, Blais, Briere, & Pelletier, 1989), interpersonal relationships (Blais, Sabourin, Boucher, & Vallerand, 1990), work (Blais, Briere, Lachance, Riddle, & Vallerand, 1993), sport (Ingledeu, Markland, & Sheppard, 2003) and leisure (Losier, Bourque, & Vallerand, 1993). Recently, the theory has also been used to conceptualise problematic behaviour, such as behavioural addictions (Clarke, 2004), and predict how individuals will respond to addiction therapy (Leblond, Ladouceur, & Blaszczynski, 2003; Wild, Cunningham, & Ryan, 2006).

Self-determination theory is largely concerned with motivational orientation. Motivation involves both internal and external forces that trigger, direct, develop and maintain involvement in an activity (Ryan & Deci, 2000). Three main types of motivation have been proposed (Chantal & Vallerand,

1996). The first type is “intrinsic” motivation, when an individual behaves in response to some internal state, such as a desire to learn, or be pleased or excited, or seek some other kind of inherent satisfaction. The second is “extrinsic” motivation, when an individual is acting primarily in response to external forces, such as rewards of some kind, like money, or by the influence of others, such as peers or persons of higher authority. The third type is “Amotivation”, which refers to behaviour that is neither intrinsically nor extrinsically motivated, characteristic of a person who has lost their sense of choice and control over their behaviour (Chantal & Vallerand, 1996).

In the first published application of self-determination theory to behavioural “addictions”, Vallerand, Chantal, Vallerand and Vallieres (1995) hypothesised that highly intrinsically motivated gamblers – those who played for positive feelings of efficacy, curiosity, interest and enjoyment – would report greater involvement in gambling than extrinsically motivated gamblers, who played for the rewards of gambling, such as money and social recognition. The results showed that high self-determination (a function of high intrinsic motivation and low extrinsic motivation) was significantly positively correlated with gambling involvement. However, it was not clear from their results whether motivational orientation differed between problem and non-problem gamblers. A follow-up study by Ladouceur, Arsenault, Dube, Freeston and Jacques (1997) surveyed 110 gamblers using measures of gambling involvement, problem gambling, and the motivation to gamble. The researchers found that probable pathological gamblers ( $N = 30$ ) scored significantly higher on the GMS subscales for intrinsic motivation for excitement, extrinsic motivation for introjected regulation and amotivation.

Similar findings were also obtained by Clarke (2004), who surveyed 147 New Zealand university students and found that: (a) beyond gambling frequency, number of activities and parents' gambling, motivation explained a substantial proportion of variance in SOGS scores, and (b) the strongest predictors of problem gambling included amotivation and the motivations for accomplishment and tension release. Clarke and Clarkeson's (2007) study of 104 older adult gamblers showed that the strongest motivational predictors of problem gambling were intrinsic motivation to experience stimulation and amotivation.

These results led to the suggestion that problem gambling may be influenced by the dual-process of positive and negative reinforcement (Clarke, 2004). Problem gamblers are positively reinforced by the excitement of wins delivered periodically on variable-ratio reinforcement schedules inherent within games of chance, but also by the way in which gambling relieves feelings of guilt or tension. These motivations to obtain stimulation and to relieve tension override any intentions to reduce or stop gambling. Ladouceur et al. (1997) has suggested that problem gamblers will continue to gamble despite the adverse consequences of doing so because the person does not always perceive the relationship between their gambling behaviour and the consequences ("amotivation").

Given the many similarities between gambling and video game playing, particularly with regard to the structural characteristics of both activities (Fisher, 1994; Griffiths, 1991a; Gupta & Derevensky, 1996; Johansson & Gotestam, 2004; Ladouceur & Dube, 1995; Wood, Gupta, Derevensky, & Griffiths, 2004), it is not difficult to apply a gambling model of motivation to

problematical levels of video game playing. Problem video game playing may be conceptualised as a maladaptive motivational consequence characterised by low self-determination and thus poorer psychological functioning. Table 1 presents the conceptual definitions of all seven types of motivation, as they relate to video game playing. Table 1 shows that it is possible to define each type of motivation in the context of video-gaming, so that findings obtained previously with gamblers can be investigated using a similar methodology.

Table 1

Conceptual definitions of seven types of video game playing motivation

Motivation type	Definition
Intrinsic motivation to know	Video game playing for the pursuit of knowledge about the game, including learning, exploring and understanding all of the elements of the game.
Intrinsic motivation to accomplish	Video game playing for the internal need to finish the game or overcome its challenges, as well as improve one's skill at the game.
Intrinsic motivation to experience stimulation	Playing video games for the pleasure and excitement associated with the activity.
External motivation – Introjected	Playing video games for a release of tension or guilt. Paradoxically, it may be that these negative feelings are caused by the excessive amount of time spent playing video games.
External motivation – Identified	Video game playing for internal values such as social recognition.
External motivation – External regulation	Video game playing for the rewards, items, or achievements in the video game.
Amotivation	Playing video games to play to relieve the feeling of boredom but without any purpose, apathetic, mentally disengaged and with little sense of meaning.

Note: Extrinsic motivation involves being part of a positive and negative reinforcement schedule: receiving or avoiding something (i.e., the player is being influenced by a reward system).

## THE PRESENT STUDY

In conclusion, the present study employed self-determination theory to investigate the relationship between motivation and problem video game



playing. Previous research suggests that problem gamblers are distinguished by high levels of (a) intrinsic motivation to experience stimulation, (b) extrinsic motivation for identified regulation, and (c) amotivation. That is, they are more likely to gamble to fill an emotional need rather than to gamble for a specific purpose (e.g., to enhance knowledge or skill). Accordingly, this study sought to investigate several hypotheses.

1. Greater involvement in video game playing would be associated with higher levels of all types of video game playing motivation.
2. Intrinsic motivation to experience stimulation, extrinsic motivation for identified regulation and amotivation would predict additional unique variance in problematic video game playing scores beyond the video game playing variables.

In addition, because males often report higher levels of video game playing and are over-represented in studies of problematic video game play (Griffiths, Davies, & Chappell, 2004a, 2004b; Griffiths & Hunt, 1995; McClure & Mears, 1984; Yee, 2006b), it was reasoned that any analyses conducted would control for gender differences prior to testing other more specific hypotheses relating to motivation.

## METHOD

### *Procedure*

Participants were obtained by visiting various video game retail outlets, Internet cafes, and LAN gaming businesses in the city of Adelaide, South Australia. This sampling method was based on previous research that has investigated excessive gambling among patrons of gambling venues (e.g. Griffiths, 1991b; Ladouceur & Dube, 1995). This approach was particularly useful for identifying frequent players. Participants were informed of the purpose of the study, and told that their responses would be completely confidential. Participants who agreed to take part in the study signed a consent form and were given a paper-and-pencil survey to complete on their own.

### *Participants*

A total of 399 participants completed the survey, including 328 males and 71 females. The mean age of the participants was 20.3 years ( $SD = 5.1$ ). The majority of the participants were single ( $N = 249$ ) and reported having a White, English-speaking background ( $N = 371$ ). In general, participants were studying towards or had completed their secondary school education ( $N = 209$ ) or undergraduate degree ( $N = 114$ ), were unemployed ( $N = 112$ ), or working on a casual basis ( $N = 198$ ). In terms of video game playing variables, the average respondent had approximately 10 years ( $SD = 5.6$ ) experience playing video games and reported to play three different video games concurrently in the last month. A typical week of video game playing

was reported to be 17.8 hours on either a personal computer and/or dedicated games console, with an average playing session lasting 2.0 hours ( $SD = 1.4$ ) on a weekday and 2.9 hours ( $SD = 2.3$ ) on the weekend.

### *Materials*

*Video Game Play Survey.* This survey measured a person's duration of play (in hours) on different video game systems for each day of the week in a typical week in the last three months. This measure yielded an overall number of hours spent each week playing video games.

*Problematic Video Game Playing Test (PVGT).* The PVGT is a modified version of Young's (1998) Internet Addiction Test, a 20-item questionnaire designed to measure problematic aspects of Internet use. Each item on the test was modified to accommodate problematic video game playing. One item, for example, asks "Do you feel preoccupied with *videogames* when not playing? [Italics: edit]". All questions refer to problems experienced for a period of at least three months. Each item was scored on a five-point Likert scale, ranging from "1 = Never" to "5 = Always". Thus, total scores ranged from 20 to 100. In the present study, the PVGT demonstrated excellent internal consistency, with a Cronbach's alpha of .93. Validation by King and Delfabbro (2008) showed that the PVGT shows high internal consistency and moderate convergent validity, and the measure corresponds well with the components model of addiction.

*Video Game Playing Motivation Scale (VGMS)*. The VGMS is an adapted version of the Gambling Motivation Scale (Chantal, Vallerand, & Vallieres, 1994), a 28-item measure of a person's motivation to gamble. Each item is scored on a 7-point Likert scale, ranging from "Not at all" to "Exactly". The VGMS measures seven types of motivation (see Table 1). Higher scores on each motivation subscale indicate greater motivation. Eighteen items were kept identical to the original version because the operant term "game" was applicable to both gambling and gaming activities. However, because video game players play for points and other in-game rewards instead of money, ten extrinsic motivation items were modified. For example, the original item "To make a lot of money" was changed to "To get a really high score".

## RESULTS

### *Gender differences in video game playing*

Males and females differed with respect to how long they played video games in a typical sitting. Male participants reported playing for an average duration of 2.3 hours ( $SD = 1.4$ ) on a typical weekday session (i.e., Monday to Friday) and 3.3 hours ( $SD = 2.3$ ) on a typical weekend session (i.e., Saturday and Sunday). By comparison, female participants reported playing for an average duration of 1.1 hours ( $SD = 1.1$ ) on a typical weekday and 1.7 hours ( $SD = 1.6$ ) on a weekend session. Male participants also reported having played video games for significantly longer in their lifetime than female participants (Males:  $M = 11.3$  years,  $SD = 5.4$ , Females:  $M = 7.9$  years,  $SD = 6.1$ ) and males reported playing significantly more video game titles concurrently than

females (Males:  $M = 4.2$ ,  $SD = 3.5$ , Females:  $M = 2.6$ ,  $SD = 1.5$ ). Male participants tended to prefer first-person shooters, role-playing games and real-time strategy games, whereas female participants reported to prefer puzzle games, action adventure and simulation games.

#### *Gender and motivation*

Given these broad differences in terms of video game playing patterns and video game preferences, it was reasoned that males and females may also differ in terms of their motivations to play video games and the extent to which they play problematically. Table 1 presents the mean motivation subscale scores and overall problem play (PVGIT) score for male and female participants.

Table 2

## Gender differences in motivation factors and problem video game playing

Variable	Male ( <i>N</i> = 328)	Female ( <i>N</i> = 71)	<i>t</i> -value	Effect size
	M (SD)	M (SD)	( <i>df</i> = 397)	Cohen's <i>d</i>
Intrinsic Motivation (IM)				
To Know	17.4 (5.2)	15.3 (5.9)	3.0*	.30
To Accomplish	13.8 (4.9)	11.4 (4.9)	3.7*	.36
Experience Stimulation	19.4 (4.6)	16.6 (5.8)	4.8*	.45
Extrinsic Motivation (EM)				
Identified	15.8 (5.0)	12.6 (5.8)	2.9*	.45
Introjected	11.1 (5.3)	9.1 (5.2)	2.8*	.28
External Regulation	14.3 (5.9)	13.3 (6.3)	1.2	.12
Amotivation	11.7 (5.9)	10.5 (6.2)	1.6	.15
Problem Score	47.1 (15.3)	38.4 (13.9)	4.4*	.59

\*  $p < .01$ 

In general, males reported higher scores on all seven types of motivation than females. Independent sample *t*-tests revealed statistically significant gender differences for five of these motivation types ('IM to know', 'IM to accomplish', 'IM to experience stimulation', 'EM – identified' and 'EM – introjected').

However, because a large sample size ( $N = 399$ ) can inflate significance levels in the presence of a small effect, Cohen's *d* effect size measures are also provided. Cohen (1992) stated that a value of .2 indicates a "small" effect size, .3 to .5 indicates a "moderate" effect size, and a value larger than .6 indicates a "large" effect size. The largest effect sizes were .47 and .45 for the 'EM – identified' and 'IM to experience stimulation' variables, respectively.

There were no significant differences between males and females in terms of 'EM - external regulation' or 'Amotivation'.

*Motivation and problem video game playing*

Table 2 presents the relationships between all major variables of interest.

Most significantly, all seven motivation types were significantly positively correlated with total PVGT score and hours spent playing video games each week, which supported the first hypothesis.

Table 3

Correlations between measures of video game playing, motivation and problematic video game play

Measure	1	2	3	4	5	6	7	8	9	10
1. IM – To know										
2. IM - To accomplish	.68									
3. IM – Stimulation	.62	.55								
4. EM – Identified	.52	.53	.58							
5. EM – Introjected	.45	.69	.37	.44						
6. EM – External regulation	.53	.60	.37	.35	.65					
7. Amotivation	.38	.49	.24	.23	.48	.52				
8. Weekday session duration	.32	.27	.25	.38	.30	.19	.17			
9. Weekend session duration	.30	.29	.27	.37	.35	.22	.16	.74		
10. Total weekly hours played	.35	.35	.28	.41	.38	.24	.16	.81	.80	
11. PVGT Score	.33	.45	.28	.39	.51	.44	.39	.36	.36	.43

Note: All variables significantly correlated at the .01 level (due, in part, to large N)

A hierarchical multiple regression analysis was then conducted to identify the strongest motivational predictors of problematic video game play. Because of their strong relationship with PVGT score, gender and total hours spent playing video games each week were entered on the first step; the two other playing variables (i.e., mean weekday and weekend session duration) were not selected due to concerns about multicollinearity due to their strong association ( $r > .80$ ) with total weekly hours played each week. On the second step, all seven motivation variables were entered. Table 3 presents the results of the regression analysis.



Table 4

Summary of hierarchical regression analysis for variables predicting problematic video game play

Variable	B	SE B	$\beta$	t
Step 1				
Gender	3.90	1.91	.10	2.04*
Total hours played per week	.467	.06	.38	8.38**
Step 2				
IM – To know	-.18	.18	-.06	-1.00
IM – To accomplish	.14	.22	.05	<1
IM – To experience stimulation	-.08	.18	-.02	<1
EM – Introjected	.36	.16	.13	2.31*
EM – Identified	.56	.18	.19	3.06**
EM – External regulation	.35	.15	.14	2.34*
Amotivation	.43	.13	.16	3.34**

\*p<.01, \*\*p<.001

Note:  $R^2 = .19$  for Step 1;  $\Delta R^2 = .18$  for Step 2.

