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Notions of Video Game Addiction and Their Relation to Self-Reported Addiction Among Players of World of Warcraft

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Abstract In this study, 438 players of the online video game, World of Warcraft, completed a survey about video game addiction and answered an open-ended question about behaviors they considered characteristic of video game addiction. Responses were coded and correlated with players' self-reports of being addicted to games and scores on a modified video game addiction scale. The behaviors most frequently mentioned as characteristic of addiction included playing a lot and games' interfering with other activities, especially socializing or work. Few players mentioned such signs of addiction as withdrawal symptoms or tolerance, and some thought it was not possible to become addicted to video games. Self-reported addiction to video games correlated positively with perceptions that video game addiction involved playing a lot or playing to escape problems, and correlated negatively with perceptions that addiction involved games' interfering with other activities or not being able to stop play. Implications for assessment are discussed.

Keywords Video game · Addiction · Problematic video game use · Perceptions · World of Warcraft

In 2009, video game sales worldwide were estimated at $40 billion (Alderman 2009). Key video game markets include the U.S., where about two-thirds of households play computer or video games [Entertainment Software Association (ESA) 2010]; as well as Canada, China, Japan, South Korea; Australia, and Western Europe; markets are also emerging in India, Russia, Brazil, and Southeast Asia (Butler 2009; Walsh 2009; "Worldwide online gaming community" 2007). As the number of players has increased worldwide, so have

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media reports of excessive play (see "Video game addiction" 2010). In 2007, the American Psychiatric Association (2007) decided that research was too inconclusive to classify excessive video game play as an addiction. Yet in Yee's (2006b) study of a self-selected sample of over 5,500 online game players, nearly half considered themselves addicted to their preferred game. Gentile's (2008) study of 1,178 children aged 8–18 (see below) also reported that although only 8.5% of children were classified as showing pathological levels of video game use, respectively 21% and 65% of children with non-pathological or pathological levels of use reported being addicted to games. What criteria do players use to decide one is addicted to games? Understanding this might help researchers assess problematic video game use in terms players can understand. This study describes World of Warcraft players' views of video game addiction and their relation to players' views of being addicted to games themselves. The article thus takes a social-cognitive approach (see Bandura 2001), asking about perceptions of behavior, self, and context associated with views of addiction, and about the possible role of these beliefs in helping players evaluate their own play.

Characteristics of Video Game Players

Video game players may play on game systems or online, and the characteristics of those who prefer each game environment may differ. However, in general, U.S. players are on average age 34 and have played computer or video games about 12 years; about 60% are men (ESA 2010). Similarly, Australian and Western European players tend to be in their early- to mid-30s (Butler 2009; Kastiel 2009)—older than Eastern European and Latin American players, who tend to have come to video games later due to lagging technology in their countries (Kastiel 2009; "South America" 2008). Most Chinese players (84%) are also estimated to be 19 to 30 (Canadian Government 2008). In general, the number of female and older male players is increasing (Meloni 2010; Walsh 2009). According to the NPD market research group, in 2010 video game players worldwide played about eight hours/week (Takahaski 2010).

Among online gamers in the U.S., about 14% play massively multidimensional online games (MMOs) (ESA 2010), such as EverQuest or World of Warcraft (WoW), which has 11.5 million users and is the world's most subscribed-to MMO (Guinness World Records 2009). These games can be played 24 h a day and feature complex, exciting, ever-evolving stories that reward players with new skills as their game characters socialize to advance through game levels (Ducheneaut et al. 2006; Wood et al. 2007)—an engaging process that can lead players to lose track of time (Wood et al.). Game guilds may also require up to 25 players to schedule raids for 2 to 8 h at a time (Williams et al. 2006) or a minimum of 20 h a week (Peters and Malesky 2008).

Compared to video game players generally, MMO players are more likely to be male and to play more. For example, in a self-selected sample of 7,000 EverQuest players (mean age 31), most (80%) were male and, according to company game data, played their main game character on average 25.86 h per week (Williams et al. 2008). Analyzing company polls from two EverQuest fan sites (with *N*s of 8,800 or more per poll), Griffiths et al. (2003) also found that most respondents were male (85%), age 14 to 29 (72% on one site), and North American (81% on one site). Over 40% reported playing 30 h or more a week.

