The Psychology of Massively Multiplayer Online Role-Playing Games (MMORPGs)

Amy Vowles

A Thesis submitted to
The University of Birmingham
for the degree of
Clinical Psychology Doctorate

College of Life & Environmental Sciences
The University of Birmingham
June 2012

THESIS OVERVIEW

This thesis consists of two volumes. Volume I is comprised of the research element while volume II is a compilation of Clinical Practice Reports.

The focus of Volume I is Massively Multiplayer Online Role Playing Games (MMORPG) which are a distinct genre of computer game played online. As these games have become more and more popular throughout the world, concerns about the impact of these games has arisen. Both the media and the research literature have highlighted some of the problematic outcomes associated with this type of game and the concept of 'online game addiction' has been discussed. The evidence base in this area however is small and often inconsistent.

The first chapter of Volume I is a systematic literature review which aims to consider the possible factors that may be implicated in the development of problematic use of MMORPGs. This is for the purpose of identifying those most at risk and thus offering some guidance as to preventing and intervening with problematic or 'addictive' gaming. The second chapter describes an empirical study into the effects of MMORPGs on psychological wellbeing. There is conflicting evidence in the literature regarding the effect of games on wellbeing with some evidence of benefits and some of negative effects. This research considers if the players motivations for play or the level of problematic use mediates the relationship between MMORPG play and psychological wellbeing. A further document is also provided in this volume which offers a summary of the research which is suitable for public dissemination.

Volume II is made up of four full length clinical practice reports. Each clinical practice report was written to coincide with a specific placement and a variety of methods are employed. The first report is a case formulation from two separate models. Here, a Cognitive

Behavioural Model and a Psychodynamic model are considered and compared. A service evaluation report is also presented which considers the appropriateness and accessibility of a mental health promotion leaflet for adult service users of a community learning disability team. A single case-experimental design is also included which describes the case of an older adult gentleman with dementia and learning disability who was admitted to an acute hospital and seen by the Psychiatric Liaison team due to a referral for support with challenging behaviour. The report details a behavioural intervention and evaluates the efficacy of the intervention through baseline and outcome data. Finally, a detailed case study is provided which describes the process of assessment, formulation, intervention and evaluation of a female service user of an adult community mental health team, with a history of sexual abuse. The report describes these processes from a Cognitive Behavioural and Schema Model. In addition, an abstract is provided of a fifth clinical practice report which was presented orally. The presentation was a further case study detailing a parent-infant psychotherapy intervention with a seventeen year old father and his eight week old daughter who were referred to a specialist early attachment service due to identified risks to the attachment relationship. Identifiable information has been removed from each of these clinical practice reports in order to protect the confidentiality of the services and service users.

This thesis is lovingly dedicated my wonderful family for all of the love and support they have given on this long journey.

To my parents especially, for teaching me to love to learn and to believe in myself from the very first moment.

And to my wonderful fiancé for all of the inspiration and encouragement every step of the way.

The author would like to acknowledge and give thanks for the support and guidance of the entire Course Team, in particular Dr Gerry Riley for his continued advice and encouragement in the role of Appraisal Tutor. Also to Professor Alexandre Copello, without whom the research would not have been possible. And to each and every Clinical Supervisor who has supported her development on placement throughout this training.

Finally, many thanks are expressed to the research participants for their time, honesty and well wishes.

CONTENTS

List of Tables

List of Figures

Volume II - Clinical Practice Reports

List of Tables

List of Figures

CPR4

The Psychological Risk Factors for Problematic Use of Massively Multiplayer Online Role-Playing Games (MMORPGs)

Word Count: 6824

ABSTRACT

This paper reviews the literature on the psychological predictors of the problematic use of Massively Multiplayer Online Role Playing Games (MMORPGs). Nineteen studies were included in the review and results are discussed in terms of seven broad areas; Play time, Demographic differences, Psychological wellbeing and mental health, Personality, Cognitive factors, Physiological factors and Gamer experience and motivations.

As a new area of research, the literature at present shows some limitations and inconsistencies across studies. Often factors have been considered in only one published paper, or findings are variable. The most consistent evidence suggests that increased play time is a significant risk factor for problematic use, along with mental health problems and poor psychological wellbeing. The strongest and most consistent predictor of problematic use identified so far appears to be the immersive use of MMORPGs in escaping from real life.

Further research should replicate these results and continue to investigate alternative possible risk factors. Longitudinal studies are imperative to differentiate confidently between risk factors and outcomes of problematic gaming, and group comparison studies should include problematic gamers, non-problematic gamers and a non-gaming control group to establish factors associated with problematic gaming specifically as oppose to gaming in general. Studies should consider the impact of age and location of the target population so that results are generalisable to the MMORPG population as a whole.

Implication for prevention and intervention of problematic gaming are discussed along with the implications of research in this area on the gaming industry.

INTRODUCTION

The problematic use of online games, where games are played to such an extent as they interfere with other aspects of the player's life, has recently received increasing interest in the research literature. Small but significant numbers of players have been found to be displaying signs of problems (Charlton & Danforth, 2007; Gentile et al, 2011; Griffiths, 2010; Grüsser, Thalemann, & Griffiths, 2007; Ko et al., 2009; Lemmens, Valkenburg, & Peter, 2009; Smahel, Blinka, & Ledabyl, 2009; Yee, 2006). A glossary of specific gaming terms used in this paper is provided in Appendix 2 for further information.

The term 'Online Game Addiction' has been used and studies have identified similar features to those found in Substance Addiction, Gambling Addiction, Internet Addiction and Exercise Addiction, where characteristics include tolerance, withdrawal, craving, mood modification, salience/preoccupation and conflict (Chappell, Eatough, Davies, & Griffiths, 2006; Grüsser, et al, 2007; Kuss & Griffiths, 2012). According to a study of 30,000 online game players, 50% considered themselves 'addicted', 15% become angry and irritable when prevented from playing, 30% continued to play despite frustration or lack of enjoyment and 18% reported academic, health, financial or relationship problems because of game play (Yee, 2006).

Although it is widely accepted that gaming can become problematic, there is current debate as to whether this is an 'addiction' and constitutes a psychiatric disorder (Griffiths, 2010; Ng & Wiemer-Hastings, 2005; Petry, 2011; Widyanto & Griffiths, 2006). Currently there is no formal diagnosis for gaming addiction in either the Diagnostic and Statistical Manual of Mental Disorders (DSM) or International Classification of Diseases (ICD). A variety of terms such as 'excessive use', 'pathological use', 'problematic use', 'dependency'

and ‘obsession’ have been used, however this review applies the term 'problematic use' of online games as the most commonly used and inclusive phrase.

Studies have highlighted negative consequences of problematic use of online games in terms of association with mental health problems (depression, anxiety, poor self-esteem), physical health problems (health, sleep, diet and seizures), interpersonal problems (social functioning and contact, relationships) and academic/occupational problems (Chappell et al, 2006; Chiu, Lee, & Huang, 2004; Chuang, 2006; Liu & Peng, 2009; Lo, Wang, & Fang, 2005; Morgan & Cotton, 2003; Rau, Peng, & Yang, 2006; Smyth, 2007; Stetina, Kothgassner, Lehenbauer, & Kryspin-Exner, 2011; Williams, Yee & Caplan, 2008).

Given this, there are concerns about the number of hours players typically spend playing the game. Research suggests an average of 22 hours per week with 8-9% of players exceeding 40 hours per week (Yee, 2006). Griffiths, Davies and Chappell (2003) argued that 24% dedicated more than 40 hours per week.

Charlton & Danforth (2007) however, differentiate between 'addiction' and 'engagement', arguing that it is not time in game that is important. They argue that two players can play to the same extent but one is considered ‘addicted’ due to negative consequences and finding it difficult to resist the activity. The other is considered ‘engaged’ due to the lack of resulting problems. Thus, the differentiation is the presence or absence of negative consequences, and it is possible for players to play for extended periods without ‘addiction’. This differentiation may explain the mismatch in the literature that suggests that many players play for extended periods, however negative outcomes and problematic use only occur in small numbers of players (Davies, 2005; Liu, 2009; Liu & Peng, 2009; Smyth, 2007). Sublette and Mullan (2012) in a review of the literature also conclude that only 'addicted' players report significant negative consequences.

Therefore, it is important to identify and build a profile of those most at risk of problematic use of online games in order to prevent the development of problematic gaming and provide suggestions regarding treatment where problems occur. Identification and treatment effectiveness of online game addiction was though beyond the scope of this review.

A recent review has discussed the risk factors for the development of problematic use of online games (Kuss & Griffiths, 2012). However, problematic use is more prevalent, players play for longer and there is greater interference with real life in Massively Multiplayer Online-Role Playing Game (MMORPG) players than alternative game genres (Guinn, Bickham & Rich, 2011; Ng & Wiemer-Hastings 2005; Porter, Starcevic, Berle & Fenech, 2010; Smyth, 2007; Stetina et al, 2011). These effects may be a result of the specific design of MMORPGs which encourages a more intensive and immersive style of play.

In MMORPGs, players control their character within a virtual world, taking on a specific role and developing abilities and items (skills, clothing, weapons etc) to complete tasks. The roles often require the completion of repetitive, frequent tasks, requiring regular and consistent play. The online aspect means that many players can interact and work together to achieve goals and there is the opportunity for a vast virtual social life. Furthermore, MMORPGs have no end-point, unlike most types of game, and so there is always something new to achieve. These factors may result in more intensive play than alternative types of game, thus greater interference with other responsibilities, greater risk of negative consequences and therefore greater incidence of problematic use.

In light of this, it is argued that this type of game requires further, specific consideration. The aim of this review therefore was to examine the published research on the psychological risk factors for the development of problematic use of Massively Multiplayer Online-Role Playing Games (MMORPGs).

METHOD

Search strategy

The initial search was conducted via the OVID search engine, including PschINFO, Embase and Medline, and the Web of Knowledge (WoK) search engine. The first MMORPG, Neverwinter Nights, was developed in 1991 (Koster, 2000; MMOHut, 2012) therefore, the search included dates subsequent to this time. Specific search terms are presented in Appendix 3.

Figure 1 summarises the process undertaken. The 739 references initially identified were reviewed based on the title, abstract and reference. Duplicates and those not relevant to the review topic were excluded. The articles were then refined based on specific inclusion criteria outlined below.

I. The main theme of the article considers problematic use (other terms considered) of online games
II. The research is specific to Massively Multiplayer Online Role Playing Games (MMORPGs)
III. The article is primarily concerned with identifying factors implicated in the development of problematic use of MMORPGs
IV. The article is published in a journal and therefore has been peer reviewed
V. The article provides empirical data relevant to the topic
VI. The article is published in English language

Of the 15 studies excluded due to the research question not being specific to MMORPGs, five stated the types of games participants played including Browser Games, First Person Shooter Games (FPS) and Strategy Games, among others. The remaining 10

stated the inclusion of online game players but did not indicate the specific genre and thus could not be included.

Further keyword searches on the PubMed and Google Scholar search engines were conducted and the reference section of each of the included articles was examined for further relevant articles. No additional articles were identified from this process. Nineteen articles in total met the criteria and were retained for quality review. A summary of the included papers is presented in Table 2.

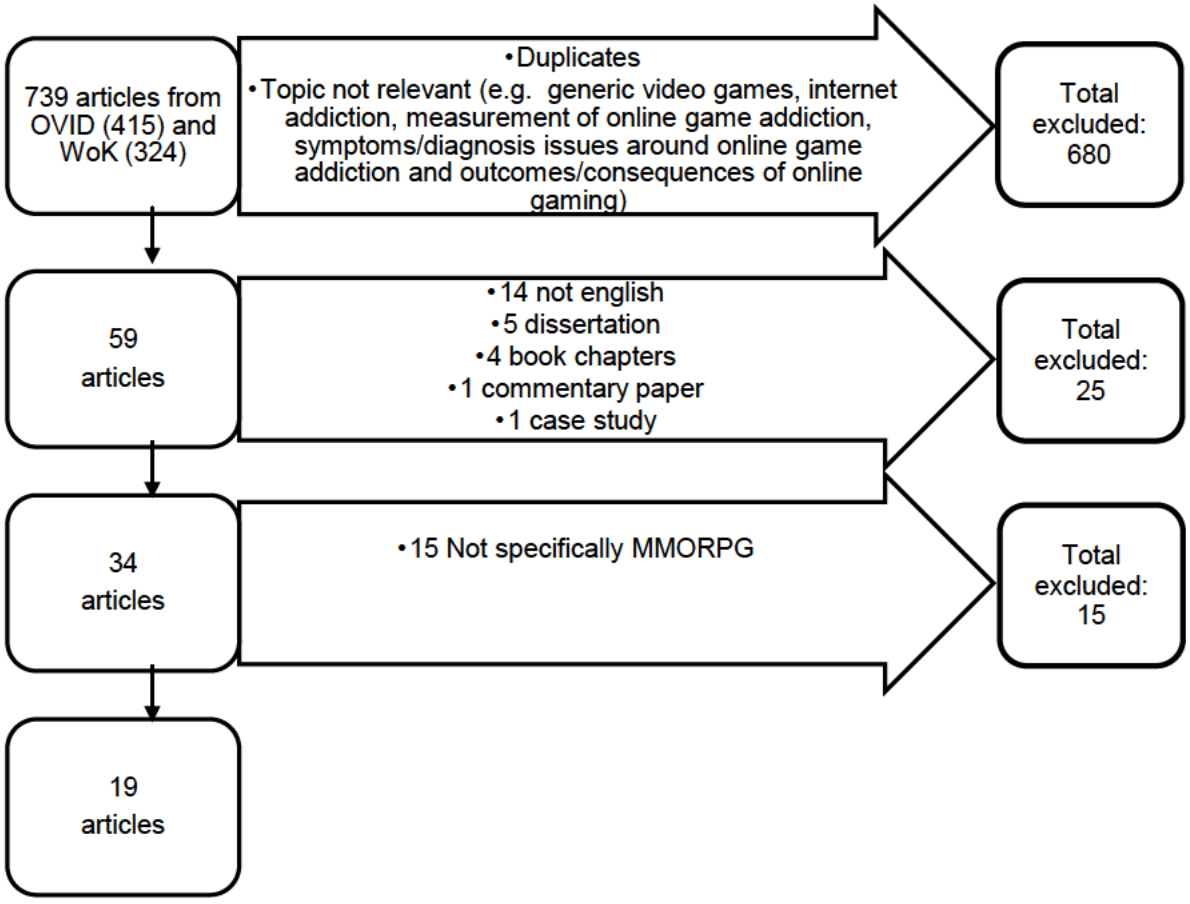

Figure 1: Illustration of the exclusion process

Quality review

Following the selection of papers, the quality of the evidence was determined through critical evaluation. Caldwell, Henshaw and Taylor (2005) conducted a review of

Table 1: Evaluation criteria to be met for inclusion

1.	The title reflects the content
2.	The abstract summarizes the key components
3.	The rational for the research is outlined and the literature review is comprehensive and up to date
4.	The aims of the research are clearly stated
5.	The methodology is clearly identified
6.	The sample is clearly described and reflective of the population
7.	The results are clearly presented
8.	The conclusions and discussion are appropriate and clear

existing evaluation tools for health research. The authors combined these to provide a systematic framework for the process of evaluation, which they claim to be robust in its use with a range of research methods.

Appendix 4 provides the flow chart framework used and additional questions considered at each stage. This framework does allow for evaluation of both qualitative and quantitative, however as all papers here were quantitative, only aspects relevant to quantitative reports are presented.

Eight main criteria were identified as crucial to be met for inclusion and are presented in Table 1. No articles were excluded from this review based on not meeting any of these criteria.