Controlling for gender and total weekly hours spent playing video games, the extrinsic motivation and amotivation factors emerged as the strongest predictors of problematic video game play, explaining as much unique variance in PVGT scores as gender and time spent playing video games each week. The strongest motivation factors were 'EM – Identified' and Amotivation. None of the intrinsic motivation variables emerged as significant predictors of problematic video game play. The second regression model explained an additional 17% of the total variance in PVGT scores, an amount

that was almost equivalent to the gender and total weekly use variables. Therefore, the second hypothesis was partially supported.

## DISCUSSION

The present study considered whether intrinsic motivation to experience stimulation, extrinsic motivation for identified regulation and amotivation were the strongest motivational predictors of problematic video game playing. Controlling for gender and total hours spent video game playing each week, the regression analysis revealed that these factors explained 17% of the unique variance in problematic video game playing (PVG) scores. This finding was highly comparable with studies of problem gamblers (Clarke, 2004; Clarke & Clarkson, 2007; Ladouceur et al., 1997). Whilst gambling research has consistently identified intrinsic motivation (IM) to experience stimulation as a significant predictor of problem gambling (Clarke, 2004; Ladouceur et al., 1997), none of the three IM factors were significant predictors of problem video game playing in this study.

Consistent with previous studies of the demographics of video game playing populations (e.g., Griffiths et al., 2004a), the results showed that males reported: (a) playing for longer periods on both weekdays and weekends, (b) predominantly playing shooting, role-playing and strategy video games, (c) a longer life history of playing video games, and (d) a higher degree of problem video game playing in general. In addition, males reported higher levels of intrinsic motivation for stimulation and accomplishment, and external motivation for identified regulation. Therefore, future studies of video

game players' motivations should consider the effect of gender to avoid overstating any observed relationship between motivation and video game playing.

Whilst self-determination theory has been used to explain the general appeal of video game playing (Ryan, Rigby, & Przybylski, 2006), the present study also demonstrates the theory's utility in explaining problematic involvement in video games. Problem video game playing and, by extension, video game addiction appear to be a maladaptive motivational consequence. Problem players report being motivated by extrinsic motivation for introjected regulation (i.e., playing video games for a release of tension or guilt), identified regulation (i.e., playing for internal values such as wanting to be dynamic and important in the eyes of others), and external regulation (i.e., playing is reinforced by the intermittent reward systems within video games). Problem players are also 'amotivated', which means that they play with a sense of apathy and mental disengagement as the activity increasingly lacks meaning (Chantal et al., 1994).

Shifting player motivation may underlie the development of problematic video game playing. It is possible that problem players do not initially play video games in order to relieve tension or for some other extrinsic purpose, but play video games because of their intrinsic appeal. Subsequently, as the player's pattern of use becomes increasingly excessive, the motivational orientation shifts to more extrinsic and amotivation factors. However, this model is purely speculative because the literature offers only a limited snapshot of the association between motivation and behavioural "addiction". Future research should employ longitudinal research methods in order to

determine whether motivation causes or reflects problematic involvement in video games, and assess to what extent other social and psychological variables mediate this relationship.

This research has implications for helping individuals who play video games excessively. Clarke (2004) suggested that motivational orientation may be “re-directed” in order to assist problem gamblers. He claimed that problem gamblers could learn relaxation techniques which could help reduce tension and thus eliminate the need to gamble for this reason (introjected regulation). Further, problem gamblers could seek out alternative sensation-seeking activities, including team-based sports and recreation, which can satisfy internal needs for excitement, accomplishment, and knowledge about an activity, as well as provide opportunities for social approval and other rewards. Similar recommendations may be put forward for problem video game players. In addition, this research suggests that it may be useful for problem video game players to consider what keeps them motivated to play video games. A better awareness of those motivation factors which underpin excessive playing may enable individuals to manage their video game playing habits to ensure more self-determined and intrinsically rewarding experiences.

The present study had a number of strengths, including psychometric tools comparable with gambling research and a large sample drawn from video game outlets, but this study was not without some limitations. First, this research was correlational and therefore cannot make statements on the causal relationship between video game playing motivation and future involvement in problem video game playing. Second, as Charlton (2002) has suggested, video game players sometimes tend to overestimate the amount

of time that they spend playing. Third, players may not always be consciously aware of the various motivations which lead them to play and remain involved in a video game. Similarly, some respondents may not be able and willing to provide an objective account of their problem video game playing behaviours. Lastly, whilst respondents were surveyed at a range of locations in different socio-economic areas, it is possible that the sampled population may not represent some types of players.

The present study applied the gambling model of motivation to problem video game playing, and provided further support for the theory that motivational orientation may be a key determinant of problematic behaviour. For video game players, particularly those players of online role-playing games who are at greater risk of problematic involvement, this information is of significant educational value. Players may benefit by identifying, and subsequently redirecting or reducing, those motivations which contribute to potentially problematic playing styles. Psychologists should encourage problem players to play video games for the positive experiences of enjoyment, learning and having a sense of accomplishment because these experiences produce greater self-determination and increased psychological functioning.

Chapter 10. Paper 7

The general health status of heavy video game players: Comparisons with

Australian normative data

Daniel King and Paul Delfabbro

School of Psychology, University of Adelaide

Published manuscript

Journal of Cybertherapy and Rehabilitation

Statement of Contributions

Daniel King (Candidate)

I was responsible for the conception and primary authorship of this paper. I conducted the literature review that led to the development of the paper's main research question. I contacted multiple research participant pools to obtain permission to carry out survey research and subsequently collected the survey data. I entered the raw survey data and conducted the necessary statistical analyses. I prepared multiple drafts of the paper in collaboration with my primary supervisor. I was corresponding author and primarily responsible for responses to reviewers and revisions to the paper.

Signed.....Date.....28/08/09.....

Paul Delfabbro (Co-author)

I was the primary supervisor for the research programme that led to this manuscript. Mr. King was responsible for writing this manuscript; my role was to comment on drafts, make suggestions on the presentation and refinement

of the material in the paper, and to provide editorial input. I had an advisory role with respect to the direction and specifics of the data analyses. I also provided advice on responding to comments by the journal reviewers and editor.

I hereby give my permission for this paper to be incorporated in Mr. King's submission for the degree of PhD in the University of Adelaide.

Signed.....Date.....28/08/09.....

## ABSTRACT

The health-related quality of life among heavy users of electronic entertainment has not been well described in the literature. This research examined the general health status of heavy video game players. "Heavy" video game playing was defined as (a) playing for over 30 hours per week, (b) playing for at least 4 days per week, and (c) playing for an average duration of 3 hours in a typical sitting. A total of 411 participants were drawn from video game outlets and gaming cafes, and administered a survey package. The heavy playing subgroup (N=45) scored significantly lower on measures of physical functioning, mental health, vitality, general health and social functioning than normal Australian adults. The majority of this subgroup also did not meet national guidelines for weekly exercise and reported some sleep-related problems.



## INTRODUCTION

Video game playing is an increasingly prevalent national pastime. However, among health professionals and the lay public, there is concern that frequent sedentary behaviour associated with screen-based entertainment like television and video games may displace regular physical activity and therefore contribute to general health problems such as obesity. In the last two decades, numerous studies have examined patterns of video game play among children and adolescents to identify the effects, if any, of video game playing on general health, emotional well-being and development. Previous research has identified a weak relationship between television and video game use and health risks by taking an epidemiological approach, such as surveying large random samples of schoolchildren (e.g. Wake, Hesketh & Waters, 2003). In these studies, individuals commonly report low to moderate television or video game use, typically 30 to 120 minutes per day. In explaining the apparent lack of a strong statistical relationship between sedentary behaviour and obesity, Vandewater, Shim and Caplovitz (2004, p. 83) stated,

It could be that the youth obesity status is linked to television only at the highest levels of such use (e.g. 20-30 hours or more weekly) as some research has indicated.

Little is known regarding the health-related quality of life in persons who report to play video games on a more frequent basis, i.e. over 30 hours per week.

Thus, the present study sought to investigate the general health status of this subgroup of “heavy” video game players, and consider their general health profile in the context of the normal Australian adult population.

Vandewater, Shim and Caplovitz (2004) advanced three main hypotheses concerning why television and video game use may be related to obesity and other health problems. The first is known as the “couch potato” hypothesis, a theory which has been termed an “intuitive belief” (Tremblay & Willms, 2003), which states that sedentary behaviour displaces physical activity, thereby directly decreasing (or perhaps reducing opportunities for) energy expenditure. This hypothesis provides the most commonly used rationale for health-oriented studies of media use and is widely cited within the mass media.

The second hypothesis attempts to link television and video game use to increased risk of unhealthy food consumption. It is thought that children who spend a lot of time watching television or playing video games are more likely to consume calorie-dense snacks and other foods whilst participating in these activities. Also implicit in this hypothesis is the assumption that commercials on television promote the consumption of unhealthy foods, like sugary cereals and fast food burgers, leading children to seek out these foods or request them from their parents. This hypothesis is perhaps less applicable to video games due to the lack of in-game advertising, although the video game medium has greater potential to influence children’s attitudes to food given its interactive nature (Gee, 2003).

The third hypothesis states that television and video game use may decrease metabolic rate, to a greater degree than simply resting or sleeping.

Klesges, Shelton and Klesges (1993) found some support for this hypothesis in a sample of 8 to 12 year old children, but later attempts to replicate their results have generally not been successful. On a related note, researchers have questioned the amount of energy that is typically expended whilst playing video games. There is evidence that energy expenditure more than doubles when playing “active” video games compared with sedentary ones (Lonnington-Foster et al., 2006), despite the fact the intensity of this exercise is not high enough to contribute towards the recommended daily amount of exercise for children (Graves, Stratton, Ridgers & Cable, 2008).

Research to date has yielded mixed results for each of these hypotheses. Empirical studies that employ correlational designs have tended to report weak bivariate relationships between media use and measures of adiposity (e.g. BMI, skinfold thickness, etc.) when controlling for variables like social capital and physical activity. A meta-analysis by Marshall, Biddle, Gorely, Cameron and Murdey (2004) reported that “a statistically significant relationship exists between TV viewing and body fatness among children and youth although it is likely to be too small to be of substantial clinical relevance” (p. 1238). Vandewater et al. (2004) also concluded that the data available to date do not support the notion of turning off electronic media as being the “magic bullet” that will reduce the prevalence of youth obesity. In reality, childhood obesity has occurred as the result of a confluence of complex environmental factors, including increased availability of calorie-dense foods, decreased parental supervision, increased motorised transport, and other similar factors (Biddle et al., 2004).

There is ongoing debate over the significance of electronic media habits among obese youth, but little is known concerning the health-related quality of life among adolescents and adults who play video games as a major part of their daily lives. Recent research has suggested that between 5 and 12% of video game players play video games, particularly online games, to an excessive degree (Griffiths & Hunt, 1998; Griffiths, Davies & Chappell, 2004; Fleming & Kraut, 2007; Grüsser, Thalemann, Albrecht & Thalemann, 2005). However, at present, there is a dearth of documented evidence regarding the general health effects associated with this kind of heavy play.

Black, Belsare and Schlosser (1999) presented 21 clinical cases (16 men, 5 women) of individuals who reported compulsive computer use. Actual weekly playing time varied among participants because they were selected on the basis of psychological “dependency” on computers, rather than time spent playing. The participants’ reported range of “inessential” computer time was quite variable, ranging from 7 to 60 hours per week. Black et al. reported that their “compulsive” playing group did not report health problems (as measured by the SF-36) greater than the general U.S. population, although their mental health status was relatively lower (which may be related to their computer dependency). This research offered some insights into the self-reported health status of heavy computer users, but their sample was relatively small and was not entirely composed of “heavy” users. Other studies have reported adverse health effects of playing video games, including sleep deprivation (Tazawa & Okada, 2001), wrist and neck pain (Burke & Peper, 2002), and repetitive strain injuries (Ramos, James & Bear-Lehman, 2005).

This research was intended to provide a much-needed insight into the general health of heavy video game players, with reference to normative data on Australian adults. On the basis of the extant literature on media use and obesity, it was predicted that heavier use of video game technologies would be associated with greater general health problems, such as being overweight and general physical functioning. We also predicted that heavy video game players would score significantly lower on measures of general health, and report substantially more poor health-related behaviours, than the normal Australian population.

## METHOD

### *Procedure*

Participants were obtained by approaching the patrons of various video game retail outlets, Internet cafes, and LAN gaming businesses in the city of Adelaide, South Australia. Permission was obtained from the owners or organisers prior to data collection. Participants were approached by the first researcher and informed of the purpose of the study, and told that their responses would be completely confidential. Participants who agreed to take part in the study signed a consent form and were given a paper-and-pencil survey to complete on their own. Approximately 98% of individuals who were asked to participate accepted the invitation. This sampling method was based on previous research that has investigated excessive gambling among patrons of gambling venues (e.g., Griffiths, 1991b; Ladouceur & Dube, 1995). This approach is particularly useful for identifying frequent players. The

present study was part of a larger research project examining patterns of video game playing among young adults.

### *Materials*

*Video Game Play Survey.* This survey was designed for the purpose of the present study and was similar in design to other video game frequency measures (e.g., see Salmon, Bauman, Crawford, Timpero & Owen, 2000). The survey measured a person's duration of play (in hours) on different video game systems for each day of the week in a typical week (i.e., Monday to Sunday). Days of the week were distinguished to account for players with variable playing patterns, such as players who may play for a longer session on the weekend or on a particular night of the week. The "typical week" referred to a typical week in the last three months. By adding together all weekly session durations, this measure yielded an overall estimation of hours spent each week playing video games. An average "weekday" and "weekend" session could also be computed. Additional questions asked participants how many years in their lifetime they had played video games, and how many video games they were playing concurrently.

*SF-36 Health Survey.* The SF-36 is a multi-purpose, short-form health survey composed of 36 questions (Ware, 2000). The test yields an eight-scale profile of scores as well as physical and mental summary measures. The SF-36 has been used in over 1000 empirical studies. The measure has demonstrated moderate to strong internal consistency. In addition, studies have shown that

the SF-36 has high content, construct, concurrent, and predictive validity (Anderson, Laubscher & Burns, 1996; Sanson-Fisher & Perkins, 1998; Watson, Firman, Baade & Ring, 1996). Higher scores on each of the test's subscales indicate higher degrees of general health and well-being.

*Kessler Psychological Distress Scale (K10)*. The K10 is a brief, 10-item measure of psychological distress, suitable for clinical and epidemiological purposes (Kessler et al., 2002). Andrews and Slade (2001) reported that the K10 has high convergent validity and the test is suitable for assessing morbidity in the Australian population. The K10 yields a score from 10 to 50, with higher scores indicating a greater presence of psychological distress.

*General health survey*. Nine self-made questions were developed for the purposes of the present study. The questions were based on standard health questions used in epidemiological research. The questions queried participants' exercise habits (i.e. "how often do you exercise for 30 mins per day?"), alcohol consumption (i.e. "On how many days of the week do you drink alcohol?" and "how many standard drinks do you consume in a typical sitting?"), as well as cigarette use and caffeine consumption. Participants were also asked their height (in centimetres) and weight (in kilograms) in order to calculate their Body Mass Index (BMI).

*Sleep Hygiene Index (SHI)*. The Sleep Hygiene Index is a 13-item measure of sleep quality and sleep habits (Mastin, Bryson & Corwyn, 2006). Mastin et al. (2006) reported that the SHI is strongly correlated with other measures of

sleep quality and demonstrates strong test-retest reliability. The SHI yields an overall score between 13 and 65, with higher scores indicating poorer sleep hygiene.

## RESULTS

Table 1 presents a summary of the demographic information for the overall sample. Consistent with previous studies of the video game playing population (Griffiths, Davies & Chappell, 2003; Yee, 2006b), the mean age of the participants was 20.3 years ( $SD = 5.1$ ). The majority of the participants were single ( $N = 258$ ) and reported having a White, English-speaking background ( $N = 376$ ). In general, participants were studying towards or had completed their secondary school education ( $N = 209$ ) or undergraduate degree ( $N = 114$ ), were unemployed ( $N = 112$ ), or working on a casual basis ( $N = 198$ ). A typical week of video game playing was reported to be 17.8 hours on either a personal computer and/or dedicated games console, with an average playing session lasting 2.0 hours ( $SD = 1.4$ ) on a weekday and 2.9 hours ( $SD = 2.3$ ) on the weekend.



**Table 1 Demographic information across three video game playing groups based on weekly use**

Demographic	Video game playing (hours per week)							
	0-20		21-34		35+			
		N	%	N	%	N	%	
Gender								
Male	(336)	203	60	88	26	45	22	
Female	(75)	69	92	4	5	2	3	
Age								
14-17	(123)	88	72	22	18	13	11	
18-21	(161)	100	62	41	25	20	12	
22-25	(75)	49	65	17	23	9	12	
Over 25	(52)	35	67	12	23	5	10	
Relationship Status								
Single	(259)	164	63	63	38	31	12	
Partnered/Married	(152)	107	70	29	19	16	11	
Highest Education								
High School	(214)	139	65	44	21	31	22	
Undergraduate	(171)	109	63	47	27	15	9	
Postgraduate	(26)	24	92	1	<1	1	<1	
Employment								
Unemployed	(113)	65	57	29	26	19	17	
Casual or Part-time	(206)	144	70	39	19	23	11	
Full-time	(90)	62	69	24	27	4	4	
Yearly income								
<\$20,000	(281)	181	64	62	35	38	14	
20,000 to 30,000	(35)	27	77	6	17	2	6	
30,000 to 40,000	(32)	17	53	13	41	2	6	
> \$40,000	(63)	47	74	11	18	5	8	

Note: Percentages refer to % of demographic subgroup, not overall sample.

The overall sample of 411 participants was analysed to identify any relationships between media use, measures of adiposity and general health and well-being. Table 2 presents a summary of the bivariate relationships between all measures of video game use, including mean playing session duration and overall weekly use, and all continuous health-related variables. With the exception of a weak positive correlation between video game usage and decreased mental health, there were no significant correlation relationships.

#### *Identification of a heavy video game playing subgroup*

Following Vandewater et al.'s (2004) recommendation that researchers should investigate health among heavy users of media, a subgroup of heavy players was identified. At present, there are no formal guidelines for what constitutes "heavy" involvement in video games. As a conservative example, Fotheringham, Wonnacott and Owen (2000) considered people who played for more than eight hours per week as distinct from more casual players. Some researchers have argued that it is more meaningful to consider what people are sacrificing to play video games, rather than imply potentially "problem" involvement on the basis of time spent playing alone (Charlton & Danforth, 2007). Recent studies have identified a minority of players, typically players of online role-playing games, who play for over 30 hours per week (Griffith, Davies & Chappell, 2004a; Yee, 2006b). To identify this subgroup, and to avoid selecting individuals who played heavily on only one or two days

per week, participants were selected on the basis of fulfilling all of the following criteria:

- (a) playing at least 30 hours of video games per week
- (b) playing at least four days each week
- (c) playing for a mean duration of 3 hours in a typical sitting

The heavy subgroup (N = 45) was overwhelmingly male (98%) and reported a mean age of 20.1 years ( $SD = 3.9$ ). In terms of other demographic information, 66% were single, 77% had completed high school or TAFE, were either unemployed (40%) or working on a casual basis (46%), and tended to earn less than \$20,000 (75%). Overall, with the exception of being more male-oriented, the “heavy” subgroup resembled the demographic profile of the overall sample.

**Table 2 Correlations between video game use and measures of general health and well-being**

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Total weekly hours													
2. Mean weekday session	.81**												
3. Mean weekend session	.80**	.74**											
4. Physical Functioning	-.04	-.06	-.08										
5. Role-Physical	-.01	-.02	.01	.36**									
6. Bodily Pain	.01	.00	.00	.22**	.34**								
7. General Health	-.05	-.05	-.06	.41**	.25**	.19**							
8. Vitality	-.03	-.00	-.05	.36**	.28**	.28**	.44**						
9. Social Functioning	.02	.01	.03	.12**	.27**	.28**	.16**	.24**					
10. Role-Emotional	-.03	-.06	-.07	.22**	.35**	.20**	.23**	.33**	.34**				
11. Mental Health	-.10**	-.12**	-.11**	.22**	.32**	.18**	.40**	.52**	.28**	.42**			
12. BMI	-.01	.07	.05	.31**	-.11**	.02	-.13**	-.06	-.05	-.02	.00		
13. K10	.08	.13**	.13**	-.14**	-.36**	-.30**	-.40**	-.64**	-.33**	-.53**	-.74**	.02	
14. Sleep	.08	.03	.10	.19**	-.20	-.29**	-.18**	-.23**	-.16**	-.29**	-.23**	-.10**	.32**

\*\* p < .01

### *Comparisons with Australian norms*

Table 3 presents a comparison of the SF-36 subscale scores between the heavy playing group and the normal Australian population. Given the heavy group was 98% male and 95% fell into the “16 to 24 years” age group category, these data were compared with Australian normative data for 16-24 year old males. The size of the differences between the heavy playing group and the Australian norm for “Physical Functioning”, “Mental Health”, “Vitality”, “General Health” and “Social Functioning” were small to moderate (Cohen’s  $d = .27, .30, .36, .44, \text{ and } .51$ , respectively).

The heavy playing group reported a mean BMI of 25.1 ( $SD = 5.4$ ). This score corresponds very closely with the cut-off value between the “normal” and “overweight” range for Australian adults. In terms of the distribution of BMI scores, 55% of the scores fell into the “18.5 to <25” range (i.e. normal) and 31% fell into the “25 to <30” range (i.e. overweight). This figure is highly comparable with Phongsavan et al.’s (2006) Australian population data, which stated that 49% of over 12,000 Australian adults fell into the normal category, and 32% fell into the overweight category. The heavy playing group’s BMI distribution also aligned closely with 2004-05 National Health Survey data, which found that 63% of males and 59% of females were of acceptable weight, and 32% of males and 37% of females were overweight (Australian Bureau of Statistics, 2006).

In terms of self-reported psychological distress, the heavy playing group reported an average K10 score of 16.8 ( $SD = 7.2$ ). Of the 45 participants, 55% scored in the “0-15” range (i.e. low risk) and 23% scored in the ‘16 to 21’ range (i.e. moderate risk). Phongsavan et al. (2006) reported

comparable prevalence figures of 67% and 21% in these respective categories.

*Meeting recommended health guidelines*

The heavy playing group were asked how often they physically exercised for a period of at least 30 minutes. The most common responses were “less than once per week” (24%) and “one or two days per week”, followed by “three or four days per week” (20%) and “do not exercise” (18%). The National Physical Activity Guidelines for Australia recommend exercise of at least a moderate level on most days of the week for a total of 30 minutes or more. Therefore, less than 15% of the heavy playing group met this exercise requirement. However, it should be noted that the results from this survey may not necessarily be indicative of total physical activity, e.g. they may not include physical exercise performed at work.

In terms of alcohol use, 42% of the heavy group reported to not drink alcohol at all and an additional 44% drank alcohol no more than two days per week. Of those who drank, 50% consumed less than four standard drinks in a typical sitting. Approximately 40% of the group reported to drink more than four standard drinks in a typical sitting, which is classified as a potentially risky drinking behaviour by the National Health and Medical Research Council. Less than 10% of the heavy playing group reported smoking cigarettes in the last 12 months.

**Table 3** Heavy video game players' SF-36 subscale scores compared with Australian normative data

SF-36	Heavy Video Game Players (N = 45)		Australian Population Norm <sup>a</sup> (N = 561)		t	Cohen's d
	Mean	SD	Mean	SD		
Physical Functioning	91.7	12.6	94.7	9.7	1.94	.27
Role-Physical	92.8	18.9	88.8	26.8	.98	.17
Bodily Pain	86.3	16.8	82.6	22.1	1.09	.19
General Health	67.5	19.4	75.8	18.6	2.87	.44
Vitality	61.0	17.8	67.7	19.2	2.26	.36
Social Functioning	78.3	22.9	89.3	19.1	3.65	.51
Role-Emotional	84.4	30.2	89.1	27.1	1.11	.16
Mental Health	72.3	18.0	77.7	17.7	2.00	.30

<sup>a</sup> Data from Behavioural Epidemiology Unit, South Australian Health Commission.

### *Additional health information*

There are currently no formal guidelines for healthy caffeine consumption due to the varying effects that caffeine has on different people's psychophysiology. Also, caffeine consumption is difficult to measure accurately, due to the varying amount of caffeine in different beverages and foods. Despite this limitation, total reported caffeine intake was fairly uniform within the heavy playing group. Only 15% reported to not drink caffeine, whilst the majority (70%) reported to consume caffeine on three to seven days of the week. These participants tended to drink between one to four caffeinated drinks on those days (80%). Shirlow and Mathers (1995) have found that daily caffeine consumption over 250mg (i.e. approximately four cups of coffee) is associated with physical symptoms of indigestion, palpitations, tremor, headache and insomnia. Two of the 45 participants reported caffeine consumption at this level.

Sleep quality, an important aspect of general health, was also assessed. The heavy subgroup reported a mean score of 30.2 ( $SD = 7.1$ ) on the Sleep Hygiene Index (SHI). Normative data for the SHI is currently unavailable, and the authors of the test have not specified how raw scores should be interpreted. Thus, in qualitative terms, this value indicates that participants tended to experience poor sleep hygiene "some of the time".

## DISCUSSION

The present study was one of the first to examine the informed general health status of heavy video game players. It was found that those individuals who



reported playing over 30 hours per week scored lower on measures of physical functioning, mental health, vitality, general health and social functioning than normal Australian adults. The majority of the heavy playing group did not meet the national guidelines for weekly physical activity and reported some occasional difficulties with achieving high sleep quality. However, the “heavy” playing group did not differ from normative levels on measures of bodily pain, or physical and emotional role functioning. In addition, the BMI distribution of the heavy playing group did not differ greatly from established population levels.

The “couch potato” hypothesis predicts that increased time spent engaged in sedentary activities increases the risk of associated health problems, particularly overweight. The literature to date has produced mixed, if unconvincing, results with regard to this largely intuitive claim. As Biddle et al. (2004) have stated, the youth obesity problem has been the result of a complex constellation of lifestyle and environmental factors, rather than any single factor. In the present study, there was no significant correlation between video game playing and all measures of health and well-being, except for a weak but significant positive correlation with decreased mental health. This lack of association supports the argument that video game playing may play a limited role in promoting obesity in young people.

The self-reported general health status of highly frequent video game players (i.e. “heavy” users) was compared with the normal Australian adult population. This group showed small to moderate differences on some measures of general health, notably social functioning, compared with normal Australian adults. The degree of clinical significance of these results is a

worthy question of debate. Jacobson, Follette and Revenstorf (1984) operationalised clinical significance as the extent to which therapy (or some other intervention) moves someone outside the range of the dysfunctional population or within the range of the functional population. In the context of the present study, clinical significance refers to the degree of difference between the distribution of the observed group and the distribution of the normal population. In essence, does the heavy playing sample differ in any significantly identifiable way from the normal population? This research suggested that the heavy playing group does differ from the normal population to a “moderate” extent in terms of self-reported general health, vitality and social functioning. The size of this “effect” is quite substantial and therefore this may be suggestive of a clinically significant difference.

Explaining these moderate SF-36 group differences is difficult using the size-limited available data. On a measure of physical activity, the majority of the heavy playing group (>85%) did not meet national recommended guidelines, which suggests that the group’s lower general health may also be related to lack of physical exercise. However, the heavy group’s distribution of BMI scores and exercise patterns resembled closely that of the normal Australian population. It should also be noted that the largest between-group difference was on the social functioning subscale, which may suggest that part of the appeal of video games to this group is their facilitation of easier social interaction options (e.g. communication via online chat, text-based messaging, etc.). Future work using larger samples is needed in order to delineate these complex motivations to play video games from their associated health-related correlates.

The heavy playing group reported some occasional difficulties in obtaining good sleep hygiene. This finding may provide further evidence that increased use of screen-based technologies can have a deleterious effect on sleep quality. The potentially harmful effect of late night video game playing on sleep quality deserves further empirical attention, particularly among heavy users. Recent research has identified a strong association between sleep quality and general health factors, including BMI (Kohatsu et al., 2006). Higuchi, Motohashi, Liu and Maeda (2005) found that video game playing directly before bed time can affect sleep latency and REM sleep.

The heavy group did not differ greatly from the population norms on the K10 scale, which suggests that psychological distress is not a defining characteristic of this subgroup. It may be speculated that this result suggests that the heavy playing group's engagement in video games may represent more of a healthy obsession, rather than being an escape from pre-existing emotional problems. In terms of alcohol use, the majority of the heavy playing group reported to drink only infrequently. However, a large number reported to "binge-drink" on those occasions, a risky health behaviour which has been observed previously in young male populations (Bonomo et al., 2004). No unusual patterns of cigarette or caffeine use were identified.