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
Achab, Nicolier, Mauny, Monnin, Trojak, Vandel, Sechter, Gorwood, Haffen (2011) France	Online discussion forums	French population 448 World of Warcraft Players Age >18, mean 26.6 83.5% male 27.5% DAS+ ("addicted") vs. DAS- ("not addicted")	Cross sectional, questionnaire Multivariate analysis using logistic regression model	Exploratory study comparing addicts vs. non addicts	• **DSM-IV-TR substance dependence adapted scale (DAS)** ○ Cut of 3 or more criteria	• DAS+ (addiction) associated with younger, less likely uni graduates, more time playing, feeling greater personal satisfaction, power or belonging to group, feeling more irritable or anxious, feeling sad, physical or psychological effects linked to gaming, confusing fiction with real life and going out less, seeing less friends, marital, family, work and financial difficulties
Billieux, Chanal, Khazaal, Rochat, Gay, Zullino, Van der Linden (2001) Switzerland	From 2 cybercafés	Geneva, Switzerland 59 MMORPG players Age 18-38, mean 24.43 All males Cybercafé population	Cross sectional, questionnaire Multiple regression analysis (Mallows Cp due to small sample in relation to no predictors)	To investigate psychological predictors of problematic involvement with MMORPG	• **French Internet addiction test (Khazaal et al 2009)** ○ 20 items assessing negative consequences ○ likert scoring ○ Max score 100, >50 suggests problematic play	• Urgency factor of impulsive behaviour scale and immersion motivation only significant predictors
Charlton & Danforth (2010) UK	Advertised through a gaming website	85% US and Canada, 9% Europe, 3.9% Australia & New Zealand, 1.5% other 388 Asheron's call players Mean age 29.27 86% male	Cross sectional, questionnaire Correlation and multiple regression	To validate the distinction between addiction and engagement and relationship to personality factors	• **Addiction/Engagement portions of Charlton's (2002) General computing questionnaire** ○ Engagement score and addiction score obtained ○ based on core and peripheral addiction criteria ○ likert responses	• Small effect size of lower extraversion and agreeableness with increased addiction • medium effect size of lower emotional stability and attractiveness and higher negative valance with increased addiction • 3 medium effect size predictors significant - 20% • only neg valance sig effect with

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
						engagement
Collins, Freeman, Chamarro-Premuzic (2012) UK	Social networking sites, uni website, newspapers, forums, posters in uni	225 Age 13-60, mean 26.55 57.3% male 65 MMORPG players (21 problematic 44 non problematic)	Cross sectional, questionnaire	To investigate presence of personality traits in relation to problematic and non-problematic MMORPG use	• **Problem video game playing scale (Salguoro & Moran 2002)** ○ 9 signs of problematic use ○ yes/no responses ○ >5 problematic	• Positive relationship between time in play and problem video-game play (pvp) and pvp and verbal aggression. • Negative relationship between pvp and impulsivity - i.e. impulsivity may be detrimental to development of addiction • Problematic group poorer self regulation, lower impulsivity and lower agreeableness - role of agreeableness suggests problems not due to low levels of social orientation in personality • No relationship with other personality traits so personality not predispose to addiction
Hsu, Wen, Wu (2009) Taiwan	MMORPG forums	418 MMORPG players Taiwanese college students, Age 18-25 73.4% male	Cross sectional, questionnaire Linear regression/multi-collinearity analysis	To understand addiction from a user experience design approach	• **MMORPG addiction rating scale (Cho & Ting, 2003)** ○ based on DSM and previous literature ○ 8 items, likert responses	• Significant predictors of addiction are curiosity, role-playing, belonging, obligation and reward - 65.1%

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
Hussain & Griffiths (2009) UK	Online game forums	119 MMORPG players Age 18-69, mean 28.5 73% USA, 8% UK, 3% Canada 7 dependant MMORPG players, 94 non-dependent (18 not classified) Excessive and not excessive based on time spent in week	Cross sectional, questionnaire ANOVA, t-test, Chi	To explore psychological and social effects of online gaming in relation to excessive and dependent gaming	• **Self constructed statements** ○ based on modified version of components of behavioural addiction (Griffiths 2005) - (from Exercise Addiction Inventory) ○ 6 items, likert responses ○ score 24/30 at risk of addiction	• Effect of time in play on addiction • Dependent gamers find online interaction more pleasurable and easier than offline interaction, may associate higher than normal value to games, more likely to use games as mood modifier and play for almost 2x longer than non-dependant
Kim, Namkoong, Ku, Kim (2008) South Korea	World of Warcraft online forums	1471 World of Warcraft players in Korea Mean age 21.3 82.7% males	Cross sectional, questionnaire One way ANOVA and correlations Stepwise multiple regression	To explore the relationship between online game addiction and aggression, self-control and narcissistic personality traits	• **Online game addiction scale (Whang 2002)** ○ adapted from young's (1999) proposed criteria for internet addiction ○ 20 items, likert response ○ score on continuum	• no gender difference • greater addiction in unemployed • narcissism and aggression positively related • self control negatively related • interpersonal relationship quality negatively related • severity of narcissism most useful predictor
Ko, Liu, Hsiao, Yen, Yang, Lin, Yen, Chen (2009) Taiwan	University advertising	20 Taiwanese students All males 10 World of Warcraft addiction, 10 controls (non heavy internet	FMRI study/Cue reactivity paradigm	To identify the neural substrates of online gaming addiction through evaluation of the brain areas associated with	• **Diagnosis by psychiatrist according to DCIA-C (Ko et al, in press)** ○ based on internet addiction screening	• 6 areas identified as neural substrates of cue induced gaming urge/craving in addiction

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
		use and no major game use)		cue induced gaming urge		
Lafreniere, Vallerand, Donahue & Lavigne (2009) Canada	Online game forums	222 MMORPG players Mean age 23.13 86% males	Cross sectional, questionnaire Canonical correlation	Explore the role of passion in problematic gaming	• **9 problematic behaviours associated with excessive gaming (Tejeiro & Moran, 2002)**	• Obsessive passion related to problematic gaming behaviours when controlling for age and gender • Harmonious passion unrelated to problem behaviours
Li, Liau & Khoo (2011) Singapore	2 Singapore secondary schools	161 adolescents - MMOG experience Age 13-15, mean 14.04 49.1% male	Cross sectional, questionnaire Path analysis	To test relationships between Actual-Ideal self discrepancy (AISD), depression, escapism and pathological gaming	• **Pathological game use measure** o based on DSM-IV-R for pathological gambling o 10 items o Yes/No/Sometimes responses	• Increased AISD and increased depression predicted escapism and escapism predicted pathological gaming • AISD and escapism direct effect on pathological gaming • Escapism best predictor of pathological gaming
Liu & Peng (2009) USA	Game forums, social networking sites and yahoo	288 active MMO game players Mean age 27 66.3% male	Cross sectional, questionnaire Multiple regression	To consider predictors of negative outcomes and identify if preference for virtual life (PVL) positively related to psychological dependency on games	• **Psychological dependency measure** o adapted withdrawal scale of Generalized Problematic Internet use scale (Caplan, 2002) o likert responses	• PVL is a significant predictor of psychological dependency on games • Weekly play time significant predictor of Psychological dependency • PVL predicted by social control skills, weekly play time & being Asian
Metcalf &	Flyers on	59 : 40 MMORPG	Cross sectional,	To investigate the	• **Addiction-Engagement**	• Attentional bias for game related and

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
Pammer (2011) Australia	university campus and in local gaming related venues	players 62.5% male 19 Non MMORPG players, 57.9% male Addicted MMORPG players (20) - mean age 21.25, Engaged MMORPG players (20) - mean age 21.9, Non-gamers (19) - mean age 22.53	questionnaires and stroop test 3x3 ANOVA	presence of attention bias in addicted online gamers and whether high engagement is a pre-requisite to addiction	**Questionnaire (Charlton, 2002)** o Engagement score and addiction score obtained o based on core and peripheral addiction criteria o likert responses	negative words in addicted gamers that does not exist for engaged gamers. • Stronger attentional bias at lower addiction levels • High engagement is not prerequisite of addiction
Orr, Ross, Orr (2012) Canada	Psychology students in university	33 World of Warcraft players Mean age 20.61 42.4% male Horde (13) vs. Alliance (15)	Cross sectional, questionnaire ANOVA	To investigate psychological trait and symptom differences of gamers who play in different factions	• **Problematic internet use questionnaire (PIUQ) (Demetrovics, Szeredi & Rozsa, 2008)** o assesses regularity of problem behaviours o 18 items, likert responses	• horde had significantly higher scores on problematic use • obsession subscale most salient
Pawlikowski & Brand (2011) Germany	Advertisements around university	38 students 19 Excessive World of Warcraft players, 19 non-gamers	Cross sectional, questionnaires and Game of Dice Task Correlation, t-test	To examine decision making competencies of excessive World of Warcraft Players	• **Modified WoW Internet Addiction Test (Widyanto & McMurran (2004)** o 20 items, likert responses o score >50 excessive	• Reduced decision making ability in excessive gamers - comparable with other forms of behavioural addiction, impulse control disorders and substance use • Excessive gamers more often choose risky options, for immediate reward despite long term disadvantages

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
Peters & Malesky (2008) USA	E-mail to identified guild leaders and advertisments on message boards	196 World of Warcraft players from top guilds Age 18-43, mean age 24.34	Cross sectional, questionnaire Correlation	To identify if a robust factor exists that is suggestive of internet gaming problematic use, and if related to personality factors	• **Problematic use/engagement questionnaire** o Adapted Addiction-Engagement Questionnaire (Charlton, 2002) o engagement and problematic use on continuum o 27 items, likert responses	• Greater amounts of time spent playing is related to more problems • Personality plays a contributing role in determining if an individual is high risk for developing problems i.e. more likely if high in neuroticism and less likely is high in agreeableness, extraversion and conscientiousness
Smahel, Blinka & Ledabyl (2008) Czech Republic	Online game forums, and in game server wide communication channels	548 MMORPG players Mean age 25 84.6% males Euro-American players mostly	Cross sectional, questionnaire Correlation	To determine tendency to addiction in terms of identifying with character	• **14 items on MMORPG addiction** o based on substance and internet addiction theory	• Players with high tendency to addiction more feel more pride and shame of character, identify more with character and are younger, but character not main factor causing addiction due to mid correlations
Snodgrass, Lacy, Dengah, Fagan (2011) USA	World of Warcraf forums and game websites, snowballing and personal contacts	255 World of Warcraft players Mean age 26.8 79.6% male	Cross sectional, questionnaire Linear regression and ethnography	To explore problematic wow play in relation to playing with offline friends	• **World of Warcraft addiction scale** o Adapted from young's (1999) proposed criteria for internet addiction	• immersion and problematic play reduce with number of offline friends played with • immersion strongly related to problematic play • immersion mediates role between who play with and problematic play • Gaming with real life friends reduces immersion which reduces risk of addiction
Wan & Chiou	Purposive	177 Taiwanese high	Longitudinal	To investigate the	• **Online game addiction**	• Flow state negatively correlated to

Table 2: Summary of included articles. NB Only information relevant to the review topic included here

Reference & Country of Origin	Recruitment	Sample	Design/Analysis	Aim	Measure/Assessment of Problematic Use	Results/Conclusions
(2006) Taiwan Study 1	sampling of high school and college students	school and college adolescents Age 16-24 MMORPG players	survey, Cross lagged panel analysis	relationship between flow state and online game addiction and is this stable over time	**scale for high school students in Taiwan (OAST)** ○ developed from Lin & Tsai (1999) ○ 29 items, likert scoring	addiction • Addiction group score lower on flow state than non addiction group • This relationship is stable over time • Neither significantly predict the other
Study 2	Purposive sampling of high school and college students	182 Taiwanese adolescents Age 16-22 Highly frequent MMORPG players	Cross sectional, questionnaire ANOVA	To examine whether addicts essence of needs is more like dissatisfactory factor and if non-addicts essence of needs is more similar to satisfactory factor	• **Online game addiction scale for high school students in Taiwan (OAST)** ○ developed from Lin & Tsai (1999) ○ 29 items, likert scoring	• Addicted players score greater on dissatisfaction than non-addicted players • Non addicted players score greater on satisfaction than addicted players • Compulsive use of online games comes from relief of dissatisfaction rather than pursuit of satisfaction, while non addicts play to seek greater satisfaction
Zanetta Dauriat, Zermatten, Billieux, Thorens, Bondolfi, Zullino, Khazaal (2011) Switzerland	French, English and Italian Game forums	696 MMORPG players Age 13-54, mean 25.83 93.1% males	Cross sectional, questionnaire Correlation and t-test, multiple linear regression	To assess links between motivations to play MMORPGs and addictive involvement	• **Addiction scale adapted from young's (1999) proposed criteria for internet addiction** ○ 8 items ○ likert scoring	• Addiction positively correlated with time spent playing • Achievement best predictor of addiction, followed by escaping, socialising and gender • Immersing and relaxing not significant

RESULTS

From the nineteen papers reviewed, findings were categorised into seven broad areas of risk factors for problematic use of Massively Multiplayer Online Role-Playing Games (MMORPGs). These included:

1. Play Time
2. Demographic Differences
3. Psychological Wellbeing and Mental Health
4. Personality
5. Cognitive Factors
6. Physiological Factors
7. Gamer Experience and Motivations

In each section, the main findings and the strength of these findings are discussed, followed by an overall discussion of the literature as a whole, conclusions and implications.

Play time

Concerns have been raised regarding the excessive amounts of time players dedicate to MMORPG play. Despite this, no papers presented a *primary aim* of considering the impact of play time on the development of problematic use. However, ten papers reported secondary results pertaining to this.

The most frequent measure of play time was number of hours spent playing the game per week. Using this definition, two papers conclude no significant correlation between play time and problematic use (Metcalf & Pammer, 2011; Pawlikowski & Brand, 2011).

Furthermore, Metcalf and Pammer (2011) compared players classified as 'addicted' and 'highly engaged' and found no significant difference between the two groups.

Alternatively, eight studies identified a significant effect. Six positive univariable correlations between hours played per week and problematic use were reported (Hsu, Wen & Wu, 2009; Zanetta Dauriat et al, 2011; Collins, Freeman & Chamarro-Premuzic, 2012; Smahel et al 2008; Peters & Malesky, 2008; Hussain & Griffiths, 2009) albeit each of these reported relatively small to moderate correlation coefficients (0.14 to 0.43) and thus effect sizes of 0.02 to 0.19. Liu & Peng (2009) found weekly play time to be a significant predictor of problematic use in a multiple regression model, while Achab et al (2011) found 'addicted' players to spend significantly more time on the internet or gaming than 'non-addicted players'. Both Peters and Malesky (2008) and Liu & Peng (2009) conclude that play time is relevant to the development of problematic use, but is not the most important or an adequate predictor.

Alternative measures of play time, including hours spent gaming per day and length of game playing session are also positively correlated to problematic use (Hsu et al, 2009; Hussain & Griffiths, 2009). No significant difference has been found between players described as 'addicted' and 'non addicted' in terms of length of time since starting to play (Achab et al, 2011; Metcalf and Pammer, 2011). Similarly, Pawlikowski and Brand (2011) found no significant correlation between problematic use and overall hours invested into the main character.

In summary, there are a greater proportion of studies that identify a significant relationship between play time and problematic use, where play time is measured by hours per week, hours per day or hours per session. Although this relationship is challenged by two studies, these two papers used small samples sizes of 59 and 38 and both used student

populations. The sample sizes of the eight studies concluding an effect of play time ranged from 119 to 5481 and the mean ages ranged from 24.34 years to 28.5 years. Only one study limited participation to students. Studies not limited to students are likely to be more generalisable to the MMORPG playing population as a whole given the typical demographic of MMORPG players holding an average age of 26 years and a range of 11 to 68 years old (Yee, 2006).

In light of these differences, it can be concluded that increased play time is associated with problematic use, although effect sizes are relatively small and this, at best, independently predicts 19% of the variance in problematic use. Therefore, it would be erroneous to conclude that this is the main predictive factor. Moreover conclusions are based on correlational design thus cannot establish cause and effect. It is equally as plausible to conclude that problematic use leads to elevated play time as to conclude that play time leads to problematic use. Furthermore, some measures of problematic use consider play time as a core criterion and thus this may confound findings.

Demographic differences

Given that play time is unlikely to be the dominant risk factor for problematic use of MMORPGs, it would be reasonable to expect that gaming does not affect everyone in the same way and that individual difference may play a part. Ten studies have considered the impact of demographic variables in the development of problematic use, although again this has not been a primary aim of any study.

Smahel et al (2008) identified lower levels of problematic use in adults compared to both adolescents and young adults. Three studies however identified no significant effect of

age (Achab et al, 2011; Metcalf & Pammer, 2011; Zanetta Dauriat et al, 2011). Achab (2011) though did identify that a younger age of starting gaming was associated with problematic use.

A significant effect of gender was identified in one study with males scoring higher on problematic use (Zanetta Dauriat et al, 2011), while three studies identified no effect (Achab et al, 2011; Hsu et al, 2009; Kim, Namkoong, Ku & Kim, 2008). Zanetta Dauriat et al (2011) however did acknowledge that gender was the smallest of the significant predicting variables that were identified in multiple regression analysis. Li, Liau and Khoo (2011) additionally found no gender difference in problematic use, but did acknowledge that males use MMORPGs to escape from reality significantly more than females. This is important in light of the effect of escapism on problematic use as discussed later in relation to gamer experiences.

Snodgrass, Lacy, Dengah II and Fagan (2011) furthermore identified through multiple regression analysis that being of US nationality was negatively related to problematic use, however the sample were 72.6% US nationality and no data was recorded as to alternative nationalities for comparison.

Snodgrass et al (2011) additionally identified that being in a committed relationship was negatively related to problematic use and unemployment was positively related. In additional studies, unemployed participants scored higher on problematic use than workers or students (Kim et al, 2008) and problematic players are less likely to be university graduates (Achab et al, 2011).

Despite the evidence of a relationship between demographic variables and problematic use, there is very little replicated or consistent evidence. Only the risk factor of

unemployment was replicated in two studies. For age and gender, more studies have identified no relationship (*n*=3 and *n*=3 respectively) than have identified a significant effect (*n*=1 and *n*=1 respectively).

Given the lack in robust evidence of an effect of any one particular demographic variable, no conclusions can be made from the published literature. More studies are required to consider these effects and the literature would benefit from an exploratory study with the primary aim of determining the effect of demographic variables on problematic use.

Psychological wellbeing and mental health

The psychological wellbeing of participants in relation to MMORPG play was considered in five studies. Achab et al (2011) identified that 'addicted' players rated themselves as more irritable, less calm and more sad than 'non addicted' players when asked "Since you started gaming, do you feel….(happier, more irritable, more anxious, less calm or more sad)". It was concluded that gamers claiming to be 'sadder' were twelve times more likely to be associated with the addiction group and that feeling happier and obtaining pleasure from MMORPGs is a protective factor. This finding was however based on this single item, rather than any standardized measure of psychological wellbeing.