The present study had a number of limitations. Like many epidemiological studies, this study was correlational in nature and thus cannot make statements with regard to causality. This research examined video game use only and not other forms of screen-based entertainment, like television and the Internet. Subrahmanyam, Greenfield, Kraut and Gross (2001) have reported that, in many households, computers and television are

used simultaneously, and computer use may even lead to an increase in television viewing. The reliance on self-report is another problem in survey-based research. It has been shown that people tend to overestimate their height and underestimate their weight, thus affecting BMI estimates. Charlton and Danforth (2007) have noted that individuals tend to overestimate the amount of time they spend playing video games. Therefore, the heavy group may not actually play as consistently as they reported. Although, it may be argued that, in relative terms, they played more often than the overall sample.

In summary, this research has found that heavy video game players, who are largely males in their early 20s, score significantly lower on some general health factors than the normal Australian adult population. Further, the majority of our heavy video game playing subgroup did not meet national guidelines for weekly exercise and reported sleep hygiene difficulties. These findings add to the developing literature on excessive video game playing, and the broader study of youth obesity. This study suggests possible intervention strategies for individuals who play video games to excess. For example, it may be that general health factors and lack of engagement in physical activity leads to increased participation in sedentary activities, like video games, for long periods. Therefore, psychologists should consider health-related interventions for problem users of video games in addition to regular psychotherapeutic techniques. Whilst there is no definitive link between media use and obesity, this research offers some clinically significant insights into the potential health difficulties faced by a small but growing segment of the population.

## Chapter 11. General conclusion

### *Overview of Thesis Aims*

The broad aim of the present thesis was to conceptualise and measure aspects of excessive video game play. The first section, titled “Contribution to Theory”, was guided by the following research questions:

- What features of video games themselves influence the initiation, development and maintenance of the behaviour?
- Can the structural features of video games be organised in a theoretical framework to conceptualise most, if not all, video game types?
- What are the unique ethical and methodological challenges of studying video game players?

The second section, titled “Contribution to Research” was guided by the following research questions:

- What is the psychosocial context of video game play and how does it influence or contribute to excessive patterns of video game play?
- Should excessive video game play be conceptualised and measured as a problematic activity and, if so, how?
- Do excessive video game players have a particular motivational profile?
- What is the general health status of “heavy” video game players as compared with the normal Australian adult population?

## *Review of Papers*

### *Paper 1*

This paper provided a critical review of the psychological literature on the structural features of video games, and the role of these features in the initiation, development and maintenance of playing behaviour. It was found that the appeal of video games is often conceptualised in terms of the frequency with which a video game rewards a player for correct play. In online multiplayer games, a common view is that video games can satisfy various needs for social interaction and belonging. Other psychological models of video game features are based on coin-operated arcade machines, making them less applicable to modern video game systems. Despite these many conceptual understandings of video games, and the apparent importance of game features in influencing playing behaviour, this review argued there has been a lack of research that quantifies the effects of specific game features on playing behaviour. The paper identified a number of gaps in current knowledge of video game structural characteristics, and suggested that there is a need to update current psychological thinking on how certain video game features may contribute to problem video game playing behaviour.

### *Paper 2*

This paper proposed a new psychological 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 (i.e., winning) 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). This structural complexity represents a departure from previous research that has tended to view video games as fairly homogenous. The categories in the taxonomy suggested certain distinctions in terms of player motivation, as well as differing effects of video game features on the player. This taxonomy also suggests tentatively that certain types of video games may attract psychologically different types of players.

The main benefit of this taxonomy was its documentation of the features that make video games attractive to the player, including the reward mechanisms which keep a person involved in video games for a significant period of time. Individual categories in the taxonomy may be subjected to further empirical attention. The study of structural characteristics in video games is of benefit to multiple parties, including (a) psychologists, who stand to learn more about the dynamic role of technology in the emergence of new problematic human behaviours and how this knowledge can assist problem users, (b) video game players, for whom education on potentially harmful structural features may be a good protective measure, and (c) the video game industry, who aim to develop games to include more appealing and rewarding features to increase long-term consumer loyalty.

### *Paper 3*

This paper summarised the methodological challenges associated with studying video game players. Three main types of challenges were identified. First, *player-specific factors* referred to those challenges which arise as a result of particular psychological attributes and behaviours of some video game players. Player-specific factors included: activity engrossment (i.e., being too busy to participate), threat responses (to psychological research), dishonesty and social desirability in self-reporting, lack of awareness of playing behaviour, infringement of player anonymity, and lack of interest or incentive to participate in research. Second, *researcher-specific factors* referred to methodological obstacles related to characteristics of the researcher and/or chosen research design. Researcher-specific factors included: blending (i.e., the researcher not “fitting in” with the research sample), subjective sampling methodology, lack of video game-related knowledge, and lack of ecological validity in research design. Lastly, *external factors* referred to methodological challenges associated with external factors, often out of the researcher’s control. External factors included gaming establishment design (particularly the close proximity of players to each other), gatekeeper issues (difficulty in obtaining permission from venues), and industry perceptions of psychological research as being essentially “negative”.

The primary benefit of Paper 3 was its practical advice for researchers in the field of video game addiction. Since its publication, the first author has received positive feedback from multiple researchers undertaking video game-related psychology research. It is important that researchers gain an appropriate knowledge of video games, keep up-to-date with video game-



related news, network within the gaming industry, and open a respectful dialogue with the gaming community, including offering incentives and adequate feedback for participants in their research. These research practices had not been followed in some past research undertakings, and this can have detrimental long term effects on the practice of flexible and mutually gainful research with the gaming community.

#### *Paper 4*

This paper argued that the psychosocial context of video game play contributes to excessive patterns of video game play in a number of ways. First, video games are “empowering” because they give players a sense of mastery as well as a sense of status within the context of the game. Second, video games enable players to take on various social responsibilities which provide a sense of identity and belonging within a large community of other players. Specifically, the paper argued that: (a) there are boundaries in games indicated by the status of the player’s in-game character, among many other factors, (b) there is a sense of emotional safety in terms of the video game world offering an anonymous space for the exchange of personal information, (c) there is a sense of belonging through teamwork and competitive pursuits, (d) there is personal investment in terms of players spending long periods of time to acquire in-game rewards, and (e) there is a complex language and symbol system within video games that players develop and use. There are reward systems within video games which play an important role in sustaining player motivation, sometimes excessively. It was argued that the nature of these systems is similar in many ways to the variable-ratio and fixed-interval

schedules of gambling machines. Video games with concurrent reward schedules and games that do not have definitive endpoints contribute to the belief that no amount of time spent playing is “long enough.” In this respect, the findings in this study confirmed a number of theoretical claims regarding player motivation made in Paper 3.

The research findings described in this paper led to the development of a number of practical strategies for video game players who play excessively. Given excessive video game playing appears to be influenced by various situational factors, a number of behavioural strategies were put forward. These included the recommendations that the player does not have a video game machine in the same room as the person sleeps, that the player has a clock in the same room as the video game machine to monitor playing times, that the player plays in a well-lit room to minimise the subjective experience of time loss, and so on. These strategies may be particularly useful for individuals who are not suffering from any pre-existing psychological problems, and who play excessively due to a tendency to procrastinate and/or possess poor time management skills.

#### *Paper 5*

The paper provided preliminary validation data for a new measurement tool of video game addiction called the Problem Video Game Playing Test (PVGTT). The PVGTT was argued to measure the core aspects of behavioural addiction, including salience, mood modification, tolerance, withdrawal, conflict and relapse. Drawing on two large data sets of video game players, this paper presented the internal consistency, score distribution, and convergent validity

of the PVGT. Confirmatory factor analysis suggested a single factor solution of the PVGT. Item loadings on this general factor were strong for both study data sets. This result suggested that each of the 20 test items appear to tap a general “problem play” construct. The PVGT also showed moderate convergence with known correlates, including frequency and duration of video game playing sessions, as well as the total number of hours spent playing video games each week. The paper concluded that the PVGT demonstrated potential as a continuous measure of problem video game playing.

In the first chapter, it was argued that there is much contention as to whether excessive video game play is a form of behavioural addiction. The position adopted in this thesis was that video game playing may be considered along a continuum from healthy to problematic involvement. In defining aspects of ‘problem’ play, the six-factor components model of addiction was adopted (Brown, 1997). The model states that addiction occurs when an individual experiences withdrawal, salience, euphoria, tolerance, relapse and conflict as a consequence of involvement in an activity. Drawing on statistical data, Charlton and Danforth (2007) have argued that some of these factors may not be unique to addiction, as they may also be indicative of healthy obsession. Specifically, the researchers argued that ‘salience’ did not adequately distinguish between addicts and non-addicts. In this paper, the PVGT was designed to measure all six components of addictions. A test of dimensionality (factor analysis) of the PVGT found that all six components were highly interrelated and all six components loaded onto a single ‘problem play’ factor. This finding appears to suggest that all six factors do in fact play a role in problem video game play. Unfortunately, the items on the PVGT were

not identical to Charlton and Danforth's (2007) test of problem computer use, which makes direct comparison difficult. It is possible that the phrasing of the PVGT items may have tapped more harmful aspects of 'salience', and, as a result, these items were more highly correlated with the other components of addiction. The implication of this study is that problem video game play may not be reducible to a narrow set of addictive behaviours; rather, it seems that problem players experience a range of behaviours along a continuum and these behaviours are closely related to each other.

The PVGT measure could be of considerable benefit to both clinicians and problem video game players. Whilst the test does not categorise test scores into groups based on risk level like most gambling screens, the measure does yield a score that is useful for comparing the extent of problem playing in relation to others. The test is also useful for identifying certain dimensions of problem play, such as level of preoccupation or withdrawal, which may be relevant for informally assessing how video game involvement is specifically influencing a person's behaviour. In this way, the tool can be used by individuals as an exercise in raising self-awareness about their gaming behaviour and how this may affect their beliefs about video game playing.

### *Paper 6*

This paper examined the motivations which underlie excessive video game playing. The paper found that problem players report being motivated by extrinsic motivation for introjected regulation (i.e., playing video games for a release of tension or guilt), identified regulation (i.e., playing for internal values

such as wanting to be dynamic and important in the eyes of others), and external regulation (i.e., playing is reinforced by the intermittent reward systems within video games). Problem players are also “amotivated”, which means that they play with a sense of apathy and mental disengagement as the activity increasingly lacks meaning. In this sense, the motivational profile of problem video game players is very similar to problem gamblers (Chantal & Vallerand, 1996). This finding suggested that changes in player motivation may underlie the development of problematic technology-based gaming habits. It is possible that problem players do not initially play video games in order to relieve tension or for extrinsic purposes, but for their intrinsic appeal. Consequently, as the player’s pattern of use becomes increasingly excessive, the motivational orientation may shift toward extrinsic and amotivation factors.

The research findings discussed within this paper are applicable to therapeutic practices in dealing with excessive video game players. Many treatment specialists believe that the most effective method to treat problem video game playing is Cognitive Behaviour Therapy (CBT), which teaches the individual to identify and solve the underlying problem, and then to learn coping skills to prevent relapse. Using a CBT approach, video game players can identify problematic cognitions and the emotional motives that may underlie the reasons they use videogames excessively and then look for alternate ways to satisfy those needs.

The theoretical position of this thesis was that problem video game play is characterised by the six components of addiction (Griffiths, 2008). Whilst this model provides a detailed description of problem video game play, it is limited with regard to explaining why individuals play video games

excessively in the first instance. Papers 1, 2, 3 and 4 suggested that aspects of the video games themselves play a role in initiating the playing behaviour. This paper attempts to complement this view by identifying psychological characteristics of the player that influence excessive involvement in video games. In this paper, extrinsic motivation was identified as a fundamental aspect of problem playing. Specifically, problem players often use video games to relieve feelings of tension (i.e., to modify their mood as well as relieve feelings of withdrawal), to earn social recognition and win in-game rewards (without the associated intrinsic feelings of satisfaction or achievement). Greater awareness of these common playing motivations is of direct benefit to CBT practitioners in their goal of helping the client to set positive goals, understand the cognitive roots of their excessive behaviour, and develop other recreational pursuits to satisfy their internal needs.

#### *Paper 7*

This paper examined the general health status of heavy video game players. “Heavy” video game playing was defined as: (a) playing for over 30 hours per week, (b) playing for at least 4 days per week, and (c) playing for an average duration of 3 hours in a typical sitting. It was found that those individuals who reported playing over 30 hours per week scored lower on measures of physical functioning, mental health, vitality, general health and social functioning than normal Australian adults. The majority of the heavy playing group did not meet the national guidelines for weekly physical activity and reported some occasional difficulties with achieving high sleep quality. However, the “heavy” playing group did not differ from normative levels on

other health measures, including of bodily pain, and physical and emotional role functioning. In addition, the BMI distribution of the heavy playing group did not differ greatly from established population levels. In summary, this study suggested that heavy involvement in video games has an associated health 'profile', but it is important to recognise that this finding is based only on correlational data.

The primary benefit of this study was its application to therapy. For therapists managing clients with excessive technology-based gaming behaviour, it appears important to address some of the lifestyle factors that result from spending over 30 hours per week playing video games. Based on the results detailed in this paper, the most appropriate health strategies may include helping the client to increase participation in daily exercise, improve diet and nutrition, spend more time with family and friends outside of the game, and follow healthy sleep patterns.

### *Summary of Main Findings*

In this thesis, excessive video game playing was conceptualised as a problematic activity in its own right. The main research contribution of the research project was the development of a new tool for measuring problematic involvement in video games. This tool also assisted in identifying the motivational correlates of problem play and the general health profiles of potentially excessive players (i.e., the *psychological* and *health-related* profile of the heavy player). In addition, this thesis has made a theoretical contribution by reviewing the role of structural characteristics in the initiation, development and maintenance of problem playing, and the key

methodological issues related to research using the video game playing population. Further, this thesis has put forward a new psychological model of video game structural characteristics for understanding excessive video game play. In summary, these broad but complementary research contributions shed light on the phenomenon of excessive video game play and will guide a range of future research endeavours in this new and increasingly socially relevant area of behavioural addiction.

### *Overall Significance*

It may be argued that the growing social relevance of video game “addiction” and other technologically driven pathologies makes any new research in the area worthwhile because it may expand understanding on the subject.

However, an often overlooked problem of research on video game addiction (and other technological addictions) is its research questions often carry or falsely create an assumption that video games are in some way harmful *regardless of how they are used*. As outlined in Paper 3, among video game players and industry there is a perception that psychological research is generally biased toward the negative effects of playing video games.