Pawlikowski and Brand (2011) assessed psychological and psychiatric symptoms using the Symptom Checklist (SCL-90-R); a standardized and validated measure. The group defined as 'excessive' gamers scored significantly higher than non-gamers did on all of the subscales with the exception of depression (somatisation, obsessive compulsive, interpersonal sensitivity, anxiety, anger-hostility, phobic anxiety, paranoid ideation, psychotisism and

global severity index). Despite this, scores were not elevated enough to be considered clinically relevant and thus simply show a trend for increased syptomology.

Similarly, Liu & Peng (2009) considered the concept of a preference for virtual life over real life, which predicted problematic use of MMORPGs. They hypothesised that a preference for virtual life would be associated with depression and loneliness, however there was no significant relationship found. Thus again, depression was concluded to not be related to problematic use. There was no assessment in this study for a direct relationship between loneliness and depression and problematic use.

Li et al (2011) on the other hand found that depression, as measures by a self-report questionnaire, was positively correlated to problematic gaming, although this relationship was mediated by using the game as a method of escapism. They also considered the impact of Actual-Ideal Self Discrepancy (AISD), which they defined as the difference between the representation of the attributes someone actually possesses and the representation of the attributes they would like to possess. AISD was considered in this study as a facet of poor self-esteem, and was also positively correlated with problematic use. However again, this relationship was mediated by escapism. Therefore, in this study, neither depression nor self-esteem were found to have a direct relationship with problematic use.

Finally, Metcalf and Pammer (2011) compared 'addicted' gamers with 'highly engaged' gamers, and included a 'non gaming' control group, all matched for age and gender, and weekly play time and length of time playing MMORPGs in the two gaming groups. Depression, Anxiety, Stress Scale (DASS) scores were significantly higher in the 'addiction' group compared to the 'highly engaged' group, suggesting a relationship between 'addiction' and DASS. However, there was no difference between the 'addicted' group and the 'non-

gaming' control group. Thus, depression, anxiety and stress may be lower in 'highly engaged' players than in 'addicted' gamers and the general population. It is possible that low DASS may be protective from the development of problematic use, however this causality cannot be concluded from a cross sectional study.

Given the finding in Pawlikowski and Brand (2011) that 'excessive' MMORPG players do not score differently than non gamers in terms of depression specifically, it is a possibility that the Metcalf and Pammer (2011) findings are influenced by the depression questions of the DASS, and there is no difference between groups on depression but there may be in anxiety and stress. It is therefore important when considering the impact of psychological wellbeing on problematic gaming that different subcategories of wellbeing are considered separately as there may be differing effects.

It cannot be concluded as to whether these symptoms are a cause or an effect of problematic use without longitudinal research. Furthermore, given the findings of Metcalf and Pammer (2011), including problematic gamers, non-problematic gamers and non-gaming control groups would be valuable in future research.

In spite of limitations, it does appear that there is an association between psychological wellbeing and problematic use, with either symptomatology being related to greater levels of problematic use or positive psychological wellbeing acting as a protective factor. The role of depression has received more attention however it is more challenged.

Personality

Six studies in total discussed personality factors that may result in a vulnerability to problematic use of Massively Multiplayer Online Role-Playing Games (MMORPGs), although each considered a different array of personality factors with only some overlapping.

Three studies considered elements of the Big Five Personality traits; openness, conscientiousness, extraversion, agreeableness, and neuroticism. Charlton and Danforth (2010) and Peters and Malesky (2008) considered some of these factors and found comparable results. Problematic use of MMORPGs was correlated negatively with agreeableness, extraversion and conscientiousness and positively with neuroticism; although one study used the term emotional stability, which is the polar opposite and thus obtained a negative correlation. The effect sizes of these univariable correlations however ranged from 0.015 to 0.137, thus the factors independently explained very little of the variance (1% - 13%). Alternatively, Collins et al (2012) found only agreeableness to be significantly lower in the problematic group than the non-problematic group.

In comparing these studies, the former two focused on a specific game with both being of the fantasy genre, while the latter's sample was not restricted by choice of game. It cannot be ruled out that the effects of personality traits identified are specific to players of fantasy games and not found as an overall in MMORPG players.

In addition to these Big Five personality traits, three studies have considered personality in terms of alternative characteristics. Findings regarding impulsivity are mixed. Collins et al (2012) found a moderate negative correlation between problematic use and dysfunctional impulsivity (r=-0.31) and that impulsivity was significantly lower among problematic players than non-problematic players and non-players. However, the problematic

players were found to be lower in self-regulation. Similarly, Kim et al (2008) identified a negative relationship with self-control (r=0.33). It is possible that lower impulsivity in problematic players is related to an increased ability to concentrate and dedicate attention for extended periods, while poor self-control impairs the ability to regulate this prolonged activity. On the other hand, Billieux et al (2011) found no effect of impulsivity except in terms of urgency, meaning that problematic play is impulsive in the need to reduce negative affect, but not in playing despite boredom, not wanting to try new things and not thinking about consequences. This last result though is challenged by the presence of problems with decision making in problematic players as suggested in the later section on cognitive factors.

Collins et al (2012) additionally reported a significant correlation between play and aggression (r=0.27), although this was specific to verbal aggression, as opposed to physical aggression, anger or hostility. However, no difference was found between problematic players and non-problematic players so it is possible that this is a characteristic of MMORPG players in general, rather than specific to problematic players. Finally, Kim et al (2008) considered the relationship between problematic use of online games and 'narcissistic personality traits', finding a significant moderate correlation (r=0.36).

When considering the literature in terms of personality, few studies reported the same facets of personality, therefore the literature is not comparable. Despite this, the presence of exploratory studies in this area provides a good starting point for more comprehensive research. Two studies considering the Big Five obtained comparable results, although effect sizes evidenced were small. Thus, it is unlikely that any one personality characteristic independently predicts problematic use. Moreover, problematic MMORPG use is more likely associated with a particular personality profile. The Big Five characteristics discussed, along

with poor self-regulation and poor self-control appear to suggest that problematic users could be those that find face-to-face social interaction more difficult.

Achab et al (2011) supported this argument finding that problematic players lack other activities, go out less, see fewer friends and have more marital/family/work/financial difficulties than non-problematic players. Although this was a cross sectional study, and thus cause and effect cannot be established, the questions related to the problems since the onset of gaming, e.g. “Since you started gaming do you have less contact with friends” etc. Problems are therefore more likely to be outcomes of game use. However, this also suggests that problematic players are less likely to prioritise real life, which could be due some aspect of underlying personality. This however cannot be concluded without longitudinal research.

Collins et al (2012) argued against the role of poor socially orientated personalities given the finding that personality characteristics were not significant predictors. Therefore, this requires further clarification. Careful consideration though should be given to conclusions made by Collins et al (2012). Problematic use was measured rating yes or no to the occurrence of negative outcomes of MMORPG play, and no assessment was made of regularity or severity. Agreement with over half of the statements was considered representative of problematic use. It would be reasonable to expect that most players had experienced negative outcomes at some time and thus would answer 'yes', but that this was not a regular occurrence and their use was not overall problematic. Problematic use may therefore have been overestimated. This is supported by the categorisation of over half of the sample into the problematic group.

Cognitive factors

Two separate studies have reported research relating to the influence of cognitive ability on problematic use of MMORPGs. One paper considered the decision-making ability of players. Using the game of dice task, whereby decisions are made under risky conditions with the knowledge of probabilities of gains and losses, Pawlikowski and Brand (2011) concluded that 'excessive' gamers show poorer decision-making abilities compared to non-gamers and made riskier decisions. The groups were matched for IQ and thus the difference could not be explained by ability to calculate and predict the outcome. The authors conclude that excessive gaming may be precipitated by preference for attractive short-term gains and ignoring long-term risks, similar to that found in substance use and gambling addiction. It is important however to consider if players ignore the risks or are unaware, as the risks of problematic gaming may be less obvious than the risks of substance use or gambling. Furthermore, it is important to replicate this study with non-problematic gamers to differentiate if this is a facet of gaming or specifically a facet of problematic gaming, as this cannot be concluded from comparing problematic players with non-players. Similarly, the conclusions of this study are limited by the use of a student population and thus this difference may be present only in younger, less experienced players and cannot be generalised to MMORPG players as a whole.

Metcalf and Pammer (2011) considered attentional bias and used a stroop test, comparing gaming words versus negative words versus neutral words with three participant groups (problematic gamers, non-problematic gamers and none players). Longer reaction times for both gaming and negative words were identified in the problematic group that were not present in the other groups, suggesting a dual attention bias of problematic gamers. The

gaming groups were matched on age, gender, weekly hours in game and time since playing and so differences could not be accounted for by any of these factors. All of the words however were acknowledged to be related to fantasy style MMORPGs, while the population was not restricted to this. Thus, the attention bias may be underestimated, as effects on gamers of alternative genres may not have been so prominent due to possible lack in recognition or meaning of words.

Studies regarding the cognitive skills related to problematic use are a distinct gap in the literature. Both studies have found differences in cognitive ability, and both studies benefit from an experimental design rather than survey data. Although again there are issues of generalisability and causality, as it is not possible to randomly assign players to problematic and non-problematic groups. Neither can the studies be well controlled for confounding variables that may explain the differences between groups. Given only one study in each area, both are a basis for topics that require further consideration.

Cortical Processing

Only one study has considered physiological factors related to the problematic use of MMORPGs. Ko et al (2009) aimed to identify the neural substrates of problematic use, in terms of what areas are activated in fMRI by gaming urge, induced by viewing gaming related pictures. Neural responses to game related images were compared to responses to neutral images and between problematic gamers and a non-gaming control group. Gaming urge was found to be associated with six distinct areas of the brain. Based on the understood function of each area identified the researchers drew conclusions regarding the role in problematic use.

> "We suggest that the nucleus accumbens play a pivotal role to recall the previous emotional memory of gaming, as an incentive salience, after viewing the picture. Next, the expectation and the gaming urge were determined by the orbitofrontal lobe and anterior cingulate based on assessing the level of rewarding significance provided by nucleus accumbens. Then, the plan to play games is generated and executed through dorsolateral prefrontal cortex. After repeat of the above process, the caudate nucleus is involved in habituation of cue-reactivity for gaming cues" (Ko et al, 2009).

Given that there is no alternative study in this area, there is no challenge to this conclusion. However, this does highlight an area that requires further research. Replication with the addition of a non-problematic gaming group is required as it is not certain that the areas identified are specific to problematic use any more than gaming in general. Responses to gaming images in gamers may be due to recognition, recall, affection or excitement among many other possibilities in addition to gaming urge. Furthermore, gaming urge may not be distinctive to problematic play over the previously described 'engaged play'. Although the groups were matched for demographic variables and the study had a good sample size of 20, only student participants were included and all were male. Furthermore, players from only one MMORPG were included and the study was advertised to 'advanced players'. This makes conclusions difficult to generalize to the general population of MMORPG players.

Gamer experiences and motivations

The final section of this review discusses the role of gamer experiences and motivations in Massively Multiplayer Online Role-Playing Games (MMORPGs). Twelve

studies provide some evidence for the role of these factors, although again there are limitations in the extent to which studies can be compared.

Several studies discuss a range of player experiences and the relationship of these to problematic use. Hsu et al (2009) and Zanetta Dauriat et al (2011) identified through multiple regression analysis that significant predictors of problematic use were curiosity, role-playing, belonging, obligation, reward, achievement, escaping and socializing. Factors not predictive were challenge, fantasy, control, competition, cooperation, recognition, immersion and relaxing.

Alternatively, immersion into the game world (see Appendix 5 for a description of Immersion as described by Yee, 2006b) has been found to be related to problematic use (Billieux et al, 2011; Snodgrass et al, 2011). In Snodgrass et al (2011) immersion accounted for twice as much variance in problematic use (37%) as other factors combined (demographics and social factors) (18%) in a multiple regression analysis. Billieux et al (2011) identified immersion as the only gamer experience predictive of problematic involvement. Yee (2006b) suggested that immersion has subcomponents of Discovery, Role-Play, Customization and Escapism. Based on the finding of Zanetta Dauriat et al (2011) that escapism is predictive and immersion is not, the role of immersion may be driven by escapism more than the other components. In line with this Li et al's (2011) multiple regression analysis found escapism to be the best predictor of problematic gaming.

These studies each used different measures of motivation and gamer experience and so it is unclear if the definitions are comparable. Moreover, the generalisability of the studies is called into question. Billieux et al's (2011) target population were Cybercafé players who may derive very different experiences than those playing at home. Zanetta Dauriat et al (2011) had

over 93% males and both Hsu et al (2009) and Li et al (2011) used only adolescents and students. The gamer experiences derived from MMORPGs may be different across genders and across age groups. Li et al (2011) found a significant gender difference in using games to escape. Despite these limitations, it does seem that the relationship between problematic use and using the game to immerse within and/or escape real life is supported in a variety of studies with a variety of samples, and thus there is evidence of an effect of this factor. More research is required to replicate these results with more robust methodology and representative samples.

Two studies have specifically considered the impact of the social experiences of MMORPGs. Hussain & Griffiths (2009) concluded that 'dependent' gamers preferred spending time with online friends over offline friends, found socialising in game more pleasant and satisfying than offline socialisation and found online gaming satisfied social needs not met offline, compared to ‘non dependant’ gamers. However, this study found no difference between ratings of how much easier they found it to converse online, suggesting that difference is fuelled more by online interactions being more pleasurable rather than easier. This challenges the theory that problematic online gaming is related to underlying social difficulty.

Snodgrass et al (2011) found that those who play with offline friends (friends known outside of the game) are less likely to show signs of problematic use, however this relationship reduces when controlling for immersion. The authors concluded that playing with offline friends could protect from the development of problematic patterns by reducing the immersive experience and allowing for awareness of how play is affecting real life through monitoring, evaluating and regulating.

Other aspects of the gamer experience have been less studied. A significantly greater sense of power and belonging (Achab et al, 2011) and significantly greater identification to the character (Smahel et al, 2008) have both been identified as important factors. Wan and Chiou (2006) conducted a two part study identifying that flow state ("clear objective and immediate feedback, challenge encounter and adequate skill, combination of action and consciousness, concentration, sense of control, curiosity, loss of self- consciousness, purposeful experience, and inner interests") was negatively correlated with problematic use, although neither factor significantly predicts the other. They also found that problematic players are more likely to seek relief from dissatisfaction than pursue satisfaction, while non-problematic players seek satisfaction. The results of this study are specific to Taiwanese adolescents as stated within the title of the paper, although the sample size does extend to age 24. However, the "Internet Addiction Scale for High Schoolers in Taiwan" was used to measure problematic MMORPG use, which may or may not be applicable to the older participants in the sample.

Lafreniere, Vallerand, Donahue and Lavigne (2009) highlighted the difference between harmonious passion and obsessive passion for MMORPGs, where obsessive passion was related to problematic use when controlled for age and gender. Scores on harmonious passion showed no relationship. It was concluded that obsessive passion is associated with a lack of control for online gaming behaviour, linking to the literature regarding self-control described previously.

A final finding of interest was Orr, Ross and Orr (2012)'s comparison of faction membership in World of Warcraft (WoW). Although specific to this game, it offers some thought to game related choices. In WoW, players are required to choose allegiance to one of

two opposing factions upon character creation; the 'Horde' or the 'Alliance'. This study found significantly higher scores on problematic use in ‘Horde’ members compared to ‘Alliance’ members. Although no conclusions can be made regarding causality, the choice of faction is made prior to game play and thus prior to the development of problematic play. The researchers conclude that it is unclear what drives this faction choice although it is likely that some other variable is influencing both the choice and the development of problematic use. A qualitative study exploring choices and outcomes associated with faction membership would clarify this.

DISCUSSION

The aim of this systematic literature review was to consider the research regarding the problematic use of Massively Multiplayer Online Role Playing Games (MMORPG), with a view to identifying psychological risk factors. An overall summary will be provided here followed by a discussion of the current state of the literature as a whole, recommendations for further research and consideration of the implications of the literature.

The most consistent findings from the literature have been identified with regard to play time, psychological wellbeing and gamer experience. There is evidence that greater play time, as measured by hours per week, hours per day or hours per session, is associated with problematic use. The effects however are small, explaining at best 19% of the variance. Studies exploring psychological wellbeing and mental health appear to find consistent results that elevated symptoms in general are related to more signs of problematic use. There is some suggestion that positive psychological wellbeing may act as a protective factor from problematic use. On the other hand, depressive symptoms specifically may not be as implicated in the development of problematic use. This may be related to the lack in motivation for activities that is associated with depression and thus low motivation to engage in gaming. Using MMORPGs to immerse and escape from real life appears to be the best predictor of problematic use identified so far, and it is suggested to explain double the variance than other predictors together (37% compared to 18%) (Snodgrass et al, 2011).

It appears that many relationships between risk factors and problematic use are mediated by other risk factors and thus the process may follow a more complex path than a simple linear one. Given the role of poor psychological wellbeing and escapism, it is feasible that those with psychological difficulties choose maladaptive coping styles, such as escapism.

They play for longer periods to escape from day to day difficulties, therefore becoming more at risk of their play becoming problematic.

Very few conclusions can be made with confidence. Different risk factors have often been discussed, or opposing conclusions have been drawn, though this may be expected given the relatively new area and exploratory nature of the research. Despite the lack in strong overall findings, the literature provides a good basis for future research, in terms of indication of factors that may be important and require further investigation.

Further investigation is required to establish whether problematic use is more prevalent in players who struggle with face-to-face social interactions or have a particular personality or cognitive profile. Furthermore, consideration should be given to the cortical response to gaming associated with problematic use, to provide support or opposition for the similarities between the physiology of problematic gaming and the physiology of other 'addictions'.