Naturally, perception is not reality. In addition to video games being a relatively harmless form of home electronic entertainment enjoyed by millions on a regular basis, there are many benefits of video games in the educational, medical and therapeutic context. Therefore, it is important that researchers who study video games report their findings responsibly with respect to the broader context of video game playing. In the researcher’s opinion, the discourse that links violent video games and aggressive behaviour is an



example of research being misconceived by the popular press, and this has had negative repercussions for the research and playing community alike. It is with this acknowledgement of the ethical responsibility of psychological research that I now wish to describe the significance of the findings of the present thesis.

This thesis has presented a number of original research undertakings. Specifically, this research project has explored critically the influence of video game reward delivery systems and other structural complexities of video games that may explain why some individuals play video games to excess. However, the most significant theoretical contribution of this thesis was its formulation of a new psychological taxonomy for video game structural characteristics. To date, one of the major obstacles to examining the role of structural characteristics in video games in relation to players' cognitions and behaviour has been the lack of understanding of the complexity of video games. This taxonomy has attempted to address this problem by providing distinct conceptual groupings of features which contain clear and operationalised units of analysis to guide future research projects.

This research project also undertook a number of empirical investigations into the nature of problem video game playing and how it should be measured as a form of behavioural addiction. As outlined in Chapter 1, the empirical research literature on problem video game play has been relatively limited with regard to the development of a formal measurement tool. A substantial contribution of this research project was its development and testing of a theoretically driven test of video game addiction on a large representative sample of video game players. However, despite

demonstrating early potential as a reliable instrument, this test does require further validation. In particular, it requires further testing, including validation using individuals who seek out psychological help for excessive video game involvement, however this would be difficult as it appears that these individuals are quite rare (Black, Belsare, & Schlosser, 1999). Nevertheless, this test represents a significant step forward in a field that lacks a formal means of quantifying problem video game play.

The studies on player motivation and general health and well-being (Papers 6 and 7, respectively) were significant because they quantified some of the key psychological mechanisms that drive addictive behaviour, as well as the adverse personal consequences of excessive involvement in the activity. At present, the phenomenon of excessive video game playing is not well understood, particularly with regard to whether it should be conceptualised as a “primary” or “secondary” disorder or maladaptive behaviour. The present thesis contributed empirical evidence that suggested problem video game play is linked to specific motivations to seek out rewards and payouts in video games, as well as a need to engage with various video game features. Whilst this research does not rule out pre-existing psychological problems as a precipitating factor for video game addiction, the papers in this thesis suggested that problematic involvement in video games is initiated, developed and maintained in similar ways to problem gambling (which has long been recognised as a “primary” disorder).

### *Methodological Limitations*

This research project, like any other, has a number of methodological limitations. Many of these have been described in detail within each preceding chapter and thus they need not be repeated. Nevertheless, it is worth underscoring one of the most fundamental of assumptions in psychological research that has significant bearing on the interpretation of results. It is assumed that *individuals are invariably able and willing to report accurately on their past behaviours*. This assumption is especially relevant to addiction research. Whilst researchers endeavour to encourage full disclosure from participants, the fact remains that participants are communicating information to the researcher through, as one anonymous reviewer put it, a “fog of subjective experience”. By no means are the limitations of self-reported data unique to this project, because it is a shortcoming inherent to most research projects in the social sciences, but it is a factor that deserves additional emphasis in the addiction field. There are some research methods that can be used to address this problem, for example, by examining participants’ ‘automatic’ responses to addictive stimuli (see Tiffany, 1990). On the whole, however, self-report error remains an indelible feature in many psychological studies.

Another methodological limitation in this project concerns the Problematic Video Game Playing Test (PVGT). This test was partially modelled on the Internet Addiction Test (IAT), although the PVGT was almost completely reworded to be relevant to video game playing. Therefore, some limitations of the developed test, such as the disproportionate number of items on “conflict”, can be attributed to the original structure of the IAT. At the

beginning of the project, the rationale for basing the PVGT on another clinical test that examines technology-based excessive behaviour was drawn from examples in the literature (e.g., Yang, 2001) and this approach seemed to make intuitive sense. However, on reflection, there may be some important aspects of video game playing that were not measured by adopting this approach. As an example, it may have been useful to include questions related to “grinding” behaviour, as this behaviour appears to be quite common among problem video game players (see Paper 4).

Finally, it should be highlighted that this research project is virtually unique in the field with respect to its sampling method. Previous studies of video game players have relied heavily on self-selected online samples using advertisements on gaming websites. This approach is fast, cheap, and often yields sample sizes of a thousand cases and over. In contrast, this project surveyed players in person at local gaming venues, a process that required hundreds of hours of data collection, including correspondence with gaming venues, administration time, entering survey data, and so on. An advantage of this method of sampling is that it targeted individuals who may not be captured using online survey methods. In this way, this method provided much needed data on the demographic profile of players who actually attend gaming venues and gaming businesses. This research also enabled comparisons between online and offline survey data. For example, online studies suggest that the video game playing population is increasingly evenly represented in terms of gender, but this research project identified very few female players at gaming venues (approximately 20%). Therefore, this research suggests that self-sampling methods may tend to favour female

video game players. Lastly, it is hoped that this research project's commitment to surveying players in person lends some additional credibility not only to its findings, but also to the greater study of excessive video game play.

### *Future Directions*

A number of future directions were suggested by the results of the present thesis. First, Paper 5 suggested that the Problem Video Game Playing Test (PVGT) requires further validation, possibly by utilising clinicians' ratings of problematic involvement as an external criterion of 'problem' involvement. This approach may also lead to the development of a scoring interpretation chart. At this early stage, higher scores on the PVGT indicate more severe problems, therefore the test would benefit greatly from a more qualitative style of interpretation. The single-factor structure and convergent validity of the PVGT should also be re-evaluated using a large sample of video game players. A well-validated measure of problem video game play is arguably the highest priority for the field, in that it could aid in measuring accurately the prevalence of technology-based problem gaming behaviour.

Another major avenue for future research concerns the psychological taxonomy developed in Paper 2. Often psychological research fails to acknowledge the differences in the type of video game played by individuals when considering excessive video game play. Therefore, there is a need for further empirical studies to utilise the new taxonomy to identify features that are important to problem, as opposed to normal, players. There is also great potential for experimental research to examine the effects of specific in-game

features on aspects of video game playing (i.e., player enjoyment and/or frustration, desire to complete the game, subjective experience of time loss, etc.). Further, the question of whether the features in the taxonomy are clearly demarcated deserves further attention, as does the prospect that this framework is indicative of different player typologies (i.e., players who primarily seek out the storytelling experience of video games vs. players who seek out the in-game rewards and items in video games). It would also be useful to examine specific structural features of video game in relation to player motivation, as this undertaking would give psychologists a better understanding of the development of problem playing habits.

The health-related quality of life of heavy video game players requires further investigation. Specifically, future research could employ medical practitioner's ratings of general health to overcome the inherent problems of self-reported health data (i.e., some participants may underestimate the extent of their health problems), although, admittedly, there may be various ethical difficulties associated with this approach. There is also a need for longitudinal research designs and more objective measures of video game involvement. These improvements in methodology would enable more definitive statements concerning the impact of heavy and sustained use of video game technology on general health and emotional well-being over time.

#### *Concluding statement*

The present thesis aimed to develop a theoretical understanding of the mechanisms of excessive video game play, as well as conduct much needed empirical research on the phenomenon. This broad undertaking was met with

moderate success, particularly with regard to demonstrating new insights into why individuals play video games excessively. However, it should be made clear that this thesis represents only a preliminary step toward more fully understanding the psychosocial impact of video game technology, particularly among youth users. Video game technology will continue to evolve, which will likely affect the demographic nature of the video game playing population, as well as the ways in which players are influenced by new gaming technology.

In many of his works, Neil Postman, the late media scholar, argued that it is crucial that we, as a society, do not simply assimilate new technologies within our cultural landscape without critical thought, thereby rendering their social effects “invisible”. In closing this thesis, I am inclined to agree with Postman. However, I would add that, as researchers, it is important that, in the pursuit of examining the psychological effects of technology, including the possibility of “addiction” to technology, we continue to critique our assumptions and values, assess critically our methods and tools of investigation, and report responsibly our findings to the wider community.

## REFERENCES

- Abbott, M. W. (2007). Situational factors that affect gambling behavior. In G. Smith, D. Hodgins & R. Williams (Eds.), *Research and Measurement Issues in Gambling Studies*. pp.251-278. New York: Elsevier.
- Abbott, M., Palmisano, B., & Dickerson, M. (1995). Video game playing, dependency and delinquency: A question of methodology? *Journal of Gambling Studies*, 11, 287-301.
- Alexander, B. K. & Schweighofer, A. R. F. (1988). Defining "addiction". *Canadian Psychology*, 29, 151-162.
- Allen, L., & Britt, D. (1983). Social class, mental health, and mental illness: The impact of resources and feedback. In R. Felner, L. Jason, J. Moritsugu & S. Farber (Eds.), *Preventative Psychology: Theory, Research and Practice* (pp. 149-161). New York: Pergamon.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders. (4th ed)*. Washington, DC: Author.
- Anderson, C., Laubscher, S., & Burns, R. (1996). Validation of the Short Form 36 (SF-36) Health Survey Questionnaire among stroke patients. *Stroke*, 27, 1812-1816.
- Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behaviour in the laboratory and in life. *Journal of Personality and Social Psychology*, 78, 772-790.
- Anderson, C. A., Funk, J. B., & Griffiths, M. D. (2004). Contemporary issues in adolescent video game playing: Brief overview and introduction to the special issue [Editorial]. *Journal of Adolescence*, 27, 1-3.



- Anderson, G., & Brown, R. I. F. (1984). Real and laboratory gambling, sensation-seeking and arousal. *British Journal of Psychology*, 75, 401-410.
- Andrews, G., & Slade, T. (2001). Interpreting scores on the Kessler Psychological Distress Scale (K10). *Australian and New Zealand Journal of Public Health*, 25, 494-497.
- Atkins, B. (2003). *More than a game: The computer game as fictional form*. Manchester: Manchester University Press.
- Australian Bureau of Statistics. (2006). *National Health Survey 2004-05: Summary of Results*. (cat. no. 4364.0). Canberra, ACT: Author.
- Bandura, A. (1977). *Social learning theory*. New York: General Learning Press.
- Barnes, G. M., Welte, J. W., Hoffman, J. H., & Dintcheff, B. A. (1999). Gambling and alcohol use among youth: Influences of demographic, socialization, and individual factors. *Addictive Behaviors*, 24, 749-767.
- Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD Research*, 1.
- Bartle, R. (2004). *Designing Virtual Worlds*. New York: New Riders Publishing.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497-529.
- Baumeister, R., Bratslavsky, E., Finkenauer, A. & Vohs, K. (2001). Bad is stronger than good. *Review of General Psychology*, 5, 323-370.

- Behavioural Epidemiology Unit. (1995). *South Australian Population Norms for the Short Form 36 (SF-36) Health Status Questionnaire*. Adelaide, South Australia: South Australian Health Commission.
- Becker, G. S., & Murphy, K. M. (1988). A theory of rational addiction. *The Journal of Political Economy*, 96, 675-700.
- Bell, T. W. (1999). Internet gambling: Popular, inexorable, and (eventually) legal. *Policy Analysis No. 336*, Washington, DC: Cato Institute.
- Biddle, S. J. H., Gorely, T., Marshall, S. J., Murdey, I., & Cameron, N. (2004). Physical activity and sedentary behaviours in youth: issues and controversies. *Journal of The Royal Society for the Promotion of Health*, 124, 29-33.
- Black, D. W., Belsare, G., & Schlosser, S. (1999). Clinical features, psychiatric comorbidity, and health-related quality of life in persons reporting compulsive computer use behavior. *Journal of Clinical Psychiatry*, 60, 839-845.
- Blais, M. R., Briere, N. M., Lachance, L., Riddle, A. S., & Vallerand, R. J. (1993). The Blais work motivation inventory. *Revue Quebecoise de Psychologie*, 14, 185-215.
- Blais, M. R., Sabourin, S., Boucher, C., & Vallerand, R. J. (1990). Toward a motivational model of couple happiness. *Journal of Personality and Social Psychology*, 59, 1021-1031.
- Blaszczynski, A. (2000). Pathways to pathological gambling: Identifying typologies. Retrieved 06/12/06, from eGambling [electronic resource] <http://www.camh.net/egambling>

- Blaszczynski, A. (2006). Internet use: In search of an addiction. *International Journal of Mental Health and Addiction*, 4, 7-9.
- Blaszczynski, A. (2008). Commentary: A response to "Problems with the concept of video game "addiction": Some case study examples". *International Journal of Mental Health and Addiction*, 6, 179-181.
- Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction*, 97, 487-499.
- Blaszczynski, A., McConaghy, N., & Frankova, A. (1990). Boredom proneness in pathological gambling. *Psychological Reports*, 67, 35-42.
- Blinka, L. (2008). The relationship of players to their avatars in MMORPGs: Differences between adolescents, emerging adults and adults. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 2, article 1.
- Bonomo, Y., Bowes, G., Coffey, C., Carlin, J. B., & Patton, G. C. (2004). Teenage drinking and the onset of alcohol dependence: a cohort study over seven years. *Addiction*, 99, 1520-1528.
- Bradley, B. P. (1990). Behavioural addictions: Common features and treatment implications [Commentary]. *British Journal of Addiction*, 85, 1417-1419.
- Brand, J. (2007). *Interactive Australia 2007: Facts about the Australian computer and video game industry*. Bond University Press.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.

- Breen, R. B., & Zuckerman, M. (1999). 'Chasing' in gambling behavior: Personality and cognitive determinants *Personality and individual differences*, 27, 1097-1111.
- Brown, I. (1997). A theoretical model of the behavioural addictions - Applied to offending. In J. E. Hodge, M. McMurrin & C. R. Hollins (Eds.), *Addicted to crime?* (pp. 13-65). Chichester, UK: John Wiley.
- Brown, R. I. F. (1989). Gaming, gambling, risk-taking, addictions and a developmental model of a pathology of man-machine relationships. In J. Klabberg, D. Croowell, H. de Jong & W. Scheper (Eds.), *Simulation Gaming*. Oxford: Pergamon Press.
- Burke, A., & Peper, E. (2002). Cumulative trauma disorder risk for children using computer products: Results of a pilot investigation with a student convenience sample. *Public Health Reports*, 117, 350-357.
- Castronova, E. (2005). *Synthetic worlds: The business and culture of online games*. Chicago: The University of Chicago Press.
- Chantal, Y., Vallerand, R. J., & Vallieres, E. F. (1994). On the development and validation of the Gambling Motivation Scale. *Society and Leisure*, 17(189-212).
- Chantal, Y., Vallerand, R. J., & Vallieres, E. F. (1995). Motivation and gambling involvement. *The Journal of Social Psychology*, 135, 755-763.
- Chappell, D., Eatough, V., Davies, M. N. O., & Griffiths, M. D. (2006). *Everquest* - It's just a computer game right? An interpretative phenomenological analysis of online computing addiction. *International Journal of Mental Health and Addiction*, 4, 205-216.