Additional work is needed to ensure more robust research studies are conducted in the future. For example, there remains no consensus regarding symptomatology or definition and there is no agreed measure of the problematic use of MMORPGs with well-established psychometric properties (Petry, 2011). Seventeen different measures were used across the nineteen studies included here, as summarised in Table 2. Some measures employed criteria from internet addiction literature, while others from substance, gambling or exercise addiction. Differing definitions of what constitutes problematic use and where the cut offs for this may lie may result in incomparability of results. In order for more robust conclusions to be made, more work is required in defining and measuring problematic MMORPG use. Sim et al (2012) however noted that measures were varied but appeared reliable and that those

most closely resembling the DSM-IV criteria for gambling were strongest. Of the papers that reported reliability coefficients for their measures of problematic use, Cronbach Alpha scores (all between 0.75 and 0.94) are all considered reliable.

As discussed throughout, there are particular problems with the literature with regard to generalisability of the results. Several studies have published typical demographics of MMORPG players suggesting that players have an average age of 26 years and a range of 11 to 68 years old (Griffiths et al, 2003; Williams et al, 2008; Yee, 2006). Given this, research targeting only children, adolescents and student populations may not be generalisable to the general MMORPG playing population. Generalisable populations should therefore not apply restrictions to participation based on age. Furthermore, several studies are restricted to populations in one particular location that may not be generalisable to players in other localities around the world. Specifically, populations in South Asia may experience online games very differently to western cultures as online games are more popular and in some areas are considered a national sport. Thus, the impact of these games and what is considered problematic may be very different.

Finally, the current literature provides little evidence to establish cause and effect. Much of the research is correlational in comparing the strength of risk factors to the strength of problematic use. Therefore longitudinal research is required which follows players from the time they commence playing their first MMORPG to differentiate between risk factors and outcomes.

Implications of findings

Primarily, given only the moderate association between play time and problematic use, Liu & Peng (2009) suggest that reducing time spent playing is not an effective solution to prevent or recover from problematic gaming. It appears that it is important to consider the use of gaming as a process of immersion or escape. It may be more constructive to consider other aspects of the individuals' life that may lead to a desire to escape, and reduce problematic gaming through developing interventions to overcome these. Furthermore, supporting the individual to develop more adaptive coping strategies may reduce the practise of escapism and thus in turn reduce problematic gaming.

In addition, it is important to hold in mind the possible use of online gaming as an escape in general psychological assessment and formulation, in much the same way that we would consider the possible use of substances as an escapist coping strategy.

Finally, Hsu et al (2009) discusses the role of gamer experiences in the development of problematic use of MMORPGs and describes that these factors are those likely to increase the amount of time that a gamer wants to spend in game. Moreover, these are the factors suggested to make the game more enjoyable. This is of course important in the implications of the research, as game developers are being requested to think about making 'less addictive' games. In altering gamer experiences, it is likely that the result would be games that players no longer found interesting and enjoyable which would not be conducive for the online game industry. Thus, this idea is unlikely to be supported by the industry or by players. It is therefore important that players are educated about the possible negative effects of online gaming and encouraged to regulate their own playing patterns in order for play to remain a hobby without becoming problematic.

REFERENCES

Achab, S., Nicolier,M., Mauny, F., Monnin, J., Trojak, B., Vandel, P., Sechter, D., Gorwood, P., & Haffen, E. (2011). Massively multiplayer online role-playing games: comparing characteristics of addict vs non-addict online recruited gamers in a French adult population, *BMC Psychiatry*, 11, 144-156

Billieux, J., Chanal, J., Khazaal, Y., Rochat, L., Gay, P., Zullino, D., Van der Linden, M. (2001). Psychological predictors of problematic involvement in massively multiplayer online role-playing games: Illustration in a sample of male cybercafé players, *Psychopathology*, 44, 165-171

Caldwell, K., Henshaw, L., & Taylor, G. (2005). Developing a framework for critiquing health research, *Journal of Health, Social and Environmental Issues*, 5, 45-54

Chappell, D., Eatough, V., Davies, M., & Griffiths, M. (2006). EverQuest–It's just a computer game right? An interpretative phenomenological analysis of online gaming addiction. *International Journal of Mental Health and Addiction*, 4, 205–216.

Charlton, J., & Danforth, I. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behaviour*, 23, 1531–1548

Charlton, J., & Danforth, I. (2007). Validating the distinction between computer addiction and engagement: online game playing and personality, *Behaviour and Information Technology*, 29, 601-613

Chiu, S., Lee, J., & Huang, D. (2004). Video game addiction in children and teenagers in Taiwan. *Cyberpsychology and Behaviour*, 7, 571–581.

Chuang, Y. (2006). Massively multiplayer online role-playing game-induced seizures: A neglected health problem in internet addiction. *Cyberpsychology and Behaviour*, 9, 451–456.

Collins, E., Freeman, J., & Chamarro-Premuzic, T. (2012). Personality traits associated with problematic and no problematic massively multiplayer online role playing game use, *Personality and Individual Differences*, 52, 133-138

Davies, K. (2005). Addiction to Virtual Worlds: An Enticing Hobby, or a Social Problem? Retrieved from http://college.cengage.com/english/raimes/universal_keys/2e/assets/students/addiction.doc on 8th April 2010

Gentile, D., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: A two year longitudinal study, *Paediatrics,* 127, 319-329

Griffiths, M. (2010). The Role of Context in Online Gaming Excess And Addiction: Some Case Study Evidence, *International Journal of Mental Health Addiction*, 8, 119-125

Griffiths, M., Davies, M., & Chappell, D. (2003). Breaking the stereotype: The case of on-line gaming. *Cyberpsychology and Behavior,* 6, 81-91.

Grüsser, S., Thalemann, T., Griffiths, M. (2007). Excessive Computer Game Playing: Evidence for Addiction and Aggression? *Cyberpsychology & Behaviour*, 10, 290-292

Guinn, E., Bickham, D., & Rich, M. (2011). Problematic Video Game Play from the Adolescent Perspective: Prevalence and Associations with Game Factors and Health Status in a Changing Interactive Environment, *Journal of Adolescent Health*, 48, 100-101

Hsu, S., Wen, M., & Wu, M. (2009). Exploring user experiences as predictors of MMORPG addiction, *Computers in Education*, 53, 990-999

Hussain, Z., & Griffiths, M. (2009). Excessive use of massively multiplayer online role-playing games: a pilot study, *International Journal of Mental Health and Addiction*, 7, 563-571

Kim, E., Namkoong, K., Ku, T., & Kim, S. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits, *European Psychiatry*, 23, 212-218

Ko, C., Liu, G., Hsiao, S., Yen, j., Yang, M., Lin, W., Yen, C., & Chen, C. (2009). Brain activities associated with gaming urge of online gaming addiction, *Journal of Psychiatric Research*, 43, 739-747

Koster, R., (2000). Online World Timeline. Retrieved from http://www.raphkoster.com/gaming/mudtimeline.shtml on 27th April 2012

Kuss, D., & Griffiths, M. (2012). Internet gaming addiction: A systematic review of empirical research, *International Journal of Mental Health Addiction*, 10, 278-296,

Lafreniere, M., Vallerand, R., Donahue, E., & Lavigne, G. (2009). On the costs and benefits of gaming: The role of passion, *Cyberpsychology & Behaviour*, 12, 285-290

Lemmens, J., Valkenburg, P., & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, 12, 77–95.

Li, D., Liau, A., & Khoo, A. (2011). Examining the influence of actual-ideal self discrepancies, depression, and escapism, on pathological gaming among massively multiplayer online adolescent gamers, *Cyberpsychology, Behaviour and Social Networking,* 14, 535-539

Liu, M., & Peng, W. (2009). Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games), *Computers in Human Behaviour,* 25, 1306–1311

Lo, S., Wang, C., & Fang, W. (2005). Physical Interpersonal Relationships and Social Anxiety among Online Game Players, Cyber*p*sychology & *Behaviour*, 8, 15-20.

Metcalf, O., & Pammer, K. (2011). Attentional bias in excessive massively multiplayer online role-playing gamers using a modified stroop task, *Computers in Human Behaviour*, 27, 1942-1947

MMOHut. (2010). The First MMORPG – The Early History of the Genre. Retrieved from http://mmohuts.com/editorials/the-first-mmorpg on 27th April 2012

Morgan, C., & Cotten, S. (2003). The Relationship Between Internet Activities and depressive symptoms in a sample of college freshmen, *Cyberpsychology & Behaviour*, 6, 133-142

Ng, B., & Wiemer-Hastings, P. (2005). Addiction to the internet and online gaming, *Cyberpsychology & Behaviour,* 8, 110-113

Orr, E., Ross, C., & Orr, R. (2012). Trait and symptom differences between factions in online gaming: The vulnerable side of evil, *Computers in Human Behaviour*, 28, 739-743

Pawlikowski, M., & Brand, M. (2011). Excessive internet gaming and decision making: Do excessive World of Warcraft players have problems in decision making under risky conditions? *Psychiatry research*, 188, 428-433

Peters, C., & Malesky, A. (2008). Problematic Usage Among Highly-Engaged Players Of Massively Multiplayer Online Role Playing Games, *Cyberpsychology & Behaviour,* 11, 481-484

Petry, N. (2012). Commentary on Van Rooij et al. (2011): 'Gaming addiction'– a psychiatric disorder or not? *Addiction*, 106, 213-214

Porter, G., Starcevic, V., Berle, D., & Fenech, P. (2010). Recognizing problem video game use, *Australian & New Zealand Journal of Psychiatry*, 44, 120-128,

Rau, P., Peng, S., & Yang, C. (2006). Time distortion for expert and novice online game players. *Cyberpsychology and Behaviour*, 9(4), 2006.

Sim, T., Gentile, D., Bricolo, F., Serpelloni, G., Gulamoydeen, F. (2012). A conceptual review of research on the pathological use of computers, video games, and the internet, *International Journal of Mental Health Addiction*, online first

Smahel, D., Blinka, L., & Ledabyl, O. (2008). Playing MMORPGs: Connections between addiction and identifying with a character, *Cyberpsychology & Behaviour*, 11, 715-718

Smyth, J. (2007). Beyond self-selection in video game play: An experimental examination of the consequences on massively multiplayer online role playing game play, *Cyberpsychology & Behaviour*, 10, 717-721

Snodgrass, J., Lacy, M., Dengah II, F., & Fagan, J. (2011). Enhancing one life rather than living two: Playing MMOs with offline friends, *Computers in Human Behaviour*, 27, 1211-1222

Stetina, B., Kothgassner, O., Lehenbauer, M., & Kryspin-Exner, I. (2011). Beyond the fascination of online-games: Probing addictive behaviour and depression in the world of online-gaming. *Computers in Human Behaviour*, 27, 473-479

Sublette, V., & Mullan, B. (2012). Consequences of play: a systematic review of the effects of online gaming, *International Journal of Mental Health and Addiction*, 10, 3-23

Wan, C., & Chiou, W. (2006). Psychological motives and online game addiction: A test of flow theory and humanistic needs theory for Taiwanese adolescents, *Cyberpsychology and Behaviour*, 9, 317-324

Widyanto, L. & Griffiths, M.D. (2006). Internet addiction: A critical review. *International Journal of Mental Health and Addiction,* 4, 31-51

Williams, D., Yee, N., & Caplan, S. (2008). Who plays, how much, and why? Debunking the stereotypical gamer profile, *Journal of Computer-Mediated Communication*, 13, 993–1018

Yee, N. (2006). The Demographics, Motivations and Derived Experiences of Users of Massively-Multiuser Online Graphical Environments, *Teleoperators and Virtual Environments*, 15, 309-329.

Yee, N. (2006b) Motivations of Play in MMORPGs: Results from a Factor Analytic Approach, Retrieved from http://www.nickyee.com/daedalus/motivations.pdf on 10th October 2011 at 13:10

Zanetta Dauriat, F., Zermatten, A., Billieux, J., Thorens, G., Bondolfi, G., Zullino, D., & Khazaal, Y. (2011). Motivations to play specifically predict excessive involvement in massively multiplayer online role-playing games: evidence from an online survey, *European addiction research,* 17, 185-189

The Impact of Massively Multiplayer Online Role Playing Games (MMORPGs) on Psychological Wellbeing and the Role of Play Motivations and Problematic Use

Word Count:

ABSTRACT

The evidence regarding the use of Massively Multiplayer Online Role-Playing games (MMORPG) is inconclusive with regard to the outcomes on psychological wellbeing. Although a range of negative outcome have been observed, these are evident in small numbers of players.

Focusing on the most popular MMORPG, World of Warcraft, this study aimed to explore the association between the amount of time spent playing the game and psychological wellbeing. Furthermore, to investigate if this relationship was mediated by players' motivations to play or by their level of problematic use of the game.

A total of 565 participants completed an online survey. Analysis indicated a small, but negative correlation between the amount of time spent in game and psychological wellbeing, indicating that as play time increases, psychological wellbeing decreases. A Multiple Mediation Model demonstrated that this relationship specifically occurred where play was motivated by immersion and/or where play was likely to have become problematic. There was no evidence of a direct effect of MMORPG play on psychological wellbeing when taking these mediating pathways into account. Furthermore, there was no significant effect of play on psychological wellbeing where play was motivated by achievement or social interaction.

It is concluded that increased MMORPG play is associated with poorer psychological wellbeing, specifically where there is greater motivation for immersion or where there is increased problematic use. The clinical and research implications of these results are discussed.

INTRODUCTION

Research into video games has expanded and there has been increasing concern with regard to problematic or excessive use of video games, whereby play interferes with other areas of life and negative consequences occur. Recent studies estimate between 4 and 11% of 'gamers' show some signs of problematic or addictive use including withdrawal, tolerance and negative outcomes (Desai, Krishnan-Sarin, Cavallo, Potenza, 2010; Grüsser, Thalemann & Griffiths, 2007; Mentzoni et al, 2011). Furthermore, there is some evidence that video game play influences negatively on psychological wellbeing. Excessive use of video games has been associated with elevated depression, anxiety, social phobias, lower school performance and lower life satisfaction (Gentile et al, 2011; Mentzoni et al, 2011). Messias, Castro, Saini, Usman, Peeples (2001) identified an association between excessive video game use and sadness, suicidal ideation and suicide planning.

More recently, since accessibility to the internet has increased, engagement in *online games* has become more popular. A glossary of specific gaming terms used in this paper is provided in Appendix 2 for further information. Research has identified that problematic or excessive video game play, and the interference with other areas of life, is more prevelant in online role-playing games, most notably Massively Multiplayer Online Role Playing Games (Guinn, Bickham & Rich, 2011; Ng & Wiemer-Hastings, 2005; Porter, Starcevic, Berle & Fenech, 2010; Smyth, 2007). Players of Massively Multiplayer Online Role Playing Games (MMORPGs) more often display 'problematic gaming behaviour, depressive tendencies and lower self-esteem' compared to players of alternative types of online game such as First Person Shooters (FPSs), Strategy Games and Browser Games (Stetina, Kothgassner,

Lehenbauer, & Kryspin-Exner, 2011). It is important that more research is conducted focusing specifically on the impact of MMORPGs on psychological wellbeing.

Impact of Massively Multiplayer Online Role-playing Games (MMORPGs)

Williams, Yee and Caplan (2008) identified a prevalence rate of 22.7% for a diagnosis of depression in an MMORPG playing sample. This figure may be even higher if we consider those exhibiting depressive syptomatology as measured by psychometric assessments in addition to those with a diagnosis. Both males and females reported considerably higher prevalence of depression than typical rates for the US population. Higher prevalence of substance addiction was also reported. Relationships between playing online games and symptoms of depression, anxiety, poor self-esteem and interpersonal problems are also identified in additional research (Lo, Wang & Fang, 2005; Morgan & Cotton, 2003; Stetina et al, 2011). Similarly, physical problems such as health and sleep difficulties, personal life problems and academic/professional problems have been described as elevated in MMORPG players (Liu & Peng, 2009; Smyth, 2007;).

However, despite the relationships identified between MMORPG play and a vast array of negative outcomes, it has been argued that much of the research is correlational and effect sizes identified are small, and that the majority of players experience little or no negative effects (Davies, 2005; Liu & Peng, 2009; Smyth, 2007). Thus, the strength of the relationship between online game play and negative outcomes is called into question. It is not clear if elevated levels of mental health problems were apparent before the onset of gaming, or occurred as a consequence.

Furthermore, the developing research in this area has revealed some positive impact of MMORPGs, such as the development of social skills and relationships through play (Ducheneaut, Yee, Nickell & Moore, 2006; Williams, et al, 2006). Longman, O'Connor & Obst (2009) concluded that players derived social support from these sources that is, in turn, associated with improved wellbeing. In addition, online games have been linked with skill development. Chen (2009) described MMORPGs as providing opportunity for communication, problem solving, teamwork and shared goals. The benefits of these interactions on social relationships, communication skills and some cognitive functions were discussed. Ryan, Rigby & Przybylski (2006) argued that "it may be premature to conclude that computer gaming is negatively related to wellbeing".

Given the variations in the evidence, it is necessary to consider further the relationship between MMORPGs and psychological wellbeing, as well as additional factors that may be influential in this relationship.