- Charlton, J. P. (2002). A factor-analytic investigation of computer 'addiction' and engagement. *British Journal of Psychology*, *93*, 329-344.
- Charlton, J. P., & Danforth, I. D. W. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behaviour*, *23*, 1531-1548.
- Chumbley, J., & Griffiths, M. D. (2006). Affect and the computer game player: The effect of gender, personality, and game reinforcement structure on affective responses to computer game play. *CyberPsychology & Behavior*, *3*, 308-316.
- Christakis, D. A., Ebel, B. E., Rivara, F. P., & Zimmerman, F. J. (2004). Television, video, and computer game usage in children under 11 years of age. *Journal of Pediatrics*, *145*, 652-656.
- Chui, S.-i., Lee, J.-z., & Huang, D.-h. (2004). Video game addiction in children and teenagers in Taiwan. *CyberPsychology & Behavior*, *7*, 571-581.
- Clarke, D. (2004). Impulsiveness, locus of control, motivation and problem gambling. *Journal of Gambling Studies*, *20*, 319-345.
- Clarke, D., & Clarkson, J. (2007). A preliminary investigation into motivational factors with older adults' problem gambling. *International Journal of Mental Health and Addiction*.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155-159.
- Cole, H., & Griffiths, M. D. (2007). Social interactions in Massive Multiplayer Online Role-playing gamers. *CyberPsychology and Behaviour*, *10*, 575-583.

- Colwell, J., Grady, C., & Rhaiti, S. (1995). Computer games, self-esteem and gratification of needs in adolescents. *Journal of Community and Applied Social Psychology, 5*, 195-206.
- Crawford, C. (1982). *The Art of Computer Game Design*. Retrieved 28/6/2006, from <http://www.vancouver.wsu.edu/fac/peabody/game-book/Coverpage.html>
- Davies, J. B. (1992). *The myth of addiction: An application of the psychological theory of attribution to illicit drug use*. Chur, Switzerland: Harwood Academic Publishers.
- Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behaviour, 17*, 187-195.
- de Freitas, S., & Griffiths, M. D. (2007). Online gaming as an educational tool in learning and training. *British Journal of Educational Technology, 38*, 536–538.
- de Freitas, S., & Griffiths, M. D. (2008). The convergence of gaming practices with other media forms: What potential for learning? A review of the literature. *Learning, Media and Technology, 33*, 11-20.
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.
- Delfabbro, P. H., & Thrupp, L. (2003). The social determinants of youth gambling in South Australian adolescents. *Journal of Adolescence, 26*, 313-330.

- Delfabbro, P. H., & Winefield, A. H. (1999). Poker-machine gambling: An analysis of within session characteristics. *British Journal of Psychology*, *90*, 425-439.
- Derevenksy, J., & Gupta, R. (2007). Internet gambling amongst adolescents: A growing concern. *International Journal of Mental Health and Addiction*, *5*, 93-101.
- Dickerson, M. (1993). Internal and external determinants of persistent gambling: Problems in generalising from one form of gambling to another. *Journal of Gambling Studies*, *9*, 225-245.
- Dietz, W. H., & Gortmaker, S. L. (1985). Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics*, *75*, 807-812.
- Dill, K. E., & Dill, J. C. (1998). Video game violence: A review of the empirical literature. *Aggression and Violent Behavior*, *3*, 407-428.
- Dixon, L., Trigg, R., & Griffiths, M. D. (2007). An empirical investigation of music and gambling behaviour. *International Gambling Studies*, *3*, 315-326.
- Doughney, J. (2007). Lies, damned lies and 'problem gambling' prevalence rates: The example of Victoria, Australia. *Journal of Business Systems, Governance and Ethics*, *2*, 41-54.
- Douse, N. A., & McManus, I. C. (1993). The personality of fantasy game players. *British Journal of Psychology*, *84*, 505-509.
- Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. J. (2006). "Alone together?" *Exploring the social dynamics of massively multiplayer online games.*

Paper presented at the human factors in computing systems CHI 2006,  
April 22-27, Montreal, PQ, Canada.

- Egli, E. A., & Meyers, L. S. (1984). The role of video game playing in adolescent life: Is there reason to be concerned? *Bulletin of the Psychonomic Society*, 22, 309-312.
- Emes, C.E. (1997). Is Mr. Pac Man eating our children? A review of the effect of video games on children. *The Canadian Journal of Psychiatry*, 42, 409-414.
- Engelberg, E., & Sjoberg, L. (2004). Internet use, social skills, and adjustment. *CyberPsychology & Behavior*, 7, 41-47.
- Ferster, C. B., & Skinner, B. F. (1957). *Schedules of reinforcement*. New York: Appleton-Century-Crofts.
- Fisher, S. (1993). Gambling and pathological gambling in adolescents. *Journal of Gambling Studies*, 9, 277-288.
- Fisher, S. (1994). Identifying video game addiction in children and adolescents. *Addictive Behaviors*, 19, 545-553.
- Fisher, S. (1995). The amusement arcade as a social space for adolescents: An empirical study. *Journal of Adolescence*, 18, 71-86.
- Fisher, S., & Griffiths, M. D. (1995). Current trends in slot machine gambling: Research and policy issues. *Journal of Gambling Studies*, 11, 239-247.
- Fleming, A., & Kraut, R. (2007). *Project Massive: Self-regulation and problematic use of online gaming*. Paper presented at the CHI 2007, San Jose, CA.



- Fotheringham, M. J., Wonnacott, R. L., & Owen, N. (2000). Computer use and physical inactivity in young adults: Public health perils and potentials of new information technologies. *Annals of Behavioral Medicine, 22*, 269-275.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.
- Goodman, A. (1990). Addiction: Definition and implications. *British Journal of Addiction, 85*, 1403–1408.
- Graham, J. (1988). *Amusement machines, dependency and delinquency (Home Office Research Study 101)*. London: Her Majesty's Stationary Office.
- Graham, J., Liyazheng, M. S., & Gonzalez, C. (2006). A cognitive approach to game usability and design: Mental model development in novice real-time strategy gamers. *CyberPsychology and Behaviour, 9*, 361-366.
- Graves, L., Stratton, G., Ridgers, N. D., & Cable, N. T. (2008). Energy expenditure in adolescents playing new generation computer games. *British Journal of Sports Medicine, 42*, 592-594.
- Griffiths, M. D. (1990). Psychobiology of the near-miss in fruit machine gambling. *The Journal of Psychology, 125*, 347-357.
- Griffiths, M. D. (1991a). Amusement machine playing in childhood and adolescence: A comparative analysis of video games and fruit machines. *Journal of Adolescence, 14*, 53-73.
- Griffiths, M. D. (1991b). The observational study of adolescent gambling in UK amusement arcades. *Journal of Community and Applied Social Psychology, 1*, 309-320.

- Griffiths, M. D. (1993a). Fruit machine gambling: The importance of structural characteristics. *Journal of Gambling Studies*, 9, 101-120.
- Griffiths, M. D. (1993b). Are computer games bad for children? *The Psychologist: Bulletin of the British Psychological Society*, 6, 401-407.
- Griffiths, M. D. (1994). The role of cognitive bias and skill in fruit machine gambling. *British Journal of Psychology*, 85, 351-369.
- Griffiths, M. D. (1995). Technological addictions. *Clinical Psychology Forum*, 76, 14-19.
- Griffiths, M. D. (1997). Computer game playing in early adolescence. *Youth & Society*, 29, 223-238.
- Griffiths, M. D. (1999). Gambling technologies: Prospects for problem gambling. *Journal of Gambling Studies*, 1, 265-283.
- Griffiths, M.D. (2000a). Parents are right to worry about screenagers *The Sunday Post*, May 7, p. 30-31.
- Griffiths, M. D. (2000b). Does Internet and computer "addiction" exist? Some case study evidence. *CyberPsychology & Behavior*, 3, 211-218.
- Griffiths, M.D. (2002). *Gambling and Gaming Addictions in Adolescence*. Leicester: British Psychological Society/Blackwells.
- Griffiths, M. D. (2003a). Internet gambling: Issues, concerns, and recommendations. *CyberPsychology & Behavior*, 6, 557-568.
- Griffiths, M.D. (2003b). Adolescent gambling: Risk factors and implications for prevention, intervention, and treatment. In D. Romer (Ed.), *Reducing Adolescent Risk: Toward An Integrated Approach*. pp. 223-238. London: Sage.

- Griffiths, M.D. (2004). Interactive television gambling: Should we be concerned? *World Online Gambling Law Report*, 3(3), 11-12.
- Griffiths, M.D. (2005a). Does advertising of gambling increase gambling addiction? *International Journal of Mental Health and Addiction*, 3 (2), 15-25.
- Griffiths, M. D. (2005b). A components model of addiction within a biopsychosocial framework. *Journal of Substance Use*, 10, 191-197.
- Griffiths, M. D. (2005c). Relationship between gambling and video-game playing: A response to Johansson and Gotestam. *Psychological Reports*, 96, 644-646.
- Griffiths, M.D. (2006). Interactive television and gaming. *World Online Gambling Law Report*, 5(2), 12-13.
- Griffiths, M.D. (2007a). Mobile phone gambling. In D. Taniar (Ed.), *Encyclopedia of Mobile Computing & Commerce*. pp.553-556. Pennsylvania: Information Science Reference.
- Griffiths, M.D. (2007b). Interactive television quizzes as gambling: A cause for concern? *Journal of Gambling Issues*, 20, 269-276.
- Griffiths, M. D. (2008a). Convergence of gambling and gaming: Implications. *World Online Gambling Law Report*, 2, 37-42.
- Griffiths, M. D. (2008b). Diagnosis and management of video game addiction. *Addiction Treatment and Prevention*, 12, 27-41.
- Griffiths, M. D. (2008c). Digital impact, crossover technologies and gambling practices. *Casino and Gaming International* 4, 37-42.
- Griffiths, M.D. (2008d). Online 'penny auction' sites: Regulation needed. *E-Finance & Payments Law & Policy*, 2(12), 14-16.

- Griffiths, M. D. (2008e). Videogame addiction: Further thoughts and observations. *International Journal of Mental Health and Addiction*, 6, 182-185.
- Griffiths, M. D. (2008f). Video-game and Internet Addiction. In *Adolescent Addiction: Epidemiology, Assessment and Treatment*. New York: Academic Press.
- Griffiths, M.D. (2009). Gambling in Great Britain. In G. Meyer, T. Hayer & M.D. Griffiths (Eds.), *Problem Gaming in Europe: Challenges, Prevention, and Interventions*. pp. 103-121. New York: Springer.
- Griffiths, M. D., & Dancaster, I. (1995). The effect of type A personality on physiological arousal while playing computer games. *Addictive Behaviors*, 20, 543-548.
- Griffiths, M. D., & Davies, M. N. O. (2005). Video-game addiction: Does it exist? In J. Goldstein & J. Raessens (Eds.), *Handbook of Computer Game Studies* (pp. 359-368). Boston: MIT Press.
- Griffiths, M. D., & Delfabbro, P. H. (2001). The biopsychosocial approach to gambling: Contextual factors in research and clinical interventions. *eGambling [electronic resource]* <http://www.camh.net/egambling>, 5, 1-34.
- Griffiths, M. D., & Dunbar, D. (1997). The role of familiarity in fruit machine gambling. *Society for the Study of Gambling Newsletter*, 29, 15-20.
- Griffiths, M. D., & Hunt, N. (1995). Computer game playing in adolescence: Prevalence and demographic indicators. *Journal of Community and Applied Social Psychology*, 5, 189-193.

- Griffiths, M. D., & Hunt, N. (1998). Dependence on computer games by adolescents. *Psychological Reports, 82*, 475-480.
- Griffiths, M. D. & Parke, J. (2003). The environmental psychology of gambling. In G. Reith (Ed), *Gambling: Who wins? Who Loses?* (pp. 277-292). New York: Prometheus Books.
- Griffiths, M. D., & Parke, J. (2005). The psychology of music in gambling environments: An observational research note. *Journal of Gambling Issues, 13*, 1-12.
- Griffiths, M. D., & Sutherland, I. (1998). Adolescent gambling and drug use. *Journal of Community and Applied Social Psychology, 8*, 423-427.
- Griffiths, M. D., & Wood, R. T. A. (2000). Risk factors in adolescence: The case of gambling, videogame playing, and the Internet. *Journal of Gambling Studies, 16*, 199-225.
- Griffiths, M.D. & Wood, R.T.A. (2007). Adolescent Internet gambling: Preliminary results of a national survey. *Education and Health, 25*, 23-27.
- Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2003). Breaking the stereotype: The case of online gaming. *CyberPsychology & Behavior, 6*, 81-91.
- Griffiths, M. D., Davies, M. N. O., & Chappell, D. (2004a). Demographic factors and playing variables in online computer gaming. *CyberPsychology & Behavior, 7*, 479-487.
- Griffiths, M.D., Davies, M.N.O. & Chappell, D. (2004b). Online computer gaming: A comparison of adolescent and adult gamers. *Journal of Adolescence, 27*, 87-96.