Firstly, it is reasonable to expect that, if MMORPG play impacts on psychological wellbeing, then this impact will increase with greater time spent playing. Griffiths (2004) considered adverse effects of gaming and concluded that these effects are associated with 'excessive' users of games, and that there is no evidence of adverse effects from moderate play. Yee's (2006a) study of over 30,000 MMORPG players identified variety for time that players dedicate to game play, with an average time spent playing of 22 hours per week, and 8-9% of players reporting spending 40 or more hours per week. Thus, large amounts of time are often devoted to this hobby, although only a small proportion of players dedicate extensive periods. It is possible that it is this small group of excessive players who experience negative outcomes.

In light of this, the initial aim of the current study was to identify if there was a relationship between time spent playing MMORPGs and psychological wellbeing. Furthermore, previous research may have assumed that the effects of games are the same for all players, which might not be the case. The literature provides some suggestion as to factors that may result in a greater risk of negative outcomes for some individuals and thus factors that may be influence the strength or direction of the relationship between play and wellbeing.

Engaged versus problematic play

Brockmyer et al (2009) argued that ‘deep engagement in game-playing has the potential to be one important determinant of the impact of playing video games’. Furthermore, Sublette and Mullan (2012) conclude that only 'addicted' players report significant negative consequences.

The concept of 'online game addiction' is an increasingly popular topic in the literature. Yee (2006a) summarized survey findings that 50% of 30,000 MMORPG players considered themselves 'addicted to an MMORPG'. Of the participants in this study, 15% agreed that they become angry and irritable if they are unable to play when they wish to, 30% continued to play even when frustrated or not enjoying their play and 18% noted some academic, health, financial or relationship problems precipitated by game play.

However, there is current controversy as to whether this can be conceptualised as an 'addiction' and constitutes a psychiatric disorder (Griffiths, 2010; Ng & Wiemer-Hastings, 2005; Widyanto & Griffiths, 2006). Thus, there is a multitude of terms used to describe this phenomenon. Liu & Peng (2009) used the term 'psychological dependency'. They also discuss the implications of this on the negative consequences of online gaming and concluded that,

although most players do not show a dependence on play, this dependence is related to the occurrence of negative life consequences.

Differentiation has been made between the concepts of 'addiction'/'problematic use' and 'engagement' (Charlton & Danforth, 2007; Seay & Kraut, 2007). 'Engaged' play involves a significant amount of time being invested while not omitting real-life responsibilities. In contrast 'problematic' or 'addictive' play occurs where game play impacts on real-life functioning and negative consequences occur. Seay & Kraut, (2007) argue that it is this 'problematic' play that is associated with higher levels of depression and loneliness and a lack in self-regulation. Engaged play on the other hand shows no relationship with these outcomes.

Despite the debate regarding conceptualisation, it is clear that online game use can become problematic. Given that the research literature suggests that this problematic use is related to negative outcomes of playing online games, this requires further investigation.

Motivations for play

In addition to the suggestions that problematic use is implicated in the negative outcomes of MMORPGs, the research literature suggests that a player's motivations for play are important.

Ryan et al (2006) conclude that "short-term effects [of online games] concern whether or not the individual player can satisfy psychological needs when engaged in the game". Thus suggesting that the impact of gaming may be altered by the needs and motivations that the individual is attempting to fulfill, and whether or not these are met. Yee (2006b) suggested that people play MMORPGs for a variety of reasons, and described three main motivations; Achievement, Social Interaction and Immersion. These are separated into 10 subcomponents

Table 1: Yee's (2006b) MMORPG play motivations

Achievement	Social Interaction	Immersion
Advancement Progress, Power, Accumulation, Status	**Socializing** Casual Chat, Helping Others, Making Friends	**Discovery** Exploration, Lore, Finding Hidden Things
Mechanics Numbers, Optimization, Templating, Analysis	**Relationship** Personal, Self-Disclosure, Find and Give Support	**Role-Playing** Story Line, Character History, Roles, Fantasy
Competition Challenging Others, Provocation, Domination	**Teamwork** Collaboration, Groups, Group Achievements	**Customization** Appearances, Accessories, Style, Color Schemes
		Escapism Relax, Escape from real life, Avoid real life Problems

and are summarised in Table 1. A more detailed description of each motivation factor is offered in Appendix 5.

In the literature, Immersion motivations and a preference for virtual life over real life are linked to a particular risk of negative outcomes of online gaming, but Achievement and Socializing motivations are not (Caplan, Williams & Yee, 2009; Liu & Peng, 2009). Griffiths (2010) details two case studies in which one adult experiences severe negative consequences of his escapist gaming, while another adult, who plays for the same amount of time but for social reasons, derives positive experiences and effects on wellbeing. Likewise, Stetina et al (2011) noted that MMORPG players often report using the game to escape from real-life problems. Although this is described as a valuable coping strategy, it is suggested that this might also lead to problematic outcomes.

However, there is some suggestion in the literature that Social Interaction motivations and Achievement motivations may provide a means to improved psychological wellbeing. In terms of the social aspects of MMORPGs, literature suggests that meaningful, healthy and

supportive relationships of varying strengths can be developed between players and that these relationships are comparable to 'real life' relationships (Cole & Griffiths, 2007; Ducheneaut et al, 2006; Longman et al 2009; Williams et al, 2006; Yee, 2006a). Furthermore Williams et al (2006) found that 1/3 of players play with real life friends with whom they would have no contact if they did not play (e.g. due to location etc). There is strong and developed evidence for an association between supportive social networks and positive psychological wellbeing (Kawachi & Berkman, 2001; Longman et al 2009; Moak & Agrawal, 2009; Thoits, 2011).

A sense of achievement and accomplishment may positively affect psychological wellbeing, particularly through improving self-esteem and self-confidence (Kaplana & Maehrb, 1999; Seligman, 2008). Ryan et al (2006) identified that 'competence satisfaction' (i.e being satisfied with one's own competencies and achievements) was positively correlated with mood, albeit this being mood directly following play, rather than general mood/wellbeing.

Research into motivations therefore suggests that this may also affect outcomes of playing MMORPGs. There is a general suggestion that Immersion, and specifically Escapism motivations may be the biggest risk factors for negative consequences on psychological wellbeing, while the effect of Achievement and Social Interaction motivations may be less detrimental or even positive.

Aims and objectives

The literature in this area is limited and findings are inconclusive. Further research is required to consider more directly the effect of online games on psychological wellbeing.

Specifically, this research considers Massively Multiplayer online role-playing games (MMORPGs).

At the time of the study, the dominant MMORPG on the market was World of Warcraft (WoW), with over 12 million players (Blizzard Entertainment, 2010) worldwide. Furthermore this game holds the Guinness World Record (2010) for the most popular MMORPG, and appears to have been the most commonly studied MMORPGs on the market. As such, this study focused on World of Warcraft players as the largest collective population with the most comparability to previous research.

World of Warcraft (like most MMORPGs) is made up of two stages of play. Players are required to complete various tasks to develop their character to a maximum level, learn about the character and develop skills in how to play the game. At the time of data collection, the maximum character level was 85. Once at this level, the game continues indefinitely, unlike alternative genres of game that have an end to the story. It is this post levelling stage that is of interest here as the motivations, aims and experiences of players are very different to those at the levelling stage and it is this stage of play where gaming has been most reported to result in negative outcomes.

Furthermore, much of the research into outcome effects has recruited adolescent participants, often from a student population. Adolescent players are more susceptible to problematic use that interferes with 'real-life' responsibilities, while older and more experienced players are less affected due to ability to recognise and rectify problematic patterns (Davies, 2005; Griffiths, Davies & Chappell, 2004). Moreover, Yee's (2006a) study summarised the demographics of MMORPG players, and identified the average age of participants as 26 years and a range of 11 to 68 years old. Similar patterns of demographics

have been identified in additional research (Griffiths, Davies & Chappell, 2003; Williams, Yee & Caplan, 2008).Research with adult participants would therefore be likely to be more generalisable to the MMORPG playing population, therefore allowing for more reliable conclusions.

The aim of the present study was therefore to consider the impact of MMORPGs, specifically WoW on the psychological wellbeing of adult players, and possible factors that mediate this relationship. Baron & Kenny (1986) describe mediator variables as those which 'account for the relation between the predictor and the criterion'. The aim was to explore the relationship between the amount of time spent playing WoW and the impact on psychological wellbeing, in terms of problematic use and/or Yee's (2006b) model of play motivations as possible mediating factors.

METHOD

Design

A cross sectional, online questionnaire design was used to test the relationship between the average hours per week spent playing and Psychological Wellbeing. Play Motivation and Problematic Use were tested as mediating variables, with Play Motivations being divided into the three components (Achievement, Social Interaction and Immersion).

Participants

The participant population were MMORPG players; specifically players of World of Warcraft (WoW). Opportunity sampling methods were used, along with snowballing procedures, requesting participants to pass on details of the study to online friends.

Inclusion criteria

- Participants were required to have at least one character in the game that had reached the maximum level of 85 (see aims and objectives for justification).
- Participants were required to be aged 18 years or older (see aims and objectives for justification)
- Participants were required to be fluent in the English language in order to be able to appropriately and accurately answer the questionnaires.

Measures

The measures used in the study are presented in Appendix 9. Questions regarding demographic data and World of Warcraft (WoW) experience were included to obtain a measure of Play Time and to describe the sample.

One criticism of survey data is that there is no assurance that people are answering truthfully. Wood, Griffiths and Eatough (2004) suggest that, in online research, visual inspection of the data can identify inconsistent and exaggerated responding. In order to check for this, several methods of assessing Play Time were used (i.e. hours per week, days per week and hours per day). For each participant days per week and hours per day were multiplied and this was cross referenced against reported hours per week to ensure uniformity. Any inconsistent responses could then be removed from the final data, although in this sample this did not occur.

Psychological Wellbeing

Goldberg & Hillier's (1979) General Health Questionnaire (GHQ-28) was used as a measure of Psychological Wellbeing. The GHQ-28 contains four subscales; Somatic problems, Anxiety and Insomnia, Social Functioning and Depression. The 28 item version was used as it is the most widely used in both research and clinical practice due to time considerations (Jackson 2007). The Likert scoring method was used with responses ranging from 0 (no difficulties) to 3 (much greater difficulties than usual). Jackson (2007) reports reliability coefficients for the GHQ-28 having ranged from 0.78 to 0.95 in various studies. In the current study, the Cronbach's Alpha score was 0.91.

Typically, a greater score on the GHQ-28 is indicative of greater difficulties with psychological wellbeing. This standard method of scoring is used in describing the sample in order to aid comparrisons to other studies. For ease of interpretation in the mediation analysis, GHQ-28 scores have been reversed so that a higher score is indicative of better wellbeing in line with the direction of other variables.

Motivations to Play

Yee's (2006b) Motivations for Play questionnaire was used to identify players' motivation to play WoW in terms of the Achievement, Social Interaction and Immersion motivations discussed previously. The Cronbach's Alpha reliability coefficients in the current study were Achievement (0.86), Social Interaction (0.74), Immersion (0.83), Advancement (0.77), Mechanics (0.79), Competition (0.80), Socialising (0.76), Relationships (0.80), Teamwork (0.60), Discovery (0.70), Role-playing (0.70), Customisation (0.78) and Escapism (0.60). Inventory items and factor loadings can be found in Appendix 9. Questions asked participants about their involvement with specified aspects of gameplay and their level of agreement to statements about gameplay. Each question was scores on a 5point likert scale where 0 implied 'no interest' and 5 implied 'great interest'.

Yee (2006b) argued that the motivations are not mutually exclusive and thus this questionnaire is not a method of categorizing players based their primary motivation, but measuring the extent to which each motivation is important in their play.

Problematic Use

Problematic game use was measured using a WoW Specific Problematic Usage/Engagement Questionnaire (Peters & Malesky, 2008); made up of 27 questions scored on a 7-point likert scale ranging from 0 (completely disagree) to 6 (completely disagree, with one question reverse scored. , The Cronbach's Alpha was 0.68 in the current study. The measure was adapted to be WoW specific by the authors from Charlton's Addiction/Engagement Questionnaire (Charlton & Danforth, 2007) and is based largely on Brown's (1993) behavioural addiction criteria and other measures of internet addiction adapted from DSM criteria for pathological gambling (Griffiths & Hunt, 1998; Young, 1996). These include symptoms of salience, euphoria, tolerance, withdrawal symptoms, conflict, relapse and reinstatement.

The term 'addiction' was altered to 'problematic usage' by the questionnaire authors to 'avoid current controversies of whether behavioural addictions exist'. The adapted scale measures problematic usage/engagement on a continuum, whereby a higher score is a higher indication of the likelihood of problematic use, rather than as a method of categorising players into those 'addicted' and those 'not addicted'.

Procedure and ethical considerations

This research was granted ethical approval by the Birmingham University Research Ethics Committee with reference ERN_10-1079 in May 2011.

Online survey software, Limewire, was used to host the questionnaires and the study was advertised to WoW players through the 'chat' function within the game and on the official World of Warcraft Discussion Forums. Interested players were directed to a website where

they would find further information, consent criteria and complete the questionnaires (See appendix 6-9). Participants were required to agree with the consent criteria statements in order to continue. No identifiable information was requested, and no IP (Internet Provider) addresses were recorded by the program, respecting confidentiality of participants. No data was stored until participants 'submitted' their responses at the end of the questionnaires, therefore the opportunity to withdraw at any point until submitting was available. Participants were prompted to complete unanswered or missed questions at the end of each page before continuing. Furthermore, participants could return to the website to complete the questionnaires at a time convenient to themselves and therefore could consider their decision to take part for as long as they require.

Demographic questions were presented first, followed by GHQ-28, the Play Motivation Questionnaire and the Problematic Usage/Engagement Questionnaire. Completion time was approximately 15-20 minutes.

Finally, participants were provided with the opportunity to contact the researcher for details of how to obtain advice and support if any distress had been triggered by the questionnaires (Appendix 8). One participant requested this information.

Data analysis

Descriptive statistics were used to analyse the demographic variables of the sample and a zero order correlation analysed the direct relationship between the independent variable (average hours per week spent playing) and the dependent variable (Psychological Wellbeing). In order to test the potential mediating effects of problematic use and play motivation, a multiple mediator model, as described by Preacher and Hayes (2004, 2008) was

used. This method is a generalisation of the SOBEL method and the process described by Baron & Kenny (1986).

Preacher and Hayes (2004, 2008) argue that the Multiple Mediator Model, aside from its ability to calculate multiple mediator values simultaneously, is more reliable in using a non-parametric bootstrapping re-sampling procedure, which calculates bootstrap estimates of the mediated effects. They argue that this method is more robust with respect to deviations from parametric assumptions. They further argue that this method has a higher power than the standard Sobel test and maintains reasonable control over Type-I error rate.

The model being tested is represented in Figure 1, displaying direct and indirect pathways and including the measures used.

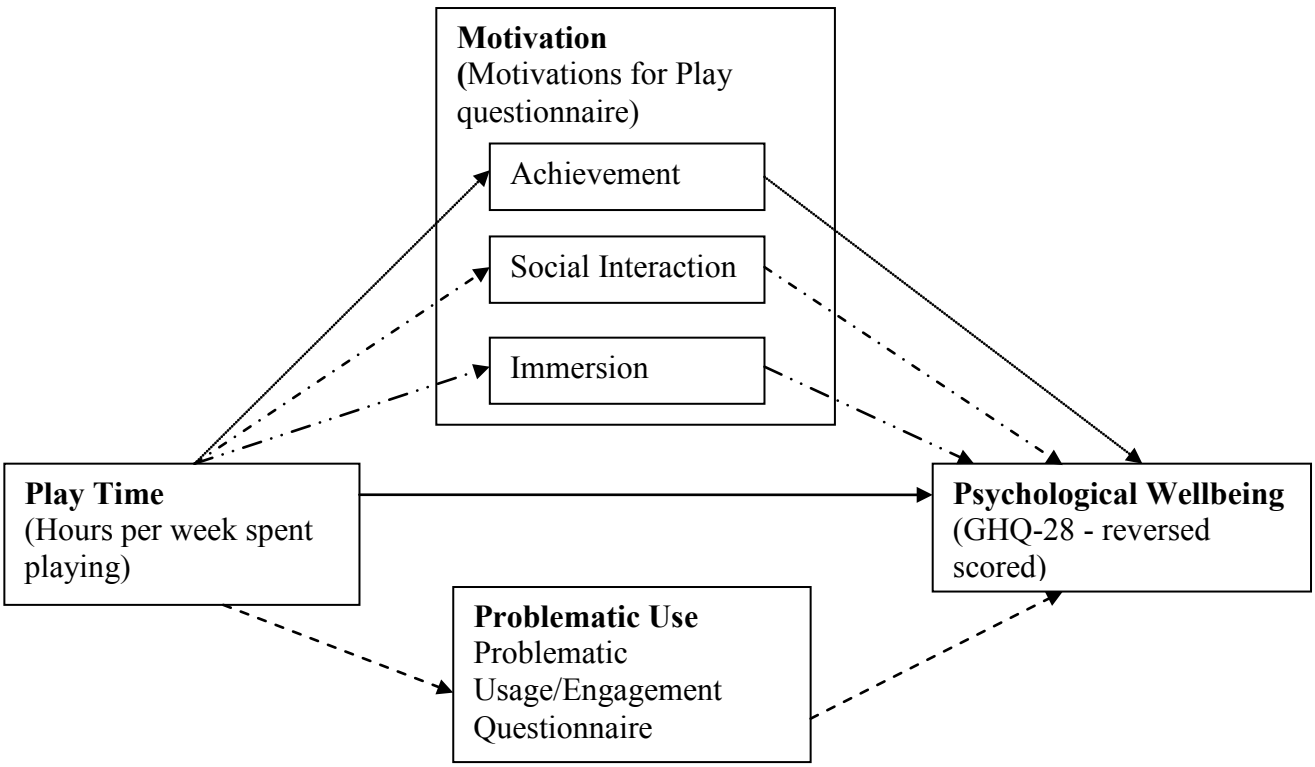

Figure 1: Visual representation of the Mediation Model tested

RESULTS

Sample characteristics

Five hundred and sixty five participants took part in this study. Demographic and general information is presented in Table 2. Of the sample, 450 were male (79.6%) and 115 were female (20.4%). The average age of participant was 24.6 with a range of 18 to 58. The nationality/location of the participants is found in Appendix 10. Participants from 45 countries were included in this study, although the majority of participants were from the UK (42%). Figure 2 provides a visual representation of the location of participants worldwide.

The patterns of WoW play of participants are also summarised in Table 2. The number of years playing the game ranges from 0.5 to 7, where 7 years of playing is the maximum since the release of the game. The mean number of years is 4.2, thus participants were mostly very experienced players. An average of 28.5 hours per week were spent playing the game (range 1 to 100 hours per week).

Figure 2: Summary of participant locations

Table 2: Summary of demographic variables

		N (%)	
Gender	Male	450 (79.6)	
	Female	115 (20.4)	
Relationship Status	Single	353 (62.5)	
	In relationship	42 (7.4)	
	Cohabiting	94 (16.6)	
	Married	63 (11.2)	
	Divorced	9 (1.6)	
	Widowed	2 (0.4)	
	Other	2 (0.4)	
Employment	Full time employed	201 (35.6)	
	Part time employed	43 (7.6)	
	Unemployed	56 (9.9)	
	Student	254 (45)	
	Stay at home parent	3 (0.5)	
	Carer	1 (0.2)	
	Disabled	2 (0.4)	
	Long term sick	4 (0.7)	
	House wife/husband	4 (0.7)	
		Mean (s.d)	**Range**
Age		24.6 (7.14)	18-58
Play Patterns	Hours per week	28.55 (19.22)	1-100
	Years playing	4.3 (1.54)	0.5-7
	Days per week	5.7 (1.5)	1-7
	Hours per day	4.73 (2.64)	1-18

Table 3: Summary of test variables

		Mean (s.d)
GHQ-28	Total	17.76 (10.67)
	Somatic	3.85 (2.84)
	Anxiety & Insomnia	4.06 (3.69)
	Social	6.97 (2.78)
	Depression	2.88 (4.27)
Problematic Use	Total	76.87 (22.52)
Play Motivation	Achievement	22.79 (5.82)
	Social Interaction	18.61 (3.22)
	Immersion	17.79 (5.22)

Men, on average played WoW for slightly fewer hours per day and slightly fewer hours per week than women (4.68:4.95 and 27.97:30.80 respectively), but played for an average of 4.39 days per week compared to 4.08 days for females. None of these differences were significant at the $p<0.01$ level when using an independent samples t-test and taking into account Levene's Test for Equality of Variance, although the difference in days per week was significant at the 0.05 level ($t(563) = 1.99$, $P < 0.05$). In terms of age, a significant although slight, negative correlation was identified with hours played per week ($r=-0.11$, $p<0.01$), suggesting that there is a small indication that younger adults play for greater hours. Age, however, only explains 1% of the variance in hours played per week.

The General Health Questionnaire (GHQ-28) identified the Psychological Wellbeing of the participant group. These findings are summarised in Table 3. For the purpose of descriptive analysis, as mentioned previously, the Total score on the GHQ represents overall wellbeing with higher scores indicating more difficulties. A mean score of 17.76 (sd 10.67) was obtained. A maximum score of 84 is achievable on the GHQ-28 when using the likert scoring method however, scores ranged from 3 to 66.

Goldberg & Hillier (1979) argue that the best estimation for a cut-off score for 'caseness' (likelihood of the presence of mental health difficulties) is based on the mean score within the sample, rather than a static predefined score. Thus, in this sample 38.2% (216) exceeded the cut off score.

The GHQ-28 consists of four scales. For Somatic Problems, participants reported a mean score of 3.85 (sd 2.84); Anxiety and Insomnia yielded a mean score of 4.06 (sd 3.69); Social Functioning had the highest mean score of 6.97 (sd 2.78) and Depression had the lowest mean of 2.88 (4.27).

There were no significant correlations between Psychological Wellbeing and age in this sample. However, significant gender differences were reported. On the Somatic scale women scored a mean score of 4.57 (sd 3.22) and men a mean score of 3.66 (sd 2.7), $t(157)=-2.8$, $p<0.01$. For the Anxiety & Insomnia scale women had a mean score of 5.58 (sd 4.55) and men had a mean score of 3.67 (sd 3.33), $t(146.7)=-4.23$, $p=0.001$, and on the Depression scale women scored a mean of 3.47 (sd 4.91) and the men scored a mean of 2.67 (sd 4.1), $t(156)=-2.16$, $p<0.05$. On the Total scale of the GHQ-28, women scored 21.30 (sd 12.25) and men scored 16.86 (sd 10.04), $t(155.3)=-3.59$, $p=0.001$. On each of the scales females scored significantly higher than males. On the social scale, again, females' scores (mean 7.40, sd 3.21) were greater than males (mean 6.86, sd 2.65) but this difference was not significant.

Effect of Play Time on Psychological Wellbeing

The effect of World of Warcraft (WoW) play on psychological wellbeing was assessed in terms of the relationship between the number of hours spent playing WoW in an average week and the reversed Total score on the GHQ-28. The GHQ-28 score was reversed in order for ease of interpretation i.e. that a higher score indicated higher wellbeing. A significant negative correlation ($r=-0.18$, $n=565$, $p<0.001$) was identified suggesting that as hours per week spent playing increases, psychological wellbeing is decreased. The effect size of 0.03 indicates that this association explains 3% of the variance.

Significant negative correlations were also identified with the Somatic ($r=-0.11$, $n=565$, $p<0.01$), Anxiety & Insomnia ($r=-0.16$, $n=565$, $p<0.001$) and Depression ($r=-0.19$, $n=565$, $p<0.001$) sub-scales of the GHQ-28, although again these are small correlation coefficients. The relationship between the Social Functioning scale of the GHQ-28 and hours

per week spent playing was significant at the $p<0.05$ level (r=-0.08, n=565, $p<0.05$). These results suggest that greater hours spent playing WoW are related to poorer psychological wellbeing on all subscales of the GHQ-28, but has the smallest relationship with Social Functioning.

Mediation analysis

The mediation model presented in Figure 1 was tested using the multiple mediator model described by Preacher and Hayes (2004, 2008) and analysed using SPSS via this method. Four mediated paths were modelled (Achievement Motivation, Social Interaction Motivation, Immersion Motivation and Problematic Use). This method uses a bootstrap methodology to obtain more robust results as described previously, however the beta values via the bootstrap methodology were identical to the asymptotic beta values and thus asymptotic values are reported here (see appendix 11).

The overall model showed a significant fit with the data $F(5,559) = 18.87$; $p < 0.001$) and accounted for approximately 14% of the variance on the GHQ-28. The total mediation model was significant (B=0.07; SE=0.01; z=5.39; $p<0.0001$).

The individual path coefficients and associated significance tests are shown in Figure 3. In terms of overall mediation effects, the Achievement Motivation was not significant (B=0.01; SE=0.01; z=0.28; p=0.78). Similarly, the path mediated by Social Interaction Motivation did not show significant overall effect (B=-0.01; SE=0.01; z=0.47; p=0.64). However, the path mediated by the Immersion Motivation did yield a significant overall effect (B=-0.01; SE=0.01; z=2.41; $p<0.05$). In terms of the path mediated by Problematic Use, again a significant overall effect was identified (B=-0.06; SE=0.01; z=4.66; $p<0.001$).

These results indicate that Problematic Use and the Immersion Motivation significantly mediate the relationship between WoW Play Time and Psychological Wellbeing. The negative beta values identify that increased hours spent playing, alongside increased immersion or problematic use is related to a decrease in psychological wellbeing. The relationship between Play Time and Psychological Wellbeing is not significantly mediated by the motivations of Achievement and Social Interaction.

Further analysis was conducted to consider the effect of the four sub-components of the Immersion Motivation variable i.e. Escapism, Customisation, Discovery and Role-Play. Significant overall effects were identified in the paths mediated by Escapism (B=-0.04; SE=0.0096; z=4.2289; p<0.001) and Customisation (B=-0.0115; SE=0.0049; z=2.3499; p<.05). The paths mediated by both Discovery and Role Play motivations did not result in significant overall effects (B=0.0007; SE=0.0013; z=0.5028; p=0.62 and B=0.0019; SE=0.0020; z=0.9172; p=0.36 respectively). Thus, mediation through the Immersion Motivation pathway is specific to the motivations of Escapism and Customisation.

It should be noted that the path coefficient for the direct effect of Play Time on Psychological Wellbeing was not significant when the mediated paths were included in the model (p=0.25). Thus, the zero order correlation between hours per week spent playing and reversed GHQ-28 (r=0.178, n=565, p<0.001) can be accounted for by the mediation variables. This suggests that there is no 'direct' effect of WoW Play Time on Psychological Wellbeing.

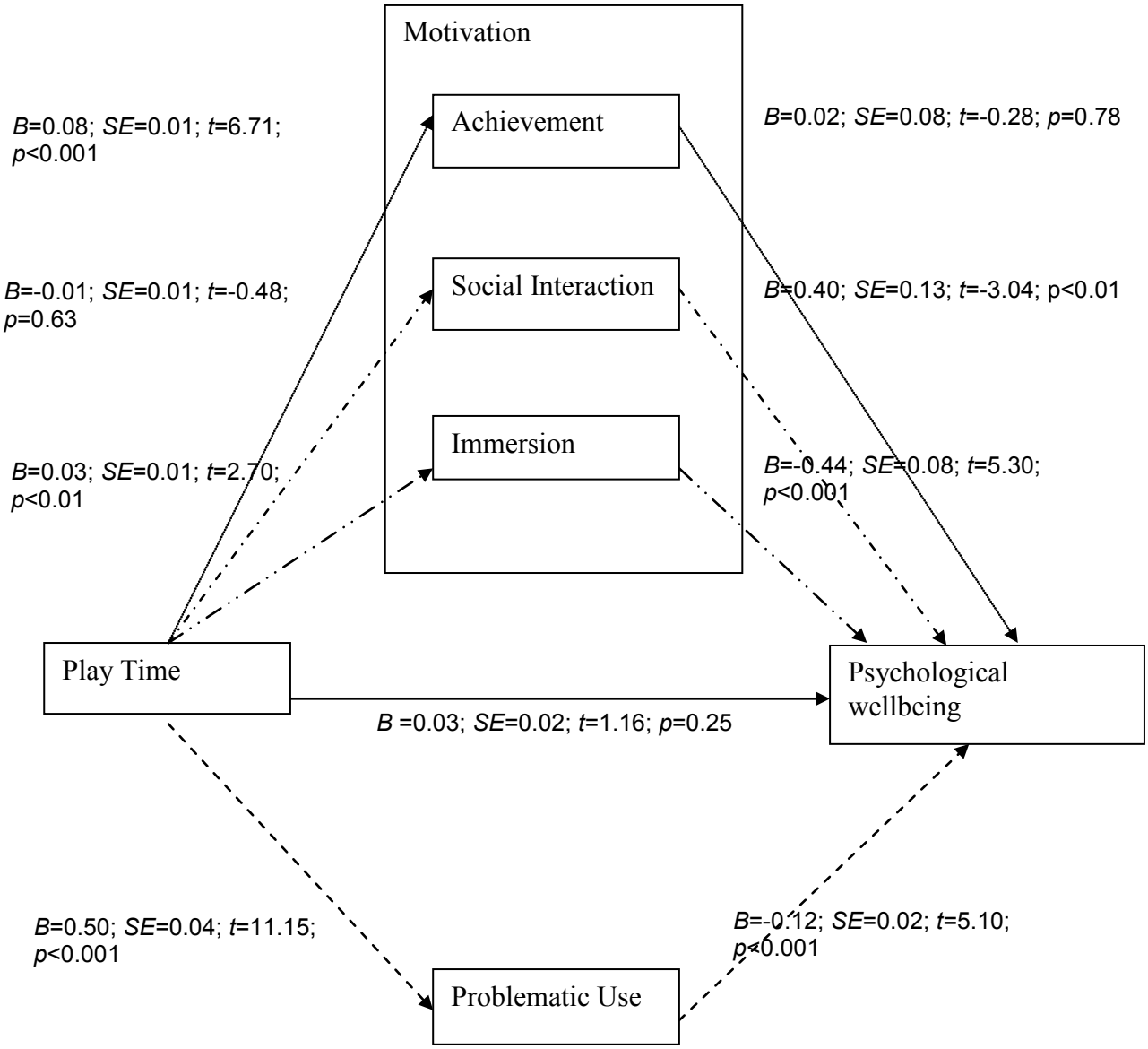

Figure 3: Mediation model with statistical effects of pathways

DISCUSSION

The main aim of this study was to consider the relationship between playing Massively Multiplayer Online Role-Playing Games (MMORPGs) and psychological wellbeing and to consider whether problematic use of MMORPGs and players' motivations for playing this type of game mediated this relationship. Results suggest that there is a small relationship between time spent playing the game and psychological wellbeing, but that problematic use and immersion into the game mediate this relationship. These findings are discussed in more detail.

In this sample, 38.2% of participants would be expected to have a diagnosable mental health difficulty. Recent prevalence rates for common mental health problems in the UK have been identified as between 16.4 - 17.6% (LHO, 2005; Mind, 2007), suggesting that rates are elevated in this sample. This supports findings of Williams et al (2008), that rates of diagnosable depression are much higher in MMORPG players than in the general population.

Furthermore, a significant negative correlation was identified between hours per week spent playing World of Warcraft (WoW) and reversed GHQ-28 total score, thus indicating that increased play time was associated with poorer psychological wellbeing. However, despite this correlation being significant, the *r*-value (-0.18) suggests only 3% of the variance in psychological wellbeing is explained. Similar correlations between hours per week spent playing and the four sub-categories of the GHQ-28 were identified, explaining between 1% and 4% of the variance, with Social Functioning being lowest effect size and Depression being the highest.

The high prevalence of poor psychological wellbeing, but small effect size supports the idea that there is a risk of negative outcomes for some players, however it appears that the risk for the majority of players is small, supporting previous comparable conclusions (Davies, 2005; Liu & Peng, 2009; Smyth, 2007). Consideration of the mediating factors of this relationship may help to explain this identify those who are at risk of negative outcomes.

The model developed by Yee (2006b) was used to consider if motivations to play MMORPGs were implicated in this relationship. Similarly, the current literature highlights a difference between engaged use and problematic use of games (with problematic use often being termed 'gaming addiction') and suggests that both may impact on the relationship between play and psychological wellbeing (Brockmyer et al, 2009; Caplan et al, 2009; Liu & Peng, 2009; Griffiths, 2010).

Previous findings from the literature have suggested that players whose play has become problematic and those who use the game as a method of immersion or escapism are most at risk of negative outcomes of their play (Brockmyer et al, 2009; Caplan et al, 2009; Liu & Peng, 2009; Griffiths, 2010). These findings have been supported in the current study as both factors strengthen the negative relationship between play and psychological wellbeing. Conversely, there have been some suggestions that achievement motivated play and socially motivated play could prove beneficial (Kaplana & Maehrb, 1999; Kawachi & Berkman, 2001; Moak & Agrawal, 2009; Ryan et al, 2006; Thoits, 2011; Seligman, 2008), however this has not been supported in the current study.

In order to understand the impact of the Immersion Motivation pathway, the four subcomponents of the Immersion scale were considered more closely. The Immersion scale consists of (i) Escapism, (ii) Customisation, (iii) Discovery and (iv) Role-play. Only Escapism and Customisation demonstrated significant mediation. Thus, when considering the mediation of the Immersion pathway, this appears to be specific to play as a method of escapism and/or motivated by customisation.

Yee (2006b) described the Escapism motivation as relaxing, escaping from real life and avoiding real-life problems. Despite some gamers reporting that this is a particular benefit of MMORPGs, it is possible that, where this escapism is elevated to a method of avoidance, it is not beneficial as a long-term coping strategy. Avoidant coping strategies have been associated with increased life stress, negative consequences of stressors and depression (Holahan, Moos, Holahan, Brennan & Schutte, 2005; Koeske, Kirk & Koeske, 1993). Thus when the focus on escapism is increased, the association between increased play and poor psychological wellbeing is stronger. Similar effects of escapism in problem gambling have previously been identified (Reid, Li, Lopez, Collard, Parhami, Karim & Fong, 2011).

The escapist properties of MMORPGs are significant given the virtual world and the vast opportunities for becoming immersed within it, including experiencing a new and different life through the game character. Further research may be required to identify if escapist behaviour is more prominent and/or detrimental in MMORPG play that in any other type of hobby such as sport or watching television and movies.