- Griffiths, M.D., Wardle, H., Orford, J., Sproston, K. & Erens, B. (2008). *Internet gambling: a secondary analysis of findings from the 2007 British Gambling Prevalence Survey*. Birmingham: Gambling Commission.
- Grüsser, S. M., Thalemann, R., & Griffiths, M. D. (2007). Excessive computer game playing: Evidence for addiction and aggression? *CyberPsychology and Behaviour*, 10, 290-292.
- Gunter, B. (1998). *The Effects of Video Games on Children: The Myth Unmasked*. Sheffield: Sheffield Academic Press.
- Gupta, R., & Derevensky, J. L. (1996). The relationship between gambling and video-game playing behaviour in children and adolescents. *Journal of Gambling Studies*, 12, 375-394.
- Gupta, R., & Derevensky, J. (1998). Adolescent gambling behavior: A prevalence study and examination of the correlates associated with problem gambling *Journal of Gambling Studies*, 14, 319-345.
- Hardoon, K. K., & Derevensky, J. (2002). Child and adolescent gambling behavior: Current knowledge. *Clinical Child Psychology and Psychiatry*, 7, 263-281.
- Hardoon, K. K., & Derevensky, J. L. (2001). Social influences involved in children's gambling behavior. *Journal of Gambling Studies*, 17, 191-215.
- Harper, A. (2007). Pay-per-kill shooters combine online gambling with gaming. *The Guardian (Technology Supplement)*, November 22, p.3.
- Hayer, T., Meyer, G. & Griffiths, M.D. (2009). *Problem Gaming in Europe: Challenges, Prevention, and Interventions*. New York: Springer.
- Higuchi, S., Motohashi, Y., Liu, Y., & Maeda, A. (2005). Effects of playing a computer game using a bright display on presleep physiological

- variables, sleep latency, slow wave sleep and REM sleep. *Journal of Sleep Research*, 14, 267-273.
- Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55.
- Huff, G., & Collinson, F. (1987). Young offenders, gambling and video game playing. *British Journal of Criminology*, 4, 401-410.
- Hussain, Z., & Griffiths, M. D. (2008). Gender swapping and socializing in Cyberspace: An exploratory study. *CyberPsychology and Behaviour*, 11, 47-53.
- Ingledeu, D. K., Markland, D., & Sheppard, K. E. (2003). Personality and self-determination of exercise behavior. *Personality and individual differences*, 8, 1921-1932.
- Jackson, A. C., Dowling, N., Thomas, S. A., Bond, L., & Patton, G. (2008). Adolescent gambling behaviour and attitudes: A prevalence study and correlates in an Australian population *International Journal of Mental Health and Addiction*, 6, 325-352.
- Jacobs, D. F. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling Behavior*, 2, 15-31.
- Jacobs, D. F., Marston, A. R., Singer, R. D., Widaman, K., Little, T., & Veizades, J. (1989). Children of problem gamblers. *Journal of Gambling Behavior*, 5, 261-268.
- Jacobson, N. S., Follette, W. C., & Revenstorf, D. (1984). Psychotherapy outcome research: Methods for reporting variability and evaluating clinical significance. *Behavior Therapy*, 15, 336-352.

- Jaffe, J. H. (1990). Trivialising dependence [Commentary]. *British Journal of Addiction, 85*, 1425-1427.
- Jansz, J., & Martens, L. (2005). Gaming at a LAN event: The social context of playing video games. *New Media & Society, 7*, 333-355.
- Jansz, J., & Tanis, M. (2007). Appeal of playing online first person shooter games. *CyberPsychology and Behaviour, 10*, 133-136.
- Johansson, A., & Gotestam, K. G. (2004). Problems with computer games without monetary reward: Similarity to pathological gambling. *Psychological Reports, 95*, 641-650.
- Keepers, G. A. (1990). Pathological preoccupation with video games. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 49-50.
- Kent, S. (2001). *The ultimate history of video games*. New York: Three Rivers Press.
- Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S-L. T., Walters, E. E., & Zaslavsky, A. (2002). Short screening scales to monitor population prevalences and trends in nonspecific psychological distress. *Psychological Medicine, 32*, 959-976.
- King D. & Delfabbro, P. (2008). Understanding and assisting excessive players of video games: A community psychology perspective. *Australian Community Psychologist, 21*, 62-74.
- Klesges, R. C., Shelton, M. L., & Klesges, L. M. (1993). Effects of television on metabolic rate: Potential implications for childhood obesity. *Pediatrics, 91*, 281-286.



- Kohatsu, N. D., Tsai, R., Young, T., VanGilder, R., Burmeister, L. F., Stromquist, A. M., et al. (2006). Sleep duration and body mass index in a rural population. *Archives of Internal Medicine*, *166*, 1701-1706.
- Korn, D. A., & Shaffer, H. J. (1999). Gambling and the health of the public: Adopting a public health perspective. *Journal of Gambling Studies*, *15*, 289-365.
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1998). Internet paradox: a social technology that reduces social involvement and psychological well-being? *American Psychologist*, *53*, 1017-1031.
- Ladouceur, R., & Dube, D. (1995). Prevalence of pathological gambling and associated problems in individuals who visit non-gambling video arcades. *Journal of Gambling Studies*, *11*, 361-365.
- Ladouceur, R., & Mireault, C. (1988). Gambling behaviors among high school students in the Quebec area. *Journal of Gambling Behavior*, *4*, 3-12.
- Ladouceur, R. & Walker, M. (1996). A cognitive perspective on gambling. In P.M. Salkovskis (Ed.), *Trends in Cognitive and Behavioural Therapies* (pp. 89–120), New York: Wiley.
- Ladouceur, R., Mayrand, M., & Tourigny, Y. (1987). Risk-taking behavior in gamblers and non-gamblers during prolonged exposure. *Journal of Gambling Behavior*, *3*, 115-122.
- Ladouceur, R., Vitaro, F., Cote, M. A., & Dumont, M. (2001). *Parents' attitudes, knowledge, and behavior towards gambling*. Paper presented at the Annual meeting of the National Council on Problem Gambling, Seattle, WA, June.

- Ladouceur, R., Arsenault, C., Dube, D., Freeston, F. H., & Jaques, C. (1997). Psychological characteristics of volunteers in studies on gambling. *Journal of Gambling Studies, 13*, 69-84.
- Lannington-Foster, L., Jensen, T. B., Coster, R. C., Redmond, A. B., Walker, B. A., Heinz, D., et al. (2006). Energy expenditure of sedentary screen time compared with active screen time for children. *Pediatrics, 6*, 1831-1835.
- Leblond, J., Ladouceur, R., & Blaszczynski, A. (2003). Which pathological gamblers will complete treatment? *British Journal of Clinical Psychology, 42*, 205-209.
- Lesieur, H. R., & Rosenthal, R. J. (1991). Pathological gambling: A review of the literature (Prepared for the American Psychiatric Association Task Force on DSM-IV Committee on Disorders of Impulse Control Not Elsewhere Classified). *Journal of Gambling Studies, 7*, 5-39.
- Loftus, G. R., & Loftus, E. F. (1983). *Mind at play: The psychology of video games*. New York: Basic Books.
- Losier, G. F., Bourque, P. E., & Vallerand, R. J. (1993). A motivational model of leisure participation in the elderly. *The Journal of Psychology, 127*, 153-170.
- Lovibond, P. F. & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*, 335-343
- Marks, I. (1990). Behavioural (non-chemical) addictions [Editorial]. *British Journal of Addiction, 85*, 1389-1394.

- Macgregor, D. M. (2000). Nintendonitis? A case report of repetitive strain injury in a child as a result of playing computer games. *Scottish Medical Journal*, 45, 150.
- Marshall, S. J., Biddle, S. J. H., Gorely, T., Cameron, N., & Murdey, I. (2004). Relationships between media use, body fatness and physical activity in children and youth: a meta analysis. *International Journal of Obesity*, 28, 1238-1246.
- Mastin, D. F., Bryson, J., & Corwyn, R. (2006). Assessment of sleep using the Sleep Hygiene Index. *Journal of Behavioral Medicine*, 29, 223-227.
- McClure, R. F., & Mears, F. G. (1984). Video game players: Personality characteristics and demographic variables. *Psychological Reports*, 55, 271-276.
- McIlwraith, R., 1990. Theories of television addiction. *Paper presented at the American Psychological Association*. Boston, MA .
- McMillen, J., & Grabosky, P. (1998). *Trends and Issues in Crime and Criminal Justice. No.88: Internet Gambling*. Canberra, ACT: Australian Institute of Criminology.
- Moody, E. J. (2001). Internet use and its relationship to loneliness. *CyberPsychology & Behavior*, 4, 393-401.
- Morlock, H., Yando, T., & Nigolean, K. (1985). Motivation of video game players. *Psychological Reports*, 57, 247-250.
- Muthén, L. K., & Muthén, B. O. (1998). *Mplus: The comprehensive modeling program for applied research - User's guide*. Los Angeles, CA.: Muthén and Muthén.

- Myers, D. (1990). Chris Crawford and computer game aesthetics. *Journal of Popular Culture*, 24, 17-32.
- Ng, B. D., & Wiemer-Hastings, P. (2005). Addiction to the Internet and Online Gaming. *CyberPsychology & Behavior*, 8, 110-113.
- Orford, J. (1992). *Community Psychology: Theory and Practice*. New York: John Wiley & Sons.
- Orford, J. (2001). Addiction as excessive appetite. *Addiction*, 96, 15-31.
- Parke, J., & Griffiths, M. D. (2002). Slot machine gamblers: Why are they so hard to study? *Journal of Gambling Issues*, 6. Retrieved August 31, 2007, from <http://www.camh.net/egambling/issue6/opinion/index.html>.
- Parke, J., & Griffiths, M. D. (2006). The psychology of the fruit machine: The role of structural characteristics (revisited). *International Journal of Mental Health and Addiction*, 4, 151-179.
- Parke, J., & Griffiths, M. D. (2007). The role of structural characteristics in gambling. In D. Smith, D. Hodgins & R. Williams (Eds.), *Research and measurement issues in gambling studies* (pp. 211-243). New York: Elsevier.
- Petry, N. M. (2006). Internet gambling: An emerging concern in family practice medicine? *Family Practice*, 23, 421-426.
- Phillips, C. A., Rolls, S., Rouse, A., & Griffiths, M. D. (1995). Home video game playing in schoolchildren: A study of incidence and patterns of play. *Journal of Adolescence*, 18, 687-691.
- Postman, N. (1986). *Amusing Ourselves to Death*. New York: Penguin Books.
- Postman, N. (1993). *Technopoly: The Surrender of Culture to Technology*. New York: Vintage.

- Poulin, C. (2000). Problem gambling among adolescent students in the Atlantic provinces of Canada *Journal of Gambling Studies*, 16, 53-78.
- Ramos, E. M. A., James, C. A., & Bear-Lehman, J. (2005). Children's computer usage: Are they at risk of developing repetitive strain injury? *Work: A Journal of Prevention, Assessment and Rehabilitation*, 25, 143-154.
- Rappaport, J. (1977). *Community psychology: Values, research and action*. New York: Holt, Rinehart and Winston.
- Rappaport, J. (1987). Terms of empowerment/exemplars of prevention: toward a theory for community psychology. *American Journal of Community Psychology*, 15, 121-148.
- Rubin, J. & Brockner, J. (1975). Factors affecting entrapment in waiting situations: The Rosencrantz and Guildenstern effect. *Journal of Personality and Social Psychology*, 31, 1054-1063.
- Rich, M. (2007). Pulling the plug on entertainment industry ratings: In reply. *Pediatrics*, 119, 1261.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25, 54-67.
- Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion*, 30, 347-363.
- Salguero, R. A. T., & Moran, R. M. B. (2002). Measuring problem video game playing in adolescents. *Addiction*, 97, 1601-1606.

- Salen, K., & Zimmerman, E. (2004). *Rules of Play: Game Design Fundamentals*. Cambridge: The MIT Press.
- Salmon, J., Bauman, A., Crawford, D., Timpero, A., & Owen, N. (2000). The association between television viewing and overweight among Australian adults participating in varying levels of leisure-time physical activity. *International Journal of Obesity, 24*, 600-606.
- Sanson-Fisher, R. W., & Perkins, J. J. (1998). Adaptation and validation of the SF-36 Health Survey for Use in Australia. *Journal of Clinical Epidemiology, 51*, 961-967.
- Selnow, G. W. (1984). Playing videogames: The electronic friend. *Journal of Communication, 34*, 148-156.
- Sevigny, S., Cloutier, M., Pelletier, M., & Ladouceur, R. (2005). Internet gambling: Misleading payout rates during the "demo" period *Computers in Human Behaviour, 21*, 153-158.
- Shaffer, H. J. (1996). Understanding the means and objects of addiction: Technology, the Internet, and gambling. *Journal of Gambling Studies, 12*, 461-469.
- Shaffer, H. J., & Hall, M. N. (1996). Estimating the prevalence of adolescent gambling disorders: A quantitative synthesis and guide toward standard gambling nomenclature. *Journal of Gambling Studies, 12*, 193-214.
- Shaffer, H. J., Hall, M. N., & Vander Bilt, J. (2000). "Computer Addiction": A critical consideration. *American Journal of Orthopsychiatry, 70*, 162-168.
- Sharpe, L. & Tarrier, T. (1993). Towards a cognitive-behavioural theory of problem gambling. *The British Journal of Psychiatry, 162*, 407-412.

- Shirlow, M. J., & Mathers, C. D. (1995). A study of caffeine consumption and symptoms: Indigestion, palpitations, tremor, headache and insomnia. *International Journal of Epidemiology*, *14*, 239-248.
- Shotton, M. A. (1989). *Computer Addiction? A study of computer dependency*. New York: Taylor & Francis.
- Smeaton, M., & Griffiths, M. D. (2004). Internet gambling and social responsibility: An exploratory study. *CyberPsychology & Behavior*, *7*, 49-57.
- Solomon, R.L. & Corbit, J.D. (1973). An Opponent-Process Theory of Motivation: II. Cigarette Addiction. *Journal of Abnormal Psychology*, *81*, 158-171.
- Subrahmanyam, K., Greenfield, P., Kraut, R., & Gross, E. (2001). The impact of computer use on children's and adolescents' development. *Applied Developmental Psychology*, *22*, 7-30.
- Suler, J. R. (2004a). Computer and cyberspace "addiction". *International Journal of Applied Psychoanalytic Studies*, *1*, 359-362.
- Suler, J. R. (2004b). The Online Disinhibition Effect. *CyberPsychology & Behavior*, *7*, 321-326.
- Tazawa, Y., & Okada, K. (2001). Physical signs associated with excessive television-game playing and sleep deprivation. *Pediatrics International*, *43*, 647-650.
- Thompson, K. M., Tepichin, K., & Haninger, K. (2006). Content and ratings of mature-rated video games. *Archives of Pediatrics & Adolescent Medicine*, *160*, 402-410.

- Tiffany, S. T. (1990). A cognitive model of drug urges and drug-use behaviour: Role of automatic and non-automatic processes. *Psychological Review*, 97, 147-168.
- Tremblay, M. S., & Willms, J. D. (2003). Is the Canadian childhood obesity epidemic related to physical inactivity? *International Journal of Obesity*, 27, 1100-1105.
- Turkle, S. (1997). *Life on the screen: Identity in the age of the Internet*. New York: Simon & Schuster.
- Vaillant, G. (1982). On defining alcoholism. *British Journal of Addiction*, 77, 143-144.
- Valentine, G., & Holloway, S. L. (2002). Cyberkids? Exploring children's identities and social networks in on-line and off-line worlds. *Annals of the Association of American Geographers*, 92, 302-319.
- Vallerand, R. J., Blais, M. R., Briere, N. M., & Pelletier, L. G. (1989). On the construction and validation of the Academic Motivation (AMS). *Canadian Journal of Behavioural Science*, 21, 323-349.
- VanDeventer, S. S. (2002). Expert behavior in children's video game play. *Simulation & Gaming*, 33, 28-48.
- Vandewater, E. A., Shim, M., & Caplovitz, A. G. (2004). Linking obesity and activity level with children's television and video game use. *Journal of Adolescence*, 27, 71-85.
- Vorderer, P., Hartmann, T., & Klimmt, C. (2003). *Explaining the enjoyment of playing video games: the role of competition*. Paper presented at the Second international conference on Entertainment computing, Pittsburgh, PA.