The role of the Customisation motivation in the relationship between game play and psychological wellbeing is less clear and more speculative. Yee (2006b) described those motivated by Customisation as players who enjoy changing and developing their characters to

be unique in style and appearance. Turkay & Adonolf (2010) noted that 65.9% of gamers said that customisation affected enjoyment to a large or moderate degree. They noted three types of customisation within games:

Type I: Customising that affects play directly (such as skills, professions, roles etc)

Type II: Customisation that does not affect play directly (such as character appearance)

Type III: Customisation that does not affect play directly but may affect performance (such as customising the interface or layout of the game screen).

Customising character appearance is found to be the favourite of the types of customisation.

Several possible mechanisms can be identified from the literature that may explain the role of customisation in the relationship between MMORPGs on psychological wellbeing. Bessiere, Seay & Kiesler (2007) discuss the role of identity in World of Warcraft Players. They argue that players create characters more similar to their ideal self than their actual self. Furthermore, they found that this tendency was stronger in those with lower psychological wellbeing. Thus, it may be possible that greater motivation for customisation is driven by a desire to create the 'ideal self', which is in turn associated with poorer psychological wellbeing.

Alternatively, Lewis, Weber &Bowman (2008) introduce the concept of 'Character Attachment', which is thought to be implicated in the outcomes of playing role-playing games. They define 'Character Attachment' as feelings of friendship and identification with a video game character, feeling responsible for the character and feeling in control of the characters actions. The authors discuss the role of customising in developing attachment. Moreover, they identified a relationship between character attachment and self-esteem,

reporting that, where character attachment was high, the correlation between attachment and self-esteem was negative and stronger than for players with low character attachment. Thus, where character attachment is high (often precipitated by increased customisation), this is associated with poorer self-esteem.

In terms of the role of problematic MMORPG use in mediating the effect of play on psychological wellbeing, the expected profile of someone who may score high on this scale should be considered. Problematic Use, as measured in the current study, was based on the principles of behavioural addiction including salience, euphoria, tolerance, withdrawal symptoms, conflict, relapse and reinstatement.

Players scoring high on this measure would be likely to be preoccupied with the game and feel uncomfortable when not playing, experience conflict between wanting to play and other responsibilities and experience conflict with others in relation to their play. They are likely to experience mood modification when playing but have to play for increasing lengths of time to obtain this, and struggle to refrain from playing for any length of time. Players of this profile may feel compelled to play and thus feel that their play is out of control. It may be this feeling of loss of control that relates to the impact on psychological wellbeing. Previous research has suggested that feelings of loss of control influence the negative feelings associated with problem gambling (Sharpe, 2002)

Furthermore, this problematic use may be driven by a desire to avoid the feelings associated with not playing. This is in contrast to a player's motivation to play, which is driven by a desire to obtain a particular feeling or experience, such as relaxation, a sense of belonging, or accomplishment.

Strengths and limitations

As with any research, it is important to acknowledge the possible strengths and limitations of the study; considering these when interpreting the findings. The initial aim of this study was to establish the relationships between MMORPG play and psychological wellbeing, and thus a correlation design was most appropriate. However, conclusions regarding causality cannot be made. It may be as feasible to conclude that mental health problems precede the use of MMORPGs as it is to conclude that playing MMORPGs precedes mental health difficulties.

Nevertheless, Gentile, Choo, Liau, Sim, Li, Fung and Khoo (2011) conducted a longitudinal study and identified that risk factors for pathological gaming included greater time spent gaming, lower social competence and greater impulsivity. In addition, they found that depression, anxiety and social phobia were outcomes of pathological gaming rather than risk factors. This conclusion provides some support for the direction of the relationship between MMORPG play and psychological wellbeing, with play time being a risk factor and poor psychological wellbeing being the outcome.

The study benefited from a large sample of current MMORPG players and the sample is similar to previous demographic studies in terms of age, gender, employment and relationship status (Griffiths, Davies & Chappell, 2003; Williams, Yee & Caplan, 2008; Yee, 2006a). Thus, it is likely to be generalisable to the typical MMORPG population. However, it is important to hold in mind that 42% of the sample was from the UK and thus results may differ from those that may be found in different geographic locations where gaming plays different roles in day-to-day life. Additionally, as participants were specifically players of World of Warcraft (WoW), we can only confidently make conclusions about players of this

game. It is important that the study is replicated with players of alternative MMORPGs. Similarly, in terms of generalisability, the data may be skewed by the exclusion of participants under the age of eighteen, although previous literature suggests that this age group make up only a small proportion of typical MMORPG players and the effects of games on this group may be very different (Davies, 2005; Griffiths, Davies & Chappell, 2004). Further studies should replicate this design including all age groups and including only children and adolescents to ascertain the impact of age on the findings.

As a self-report design, consideration must be given to the integrity of responses to questionnaires. While holding in mind the stigma that is often assumed about MMORPG players, some gamers may be protective of the game. Consequently responses may be defensive in order to 'prove' the absence of negative outcomes by under reporting problematic use, mental health problems and/or any other factors that may be considered as painting a negative picture or stereotype. Although this may be a possibility, responses on all of the scales were varied and well spread. There was no evidence of a floor or ceiling effect as would be expected if there were high incidence of under or over reporting.

Additionally, this research used online methodology, similar to that of previous research, which has been criticised as limiting participation due to need for internet access and internet usage ability. However, given that the target population are internet users this is not applicable here. Furthermore Wood, Griffiths and Eatough (2004) describe the benefits of online methodology, particularly in relation to video game research. They describe the benefits in accessing a wide range of participants, possibly worldwide, quickly and easily, as well as likely increased response rates due to participants being able to take part at their own pace, in the comfort of their own home and at any time suitable to them. Furthermore, no

differences have been found in responses to the GHQ-28 when presented on paper and online (Vallejo, Jordan, Diaz, Comeche, Ortega, 2007; Vallejo, Mananes, Comeche, Diaz, 2008).

It should be noted that, as a cross sectional design, the data collected represents only one time point. Various factors related to the timing of the data collection may have some influence over the results. First, the new expansions of the game (new levels, new content etc) had been only recently released at the time of data collection which may have increased the amount of time players were spending in game as well as their specific motivations and engagement with the game at the time. Secondly, it was noted that the data collection period was concurrent to exam period in universities. Given that 45% of the sample were students, this may also have impacted on the above factors. It is important therefore that this study is replicated at various time points throughout the year and in relation to the release of expansions and updates in order to be able to fully generalise results to an overall pattern. Additionally a longitudinal study could identify any changes in patterns across time.

Summary of conclusions and implications

In spite of the acknowledged limitations of this study, the multiple mediation model tested showed significant and robust results. The findings indicate that the problematic use of MMORPGs and being motivated to play by escapism and customisation mediates the relationship between hours per week spent playing MMORPGs and psychological wellbeing. Furthermore, when taking these mediating pathways into account there is no direct relationship between play and psychological wellbeing. In conclusion, increased MMORPG play is associated with poorer psychological wellbeing, specifically where there is greater motivation for immersion or where there is greater likelihood of problematic use. It is

probable that the lack in direct relationship between play and poor psychological wellbeing explains how many players enjoy the game with little adverse effect, while a small number have trouble. The clinical implications of these findings are important to consider for those working in many service settings.

It is common practice in clinical assessment to consider the use of adaptive and maladaptive coping strategies, including the possible use of alcohol or drugs to escape and avoid real life problems. The results of this study suggest that it may be equally as important in the current climate of ever-increasing technology use, to consider the use of immersive gaming. Where MMORPGs are used with similar motivations, they may be psychologically damaging in a similar way to alcohol or drugs and therefore it is worth offering some consideration in clinical assessment. A thorough history of the development of problems is needed to provide evidence as to the causal direction of this relationship.

Additionally, given the finding that there is no direct relationship between playing MMORPGs and psychological wellbeing, it is important to think about the implications for the stigma that is sometimes attached to players. Players often communicate their concerns about the effects of this stigma, and it may prevent players seeking help and support when and where their play may have become problematic. Given that this study, along with others (Griffiths, Davies & Chappell, 2003; Williams, Yee & Caplan, 2008; Yee, 2006a), has shown the stereotype to be misguided and that negative outcomes are not as prominent as feared, it may be important to aim to reduce this stigma and improve access to support and intervention.

The implications of this study for future research include the need to consider these results and conduct valuable longitudinal research in order to make valid and robust conclusions regarding cause and effect of the relationships identified here. It is also

imperative to consider alternative mediating factors, for example personality, cognitive skills or self-regulation, in order to build up a better profile of those most at risk of negative outcomes of gaming. Finally, it may be beneficial for this study to be replicated at various time points and with alternative games to World of Warcraft for better generalisability to the gaming population as a whole.

REFERENCES

Baron, R., & Kenny, D. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations, *Journal of Personality and Social Psychology,* 51, 1173-1182

Bessiere, K., Seay, A., & Kiesler, S. (2007). The ideal elf: identity exploration in World of Warcraft, *Cyberpsychology & Behaviour*, 10, 530-535.

Blizzard Entertainment Inc (2010). Retrieved from http://eu.blizzard.com/en-gb/company/press/pressreleases.html?id=2443926, on 10th October 2011 at 13:00

Brockmyer, J., Fox, C., Curtiss, K., McBroom, E., Burkhart, K., & Pidruzny, J. (2009). The development of the Game Engagement Questionnaire: A measure of engagement in video game-playing, *Journal of Experimental Social Psychology*, 45, 624–634

Brown, R. (1993). Some contributions of the study of gambling to the study of other addictions. In W. R. Eadington & J. A. Cornelius (Eds.). Gambling behaviour and problem gambling, Reno, NV: University of Nevada.

Caplan, S., Williams, D., & Yee, N. (2009). Problematic Internet use and psychosocial well-being among MMO players, *Computers in Human Behaviour*, 25, 1312–1319

Charlton, J., & Danforth, I., (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behaviour*, 23, 1531–48

Chen, M. (2009). Communication, Coordination, and Camaraderie in World of Warcraft, *Games and Culture*, 4, 47-73

Cole, H., & Griffiths, M. (2007). Social Interactions in Massively Multiplayer Online Role-Playing Games, *Cyberpsychology & Behaviour,* 10, 575-583

Davies, K. (2005). Addiction to Virtual Worlds: An Enticing Hobby, or a Social Problem? Retrieved from http://college.cengage.com/english/raimes/universal_keys/2e/assets/students/addiction.doc on 8th April 2010

Desai, R., Krishnan-Sarin, S., Cavallo, D., & Potenza, M. (2010). Video-Gaming Among High School Students: Health Correlates, Gender Differences, and Problematic Gaming, *Pediatrics,*126, 1414-1424

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. (2006). Building an MMO With Mass Appeal: A Look at Gameplay in World of Warcraft, *Games and Culture*, 1, 281-317

Gentile, D., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: a two year longitudinal study, *Pediatrics,* 127, 319-329

Goldberg, D., & Hillier, V. (1979). A Scaled Version of the General Health Questionnaire. *Psychological Medicine*, 9, 139-145

Griffiths, M., & Hunt, N. (1998). Dependence on computer games by adolescents. *Psychological Reports*, 82, 475–480.

Griffiths, M. (2004). Can Videogames Be Good for Your Health? *Journal of Health Psychology,* 9, 339–344

Griffiths, M. (2010). The Role of Context in Online Gaming Excess And Addiction: Some Case Study Evidence, *International Journal of Mental Health Addiction*, 8, 119-125

Griffiths, M., Davies, M., & Chappell, D. (2003). Breaking the stereotype: The case of on-line gaming. *Cyber-Psychology and Behavior,* 6, 81-91.

Griffiths, M., Davies, M., & Chappell, D. (2004). Online computer gaming: a comparison of adolescent and adult gamers, *Journal of Adolescence* 27 87–96

Grüsser, S., Thalemann, T., Griffiths, M. (2007). Excessive Computer Game Playing: Evidence for Addiction and Aggression? *CyberPsychology & Behaviour*, 10, 290-292

Guinn, E., Bickham, D., & Rich, M. (2011). Problematic Video Game Play from the Adolescent Perspective: Prevalence and Associations with Game Factors and Health Status in a Changing Interactive Environment, *Journal of Adolescent Health*, 48, 100-101

Guinness World Record (2012). Retrieved from http://www.guinnessworldrecords.com/world-records/6000/most-popular-subscription-based-massively-multiplayer-online-role-player-game-%28mmorpg%29 on 8th May 2012

Holahan, C., Moos, R., Holahan, C., Brennan, P., & Schutte, K. (2005). Stress Generation, Avoidance Coping, and Depressive Symptoms: A 10-Year Model, *Journal of Consulting and Clinical Psychology,* 73, 658-666

Jackson, C. (2007). The General Health Questionnaire, *Occupational Medicine*, 57, pg79

Kaplana, A., & Maehrb, M. (1999). Achievement Goals and Student Well-Being. *Contemporary Educational Psychology,* 24, 330-358

Kawachi, I., Berkman, L., (2001). Social ties and mental health. *Journal of Urban Health*, 78, 458-467

Koeske, G., Kirk, S., & Koeske, R. (1993). Coping with job stress: Which strategies work best? *Journal of Occupational and Organizational Psychology*, 66, 319–335

Lewis, M., Weber, R., & Bowman, N. (2008). "They May Be Pixels, But They're My Pixels:" Developing a Metric of Character Attachment in Role-Playing Video Games, *CyberPsychology & Behaviour*, 11, 515-518

Liu, M., & Peng, W. (2009). Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games), *Computers in Human Behaviour,* 25, 1306–1311

Lo, S., Wang, C., & Fang, W. (2005). Physical Interpersonal Relationships and Social Anxiety among Online Game Players, *CyberPsychology & Behavior*, 8, 15-20.

London Health Observatory (LHO). (2005). Retrieved from http://www.lho.org.uk/viewResource.aspx?id=9335 on 12.07.2012

Longman, H., O'Connor, E., & Obst, P. (2009). The Effect of Social Support Derived from World of Warcraft on Negative Psychological Symptoms, *CyberPsychology & Behavior,* 12, 563-566

Mind. (2007). Retrieved from http://www.mind.org.uk/help/research_and_policy/statistics_1_how_common_is_mental_distress on 12.07.2012

Mentzoni, R., Brunborg, G., Molde, H., Myrseth, H., Mar Skouveroe, K., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health, *Cyberpsychology, Behavior, and Social Networking*. 14(10), 591-596.

Messias, E., Castro, J., Saini, A., Usman, M., & Peeples, D. (2001). Sadness, suicide, and their association with video game and internet overuse among teens: results from the youth risk behaviour survey 2007 and 2009, *Suicide and life threatening behaviour*, 41, 307-315

Moak, Z., & Agrawal, A. (2009). The association between perceived interpersonal social support and physical and mental health, *Journal of Public Health*, 32, 191–201

Morgan, C., & Cotten, S. (2003). The Relationship Between Internet Activities and depressive symptoms in a sample of college freshmen, *CyberPsychology & Behaviour*, 6, 133-142

Ng, B., & Wiemer-Hastings, P. (2005). Addiction to the Internet and Online Gaming, *Cyberpsychology & Behaviour*, 8, 110-113

Peters, C., & Malesky, A. (2008). Problematic Usage Among Highly-Engaged Players Of Massively Multiplayer Online Role Playing Games, *Cyberpsychology & Behaviour,* 11, 481-484

Porter, G., Starcevic, V., Berle, D., & Fenech, P. (2010). Recognizing Problem Video Game Use, *Australian & New Zealand Journal of Psychiatry*, 44, 120-128,

Preacher, K., & Hayes, A. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behaviour Research Methods, Instruments, & Computers*, 36, 717-731

Preacher, K., & Hayes, A. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models, *Behaviour Research Methods*, 40, 879-891

Reid, R., Li, D., Lopez, J., Collard, M., Parhami, I., Karim, R., & Fong, T. (2011). Exploring Facets of Personality and Escapism in Pathological Gamblers, *Journal of Social Work Practice in the Addictions*, 11(1), pages 60-74

Ryan, R., Rigby, S., & Przybylski, A. (2006). The Motivational Pull of Video Games: A Self-Determination Theory Approach, *Motivation and Emotion*, 30, 347–363

Seay, A. F., & Kraut, R. E. (2007). Project massive: Self-regulation and problematic use of online gaming. In *CHI 2007: Proceedings of the ACM conference on human factors in computing systems* (pp. 829–838). New York: ACM Press

Seligman, M. (2008). Positive Health. *Applied Psychology*, 57, 3–18.

Sharpe, L. (2002). A reformulated cognitive–behavioural model of problem gambling: A biopsychosocial perspective, *Clinical Psychology Review*, 22, 1–25

Smyth, J. (2007). Beyond Self-Selection in Video Game Play: An Experimental Examination of the Consequences of Massively Multiplayer Online Role-Playing Game Play, *Cyberpsychology & Behaviour*, 10, 717-721

Stetina, B., Kothgassner, O., Lehenbauer, M., & Kryspin-Exner, I. (2011). Beyond the fascination of online-games: Probing addictive behaviour and depression in the world of online-gaming. *Computers in Human Behaviour*, 27, 473-479

Sublette, V., & Mullan, B. (2012). Consequences of Play: A Systematic Review of the Effects of Online Gaming. *International Journal of Mental Health and Addiction,* 10, 3-23

Thoits, P. (2011). Mechanisms Linking Social Ties and Support to Physical and Mental Health, *Journal of Health and Social Behaviour*, 52, 145-161

Turkay, S., & Adonolf, S. (2010). Free to Be Me: A survey on Customisation with World of Warcraft and City of Heroes/Villains Players, *Procedia – Social and Behavioural Sciences,* 2, 1840–1845

Vallejo, M., Jordan, C., Diaz, M., Comeche, M., & Ortega, J. (2007). Psychological assessment via the internet: A reliability and validity study of online (vs paper-and-pencil) versions of the general health questionnaire-28 (GHQ-28) and the Symptoms Check-List-90-Tevised (SLR-90-R), *Journal of Medical Internet Research*, .9, 1-10.

Vallejo, M., Mananes, G., Comeche, M, & Diaz, M. (2008). Comparison between administration via internet and paper-and pencil administration of two clinical instruments: SCL-90-R and GHQ-28, *Journal of Behaviour Therapy and Experimental Psychiatry,* 39(3), 201-208.

Widyanto, L. & Griffiths, M.D. (2006). Internet addiction: A critical review. *International Journal of Mental Health and Addiction,* 4, 31-51

Williams, D., Ducheneaut, N., Xiong, L., Zhang, Y., Yee, N., & Nickell, E. (2006). From Tree House to Barracks: The Social Life of Guilds in World of Warcraft, *Games and Culture*, 1, 338-361

Williams, D., Yee, N., & Caplan, S. (2008). Who plays, how much, and why? Debunking the stereotypical gamer profile, *Journal of Computer-Mediated Communication*, 13, 993–1018

Wood, R., Griffiths, M., & Eatough, V. (2004). Online data collection from videogame players: Methodological issues. *CyberPsychology and Behaviour*, 7, 511-518

Yee, N. (2006a). The Demographics, Motivations and Derived Experiences of Users of Massively-Multiuser Online Graphical Environments, *Teleoperators and Virtual Environments*, 15, 309-329.

Yee, N. (2006b) Motivations of Play in MMORPGs: Results from a Factor Analytic Approach, Retrieved from http://www.nickyee.com/daedalus/motivations.pdf on 10th October 2011 at 13:10

Young, K.(1996). Internet addiction: The emergence of a new clinical disorder. C*yberPsychology and Behaviour, 1,* 237-244

Public Dissemination Document

Massively Multiplayer Online Role Playing Games (MMORPGs) and Psychological Wellbeing

Background

What are Massively Multiplayer Online Role Playing Games (MMORPG)

Massively Multiplayer Online Role Playing Games (MMORPGs) are computer games in which the player controls their character within a virtual world, developing abilities and items (skills, clothing, weapons etc) to complete quests, defeat computer controlled 'enemies' and challenge other players. The online aspect means that the world is persistent (it continues to exists when the user is logged out) and many players can interact and work together to achieve goals. Furthermore, MMORPGs have no end point and so players can continue the same game for many years.

MMORPGs and psychological wellbeing

The media and current literature has shown an increasing interest in the impact of video games on players. Recently, this interest has grown to include MMORPGs. Programs such as "World of Warcraft Ruined My Life" talk about the dangers and some research has highlighted negative effects such as mental health problems (depression, anxiety, poor self-esteem), physical health problems (poor health, sleep and diet, and seizures), interpersonal problems (social functioning and contact, relationships) and academic/occupational problems.

However, some researchers argue that these problems only occur in small numbers of players and that most players play for relatively large amounts of time without experiencing

negative effects. Some researchers even argue for positive effects of MMORPG play on psychological wellbeing.

There has also been some specific research around MMORPG play that has become problematic. Some researchers refer to this as 'online game addiction' although this has been debated in terms of whether game play can be considered an 'addiction' in the same way as drugs or alcohol or gambling. 'Problematic' play though has been differentiated from 'engaged' play. 'Engaged' players play for large amounts of time but with little negative impact on their day-to-day lives. 'Problematic' players show symptoms similar to being 'addicted' to the game such as thinking about it all of the time, neglecting other responsibilities in order to play, playing for longer and longer and feeling irritable when they are not playing. There has been some suggestion that it is those whose play is problematic that experience negative effects.

It has also been suggested that there are three motivations players have for playing MMORPGs; Achievement, Social Interaction and Immersion. Achievement involves developing the character, scoring points, gaining power and resources and succeeding in tasks. Social Interaction focuses on chatting to other players, building relationships, and working in teams. Immersion involves immersing yourself into the character, role-playing and using the game to escape and avoid everyday stresses and problems. Those who are motivated by escaping from real life are thought to be also more at risk of negative effects.

Aims and objectives

Given what we know so far, and that researchers have argued about the effects of MMORPGs, it was important to try to further understand the effects on psychological

wellbeing. This research considers if players' motivations to play MMORPGs alters the possible impact on psychological wellbeing and whether players whose play is more 'problematic' experience more effects that are negative.

Method and procedure

An online survey was advertised to World of Warcraft (WoW) players via game forums, as WoW is the largest and most popular MMORPG on the market.

The survey measured game play in terms of average hours spent playing per week. Participants also completed questionnaires about their psychological wellbeing, their motivations to play MMORPGs in terms of Achievement, Social Interaction and Immersion and a measure of how 'problematic' their play was.

Findings

Five hundred and sixty five 18 to 58 year olds took part in the study. 79.6% were male and 20.4% were female.

Findings indicate that the longer people spent playing the game, the more likely they were to have poorer psychological wellbeing. However, this relationship only occurred where the player was motivated by immersing themselves into the game, or where play was likely to have become problematic. Where play is motivated by a desire to achieve or to interact with others, the negative impact of play on psychological wellbeing is removed.

Conclusions and implications

This research supports previous arguments that not all players of MMORPGs have negative experiences, even if they play for large amounts of their time.

It suggests that those at risk of negative effects on psychological wellbeing are those whose play has become problematic and began to interfere with real life, for example through neglecting other responsibilities, playing more and more and feeling frustrated when not playing. In addition, those who are motivated to play MMORPGs by the idea of being immersed and getting lost in a virtual world are at increased risk. Often this involves using this virtual world to escape from the stresses of everyday life. Although this can be helpful in terms of relaxation, repeated 'escaping' from real life problems can make them worse and therefore the act of playing to avoid problems can result in more negative experiences.

These finding therefore suggest that players should monitor and regulate their play closely in order to notice if their play is becoming problematic or if they are immersing themselves in their character to a greater degree than usual in order to reduce the risk of negative experiences of games.

Appendices

APPENDIX 2 - GLOSSERY OF 'GAMING' TERMS FOR LITERATURE REVIEW AND RESEARCH

Term	Definition
Browser Games	A type of online game which is played within the internet browser programme and does not require any software to be installed on the computer and so can be played anywhere. Due to the accessibility of browser games, they are often played in more frequent, shorter sessions compared to traditional computer games.
First Person Shooters (FPSs)	A type of game in which the player plays as a character and progresses through levels killing enemies, often summing and comparing the number of 'kills' versus the number of 'deaths'. The player experiences the game through the eyes of the character.
Guild	Players join together in groups of varying numbers and regularly play together. Guilds can exist with a variety of aims. Some group together for social reasons and some to work together to progress through the game content.
Guild master	The leader of the guild who makes decisions regarding what happens in the guild.
Levelling	When a player first joins a MMORPG, they choose a character and then develop this character through a number of levels until they reach a maximum level.
Massively Multiplayer Online Role-Playing Game	A game in which a very large number of players interact with one another within a virtual game world. The world is persistent, meaning that players can log in and out as they please but the world continues while they are logged out. Players assume the role of a character a develop skills and abilities based on this role. Players are often required to work together in teams to complete tasks and reach goals.
Online Game	A computer game played using an internet connection. Often meaning that several or more players can play together.
Post levelling stage	Once a character has reached the maximum level, the game continues. The game itself has no end point and the player continues to develop, gain achievements and works towards goals. At this stage, players often join guilds and work together to defeat enemies etc.
Role Playing Game	A type of game in which the player creates a character and assumes the role of this character in actions, decisions and progression through the game.
Strategy Games	Any game in which a player makes decisions based on a strategy to complete a goal. Often such games are based on war strategy in terms of making decisions to build up an army and take over another players resources.

APPENDIX 3 - LITERATURE REVIEW SEARCH STRATEGY

OVID
Embase 1988 to 2012; MEDLINE(R) 1988 to 2012; PsycINFO 1987 to 2012

1 exp computer games/
2 exp internet/
3 1 AND 2
4 (massively multiplayer online role-playing games or MMORPG or MMO).mp.
5 ((internet or online or web) adj3 (game* or gaming)).mp.
6 ((internet or online or web) adj2 (game* or gaming)).mp.
7 online game*.mp.
8 3 OR 4 OR 5 OR 6 OR 7
9 addiction/ or exp behaviour disorders/ or exp internet addiction/
10 (problem* or excess* or obsess* or Pathological).mp.
11 online game addiction.mp.
12 9 OR 10 OR 11
13 8 and 12

Total Results - 415

Web of Knowledge (Lemmatization=On)

1. Topic=(massively multiplayer online role-playing games or MMORPG or MMO)
   OR
   Topic=((internet or online or web) adj3 (game* or gaming))
   OR
   Topic=(online game*)
2. Topic=(problem* or excess* or obsess* or Pathological or addict*)
   OR
   Topic=(online game addiction)
3. 1 AND 2
4 Refined by Document Type=(Article)

Total Results - 324

APPENDIX 5 - DETAILED DESCRIPTION OF YEE'S MOTIVATIONS FOR MMORPG PLAY

Yee, N. (2006b) Motivations of Play in MMORPGs: Results from a Factor Analytic Approach, Retrieved from http://www.nickyee.com/daedalus/motivations.pdf on 10th October 2011 at 13:10

The Achievement Component:
Advancement: Gamers who score high on this subcomponent derive satisfaction from reaching goals, levelling quickly and accumulating in-game resources such as gold. They enjoy making constant progress and gaining power in the forms offered by the game - combat prowess, social recognition, or financial/industrial superiority. Gamers who score high on this subcomponent are typically drawn to serious, hard-core guilds that can facilitate their advancement.
Mechanics: Gamers who score high on Mechanics derive satisfaction from analyzing and understanding the underlying numerical mechanics of the system. For example, they may be interested in calculating the precise damage difference between dual-wielding one-handed swords vs. using a two-handed sword, or figuring out the resolution order of dodges, misses, and evasions. Their goal in understanding the underlying system is typically to facilitate templating or optimizing a character that excels in a particular domain.
Competition: Gamers who score high on this subcomponent enjoy the rush and experience of competing with other gamers on the battlefield or economy. This includes both fair, constrained challenges - such as duelling or structured Player vs Player, as well as unprovoked acts. Gamers who score high on this subcomponent enjoy the power of beating or dominating other players.

The Social Component:
Socializing: Gamers who score high on this subcomponent enjoy meeting and getting to know other gamers. They like to chit-chat and gossip with other players as well as helping out others in general - whether these be less-experienced players or existing friends. Gamers who score high on this subcomponent are typically drawn to casual, friendly guilds.
Relationship: Gamers who score high on this subcomponent are looking to form sustained, meaningful relationships with others. They do not mind having personal and meaningful conversations with others that touch on RL issues or problems. They typically seek out close online friends when they need support and give support when others are dealing with RL crises or problems.
Teamwork: Gamers who score high on Teamwork enjoy working and collaborating with others. They would rather group than solo, and derive more satisfaction from group achievements than from individual achievements. Gamers who score low on this subcomponent prefer to solo and find it extremely important to be self-sufficient and not have to rely on other gamers. They typically group only when it is absolutely necessary.

The Immersion Component:
Discovery: Players who score high on Discovery enjoy exploring the world and discovering locations, quests or artefacts that others may not know about. They enjoy travelling just to see different parts of the world as well as investigating physical locations (such as dungeons and

caves). They enjoy collecting information, artefacts or trinkets that few others have.
Role-Playing: Players who score high on Role-Playing enjoy being immersed in a story through the eyes of a character that they designed. These players typically take time to read or understand the back-story of the world as well as taking time to create a history and story for their characters. Also, they enjoy role-playing their characters as a way of integrating their character into the larger ongoing story of the world.
Customization: Players who score high on this subcomponent enjoy customizing the appearance of their characters. It is very important to them that their character has a unique style or appearance. They like it when games offer a breadth of customization options and take time to make sure that their character has a coherent colour scheme and style.
Escapism: Gamers who score high on Escapism use the environment as a place to relax or relieve their stress from the real world. These players may use the game as a way to avoid thinking about their real life problems or in general as a way to escape real life.

APPENDIX 10 - RESEARCH DESCRIPTIVES

Sample nationality/location

Australia	2	Faroe Islands	1	Italy	6	Romania	14	UK	237
Austria	2	Finland	20	Kuwait	1	Russia	3	United Arab Emirates	1
Belgium	19	France	1	Lebanon	1	Serbia	3	USA	27
Bosnia and Herzegovina	1	Germany	3	Macedonia	1	Slovakia	2		
Bulgaria	3	Gibraltar	2	Mauritius	1	Slovenia	3		
Canada	9	Greece	6	Montenegro	1	South Africa	2		
Croatia	6	Iran	1	Norway	30	Spain	4		
Czech Republic	4	Iraq	1	Poland	10	Sweden	41		
Denmark	29	Ireland	10	Portugal	5	The Netherlands	44		
Estonia	3	Israel	1	Qatar	1	Turkey	3		

Descriptive Analyses

Statistics

		Location	Age	Gender	Employment Status	Relationship Status	Years playing game	Hours per week	Days per week	Hours per day
N	Valid	565	565	565	565	565	565	565	565	565
	Missing	0	0	0	0	0	0	0	0	0
Mean			24.64				4.2973	28.5487	4.33	4.7345
Median			22.00				5.0000	24.0000	5.00	4.0000
Mode			18				6.00	20.00	5[a]	4.00
Std. Deviation			7.136				1.53607	19.22312	1.507	2.64380
Variance			50.919				2.360	369.528	2.270	6.990
Range			40				6.50	99.00	6	17.00
Minimum			18				.50	1.00	1	1.00
Maximum			58				7.00	100.00	7	18.00

a. Multiple modes exist. The smallest value is shown

APPENDIX 11 - RESEARCH STATISTICAL ANALYSIS

Correlation analysis

(For age comparrison and effect of hours on wellbeing)

Correlations

		Age	Hours per week	GHQ Somatic	GHQ Anxiety & Insomnia	GHQ Social	GHQ Depression	GHQ Total
Age	Pearson Correlation	1	-.106*	.073	.003	-.007	-.068	-.008
	Sig. (2-tailed)		.011	.082	.941	.863	.107	.841
	N	565	565	565	565	565	565	565
Hours per week	Pearson Correlation	-.106*	1	.105*	.162**	.071	.189**	.178**
	Sig. (2-tailed)	.011		.013	.000	.093	.000	.000
	N	565	565	565	565	565	565	565
GHQ Somatic	Pearson Correlation	.073	.105*	1	.610**	.416**	.439**	.761**
	Sig. (2-tailed)	.082	.013		.000	.000	.000	.000
	N	565	565	565	565	565	565	565
GHQ Anxiety & Insomnia	Pearson Correlation	.003	.162**	.610**	1	.414**	.525**	.826**
	Sig. (2-tailed)	.941	.000	.000		.000	.000	.000
	N	565	565	565	565	565	565	565
GHQ Social	Pearson Correlation	-.007	.071	.416**	.414**	1	.477**	.705**
	Sig. (2-tailed)	.863	.093	.000	.000		.000	.000
	N	565	565	565	565	565	565	565
GHQ Depression	Pearson Correlation	-.068	.189**	.439**	.525**	.477**	1	.822**
	Sig. (2-tailed)	.107	.000	.000	.000	.000		.000
	N	565	565	565	565	565	565	565
GHQ Total	Pearson Correlation	-.008	.178**	.761**	.826**	.705**	.822**	1
	Sig. (2-tailed)	.841	.000	.000	.000	.000	.000	
	N	565	565	565	565	565	565	565

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Gender Comparisons

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Hours per week	Equal variances assumed	.747	.388	-1.409	563	.160	-2.82667	2.00685	-6.76849	1.11516
	Equal variances not assumed			-1.305	161.828	.194	-2.82667	2.16647	-7.10487	1.45154
Days per week	Equal variances assumed	3.419	.065	1.992	563	.047	.313	.157	.004	.621
	Equal variances not assumed			1.856	162.761	.065	.313	.169	-.020	.646
Hours per day	Equal variances assumed	.014	.906	-.969	563	.333	-.26783	.27626	-.81046	.27480
	Equal variances not assumed			-.924	167.027	.357	-.26783	.28972	-.83981	.30416
GHQ Somatic	Equal variances assumed	6.216	.013	-3.108	563	.002	-.914	.294	-1.492	-.336
	Equal variances not assumed			-2.802	157.405	.006	-.914	.326	-1.558	-.270
GHQ Anxiety & Insomnia	Equal variances assumed	18.674	.000	-5.067	563	.000	-1.911	.377	-2.652	-1.171
	Equal variances not assumed			-4.227	146.681	.000	-1.911	.452	-2.805	-1.018
GHQ Social	Equal variances assumed	4.375	.037	-1.867	563	.062	-.540	.289	-1.108	.028
	Equal variances not assumed			-1.666	155.855	.098	-.540	.324	-1.180	.100
GHQ Depression	Equal variances assumed	9.176	.003	-2.416	563	.016	-1.072	.444	-1.944	-.201
	Equal variances not assumed			-2.160	156.144	.032	-1.072	.496	-2.053	-.092
GHQ Total	Equal variances assumed	11.447	.001	-4.035	563	.000	-4.438	1.100	-6.598	-2.278
	Equal variances not assumed			-3.588	155.304	.000	-4.438	1.237	-6.881	-1.995