- Wake, M., Hesketh, K., & Waters, E. (2003). Television, computer use and body mass index in Australian primary school children. *Journal of Paediatrics and Child Health, 39*, 130-134.
- Walker, M. B. (1989). Some problems with the concept of 'gambling addiction': Should theories of addiction be generalised to include excessive gambling? *Journal of Gambling Behavior, 5*, 179-200.
- Warden, N. L., Phillips, J. G., & Ogloff, J. R. F. (2004). Internet Addiction. *Psychiatry, Psychology and Law, 11*, 280-295.
- Ware, J. E. (2000). SF-36 health survey update. *SPINE, 25*, 3130-3139.
- Watson, E. K., Firman, D. W., Baade, P. D., & Ring, I. (1996). Telephone administration of the SF-36 health survey: validation studies and population norms for adults in Queensland. *Australian and New Zealand Journal of Public Health, 20*, 359-363.
- West, R. (2006). *Theory of Addiction*. Oxford: Blackwell Publishing.
- Wild, T. C., Cunningham, J. A., & Ryan, R. M. (2006). Social pressure, coercion, and client engagement at treatment entry: A self-determination theory perspective *Addictive Behaviors, 31*, 1858-1872.
- Williams, K. D., Cheung, C. K. T., & Choi, W. (2000). Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality and Social Psychology, 79*, 748-762.
- Williams, K. D., Govan, C. L., Croker, V., Tynana, D., Cruickshank, M., & Lam, A. (2002). Investigations into differences between social- and cyberostracism. *Group Dynamics: Theory, Research, and Practice, 6*, 65-77.

- Wood, R. T. A. (2007). Problems with the concept of video game "addiction": Some case study examples. *International Journal of Mental Health and Addiction*, *Published online 23 October 2007*.
- Wood, R. T. A., & Griffiths, M. D. (2002). Adolescent perceptions of the National Lottery and scratchcards: A qualitative study using group interviews. *Journal of Adolescence*, *25*, 655-668.
- Wood, R.T.A. & Griffiths, M.D. (2004). Adolescent lottery and scratchcard players: Do their attitudes influence their gambling behaviour? *Journal of Adolescence*, *27*, 467-475.
- Wood, R. T. A., & Griffiths, M. D. (2007). Time loss whilst playing video games: Is there a relationship to addictive behaviours? *International Journal of Mental Health and Addiction*, *5*, 141-149.
- Wood, R. T. A., Griffiths, M. D., & Eatough, V. (2004). Online data collection from video game players: Methodological issues. *CyberPsychology & Behavior*, *7*, 511.
- Wood, R. T. A., Griffiths, M. D., & Parke, A. (2007). Experiences of time loss among videogame players: An empirical study. *CyberPsychology & Behavior*, *10*, 38-44.
- Wood, R. T. A., Griffiths, M. D., & Eatough, V. (2004). Online data collection from video game players: Methodological issues. *CyberPsychology & Behavior*, *7*, 511.
- Wood, R. T. A., Griffiths, M. D., Chappell, D., & Davies, M. N. O. (2004). The structural characteristics of video games: A psycho-structural analysis. *CyberPsychology & Behavior*, *7*, 1-10.

- Wood, R. T. A., Gupta, R., Derevenksy, J., & Griffiths, M. D. (2004). Video game playing and gambling in adolescents: Common risk factors. *Journal of Child and Adolescent Substance Abuse, 14*, 77-100.
- Yang, C.-K. (2001). Sociopsychiatric characteristics of adolescents who use computers to excess. *Acta Psychiatrica Scandinavica, 104*, 217-222.
- Yee, N. (2005). The psychology of massively multi-user online role-playing games. In R. Schroeder & A. Axelsson (Eds.), *Avatars at work and play: Collaboration and interaction in shared virtual environments*. London: Springer-Verlag.
- Yee, N. (2006a). Motivations for play in online games. *CyberPsychology & Behavior, 9*, 772-775.
- Yee, N. (2006b). The demographics, motivations and derived experiences of users of Massively Multi-User Online Graphical Environments. *PRESENCE: Teleoperators and Virtual Environments, 15*, 309-329.
- Yee, N. (2006c). The labor of fun: How video games have blurred the boundaries of work and play. *Games and Culture, 1*, 68-71.
- Yeoman, T., & Griffiths, M. D. (1996). Adolescent machine gambling and crime. *Journal of Adolescence, 19*, 183-188.
- Young, K. S. (1998). *Caught in the net*. New York: John Wiley & Sons.
- Young, K. S., & Rogers, R. C. (1998). The relationship between depression and Internet Addiction. *CyberPsychology & Behavior, 1*, 25-28.

## APPENDICES

### Appendix 1. Paper 5: Interview questions

1. What are your favourite aspects of video games?
2. What are your least favourite aspects of video games?
3. When not playing video games, what thoughts about video games most often enter your mind? What do you daydream about specifically?
4. When playing a video game, what features of the game keep you playing longer than you expected? What makes it hard to get off the game?
5. What features of games make you turn them off or no longer want to continue playing?
6. Do you ever find it hard to stop playing a video game once you've started?
7. Have you ever had the experience of playing a video game and not really enjoyed playing, but continued playing anyway? What made you keep playing?
8. When do you feel like you have played a video game for "long enough"?
9. When does a video game make you feel content that you've played for "long enough"?
10. Have you ever wanted to stop playing a video game, but couldn't because you were playing with friends, either with online friends or with friends in the same room?
11. Do you ever think about specific video game characters when not playing? What do you like or dislike about them?
12. Do you ever think about the storylines in video games? What do you like or dislike about them?
13. Do you ever think about specific items, achievements or rewards in games? What do you like or dislike about them?

## Appendix 2. Paper 6: The Problem Video Game Playing Test (PVGT)

( 1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Frequently, 5 = Always)

1. Do you choose to spend more time playing video games over going out with others? 1 2 3 4 5
2. Do you snap, yell, or act annoyed if someone interrupts you while playing videogames? 1 2 3 4 5
3. Do you fear that life without video games would be boring, empty and joyless? 1 2 3 4 5
4. Do you feel preoccupied with videogames when not playing? 1 2 3 4 5
5. Do you block unwanted thoughts about your life with thoughts about videogames? 1 2 3 4 5
6. Do you neglect household chores to spend more time playing video games? 1 2 3 4 5
7. Do you lose sleep due to late night video game playing? 1 2 3 4 5
8. Do you feel depressed, moody, or nervous when you are not playing video games, which goes away when you are back playing video games? 1 2 3 4 5
9. Do you often find that you stay playing video games longer than you intended? 1 2 3 4 5
10. Do you try to hide how long you've played video games? 1 2 3 4 5
11. Does your work suffer (i.e. homework or job-related) because of the amount of time spent playing video games? 1 2 3 4 5
12. Does your job performance or productivity suffer because of video games? 1 2 3 4 5
13. Do you become defensive or secretive when someone asks you about how much you play video games? 1 2 3 4 5
14. Do you find yourself anticipating when you can play video games again? 1 2 3 4 5
15. Do you play video games before something else you need to do? 1 2 3 4 5
16. Do you try to cut down the amount of time you spend playing video games and fail? 1 2 3 4 5
17. Do others in your life complain to you about your video game playing? 1 2 3 4 5
18. Do you find yourself saying "just a few more minutes" when playing video games, and ignoring this reminder to stop? 1 2 3 4 5
19. Do you avoid spending time with a partner or non-video game playing friends to play video games? 1 2 3 4 5
20. Do you play video games as means of changing your mood, either to relax tension or to feel more excited? 1 2 3 4 5

Appendix 3 Paper 6: Video Game Play Survey

Please record the pattern of play that BEST DESCRIBES the amount of time you play video games (i.e. in the last 3 months)

	Never	Days per Week (write # of hours in each box)						
		Mon	Tue	Wed	Thu	Fri	Sat	Sun
Console games (eg. Xbox, Playstation, etc)								
PC games								
Hand-held games (e.g., PSP. Gameboy, etc)								
Mobile phone games								
Arcade games								

How many hours per week do you play video games? .....hours

How often do you take breaks when you play? Every.....minutes / I don't take breaks

Please select the basic video game genres you most commonly play:

- |                     |                          |                      |                          |
|---------------------|--------------------------|----------------------|--------------------------|
| Action Adventure    | <input type="checkbox"/> | First Person Shooter | <input type="checkbox"/> |
| Tactical Shooter    | <input type="checkbox"/> | Role-Playing         | <input type="checkbox"/> |
| MMORPG              | <input type="checkbox"/> | Real-time Strategy   | <input type="checkbox"/> |
| Turn-based Strategy | <input type="checkbox"/> | Racing               | <input type="checkbox"/> |
| Sports games        | <input type="checkbox"/> | Platformers          | <input type="checkbox"/> |
| Simulation          | <input type="checkbox"/> | Puzzle               | <input type="checkbox"/> |

How many different video games are you concurrently playing? ..... games

How long have you been playing video games for? ..... years

## Appendix 4 Paper 7: Video Game Playing Motivation Scale (VGMS)

NOT AT ALL	SOMEWHAT	EXACTLY
1	2	3
4	5	6
7		

What motivates you to play your favourite video games?

- |   |               |
|---|---------------|
| 1. Because it is exciting to do well in the game.   | 1 2 3 4 5 6 7 |
| 2. Because it makes me feel important.  | 1 2 3 4 5 6 7 |
| 3. For the feeling of efficacy that I get when I play my favourite game.                                    | 1 2 3 4 5 6 7 |
| 4. Because, for me, it is the best way to relax completely.   | 1 2 3 4 5 6 7 |
| 5. I play for points or rewards, but sometimes I ask myself if I should continue to play my favourite game. | 1 2 3 4 5 6 7 |
| 6. Because playing the game allows me to test my capacity to control myself.                                | 1 2 3 4 5 6 7 |
| 7. I play for points or rewards, but sometimes I ask myself what I get out of it.                           | 1 2 3 4 5 6 7 |
| 8. To get rich or powerful in the game.   | 1 2 3 4 5 6 7 |
| 9. To show others that I am a dynamic person.   | 1 2 3 4 5 6 7 |
| 10. For the pleasure I get at improving my knowledge of the game.   | 1 2 3 4 5 6 7 |
| 11. To obtain all the rewards associated with completing the game.  | 1 2 3 4 5 6 7 |
| 12. Because it allows me to enjoy myself.   | 1 2 3 4 5 6 7 |
| 13. Because it is the best way I know of to eliminate tension.  | 1 2 3 4 5 6 7 |
| 14. For the strong sensations I feel when I play my favourite game.   | 1 2 3 4 5 6 7 |
| 15. For the satisfaction of learning new ways of playing my favourite game.                                 | 1 2 3 4 5 6 7 |
| 16. To be envied by other players.  | 1 2 3 4 5 6 7 |
| 17. Because it is the hobby I have chosen to clear my mind.   | 1 2 3 4 5 6 7 |
| 18. For the pleasure of knowing my abilities at this game.  | 1 2 3 4 5 6 7 |
| 19. For the satisfaction I feel when I can control the game.  | 1 2 3 4 5 6 7 |
| 20. For the curiosity of knowing what can happen in the game.   | 1 2 3 4 5 6 7 |
| 21. I play for points or rewards but sometimes I feel I am not getting a lot out of it.                     | 1 2 3 4 5 6 7 |
| 22. To earn lots of rewards quickly and easily.   | 1 2 3 4 5 6 7 |
| 23. Because it's the best way I know of to meet my friends.   | 1 2 3 4 5 6 7 |
| 24. For the feeling of control it gives me.   | 1 2 3 4 5 6 7 |
| 25. I play for the rewards but I sometimes ask myself if it is good for me.                                 | 1 2 3 4 5 6 7 |
| 26. Because when I win, I feel like someone important.  | 1 2 3 4 5 6 7 |
| 27. To get a really high score.   | 1 2 3 4 5 6 7 |
| 28. For the thrill or excitement it gives me.   | 1 2 3 4 5 6 7 |

## **PAPER REPRINTS**



King, D., Delfabbro, P. and Griffiths, M. (2009) Video Game Structural Characteristics: A New Psychological Taxonomy.  
*International Journal of Mental Health and Addiction*, v. 8 (1), pp. 90-106, Jan 2009

NOTE: This publication is included in the print copy of the thesis held in the University of Adelaide Library.

It is also available online to authorised users at:

<http://dx.doi.org/10.1007/s11469-009-9206-4>

King, D., Delfabbro, P. and Griffiths, M. (2009) The Psychological Study of Video Game Players: Methodological Challenges and Practical Advice.  
*International Journal of Mental Health and Addiction*, v. 7 (4), pp. 555-562, October 2009

NOTE: This publication is included in the print copy of the thesis held in the University of Adelaide Library.

It is also available online to authorised users at:

<http://dx.doi.org/10.1007/s11469-009-9198-0>

King, D.L. and Delfabbro, P.H. (2009) Understanding and Assisting Excessive Players of Video Games: A Community Psychology Perspective.  
*Australian Community Psychologist*, v. 21 (1), pp. 62-74, June 2009

NOTE: This publication is included in the print copy of the thesis held in the University of Adelaide Library.

King, D.L., Delfabbro, P.H. and Zajac, I.T. (2011) Preliminary Validation of a New Clinical Tool for Identifying Problem Video Game Playing.  
*International Journal of Mental Health and Addiction*, v. 9 (1), pp. 72-87, February 2011

NOTE: This publication is included in the print copy of the thesis held in the University of Adelaide Library.

It is also available online to authorised users at:

<http://dx.doi.org/10.1007/s11469-009-9254-9>

King, D. and Delfabbro, P. (2009) The General Health Status of Heavy Video Game Players: Comparisons with Australian Normative Data.  
*Journal of CyberTherapy and Rehabilitation*, v. 2 (1), pp. 17-26, Spring 2009

NOTE: This publication is included in the print copy of the thesis held in the University of Adelaide Library.

King, D. and Delfabbro, P. (2009) Motivational Differences in Problem Video Game Play.

*Journal of CyberTherapy and Rehabilitation*, v. 2 (2), pp. 139-149, Summer 2009

NOTE: This publication is included in the print copy of the thesis held in the University of Adelaide Library.