Further, those who report playing a lot tend to report more problems. In Yee's (2006b) sample of 5,500 self-selected MMO players (80% male, mean age 26), players averaged 23 h of play/week in their chosen MMO. Indeed, 61% said they had played a game at least

10 h continuously and nearly half felt addicted to their MMO. A smaller group (N=3,000) also completed a version of Young's (1998b) Diagnostic Questionnaire for Internet Addiction, modified to assess preoccupation with video games, withdrawal symptoms, developing tolerance for play, unsuccessful attempts to control or stop play, playing to escape from problems, lying about play, and play interfering with a significant relationship, job, educational or career opportunity. Yee (2006a) found that those reporting a greater number of problems tended to play a greater number of hours per week, or to play for achievement or to escape problems. Among 196 self-selected WoW guild members (who played on average 29 h/week), reported amounts of play also correlated highly with a measure of problematic use-engagement (Peters and Malesky 2008; see Grűsser et al. 2007, noted below).

Admittedly, studies from self-selected samples—especially those recruited from MMO fan sites or forums—may draw players with high levels of play or problematic use. Smyth (2007) instead asked about the experiences of 100 U.S. college students (aged 18–20, 73% male) who were randomly assigned to play one of four types of video games for a month—an arcade game, a console game, a solo computer game or a MMO. Equipment was supplied, players were required to play only one hour a week. When the study began, players in the four conditions did not differ in their play time. Yet after a month, those assigned to play MMOs reported the most play in the past week (14 h vs. six or less), the most enjoyment of and willingness to continue playing the game, the greatest likelihood of making new game friends, and the most interference with social life, academics, sleep and health. The study was too brief to assess long-range effects of play, but did suggest that MMOs have especially strong influences on players.

A study drawing on a stratified random sample (N=3,405) of Norwegian adults registered in a national database also found that among gamers, those who reported playing video games four or more hours a day were especially likely to report playing online and to report negative reactions from others and negative effects on school or work (Wenzel et al. 2009). While some may play video games extensively without problems (see Griffiths 2008), concern about problematic video game use has prompted discussion of its prevalence and whether it constitutes an addiction.

Researcher Notions of Problematic Video Game Use

To date, researchers have not agreed on definitions of video game addiction, nor is it accepted as an addiction in the American Psychiatric Association's (2000) Diagnostic and Statistical Manual-Fourth Edition (DSM-IV). Additionally, the term might seem to sensationalize problems with games (Wood 2008). Instead, researchers tend to refer to "problematic use" of video games (see King et al. 2009, for a review).

Most people think of addictions as having to do with substances (such as alcohol or drugs) that alter brain and blood chemistry and result in physical withdrawal symptoms; some researchers have argued that behaviors (such as excessive video game use) do not alter body chemistry and cannot be considered addictive in the same way (see Holden 2001). More recently, evidence has suggested that certain behaviors (the mostly widely accepted being gambling) may be addictive; it appears that chemicals in the brain, such as dopamine, do seem to change over time as people engage in repetitive behavior (see Holden 2001, 2010). Indeed, gambling has been proposed for inclusion as an addiction in the forthcoming DSM-V (Holden 2010). Yet excessive video game play has not been considered addictive in the same sense as gambling (Wood et al. 2004a), and few have pressed for its inclusion as an addiction in the DSM-V.

Instead, excessive video game play or Internet use have been viewed as symptomatic of other underlying disorders, including depression, obsessive-compulsive disorders, other anxiety disorders, or impulse control disorders (Black et al. 1999; Shapira et al. 2000; Wood 2008). Case studies also suggest that excessive play can reflect poor time management, poor coping, and/or attempted distraction from family issues (e.g., Keepers 1990; Wood 2008).

Shaw and Black (2008) think excessive Internet use is like pathological gambling and should be diagnosed as an impulse control disorder (American Psychiatric Association 2000): "These conditions are characterized by the failure to resist one's impulses to engage in a particular behaviour despite serious personal consequences, and are considered pleasurable and are seldom resisted" (Shaw and Black p. 355). According to the DSM-IV (American Psychiatric Association 2000), pathological gambling is diagnosed upon report of five or more of eight symptoms: preoccupation with gambling and progression of symptoms; tolerance (playing increasing amounts to achieve a high); withdrawal symptoms —unpleasant feelings or physical effects which occur when attempting to reduce or stop play, and loss of control; playing to escape problems or negative feelings; disruption of family, school, or work; lies and deception about gambling; chasing (preoccupation with chasing a bigger payout to recover losses); engaging in illegal acts to get money to gamble; and needing financial bail-out.

Several researchers have adapted criteria for pathological gambling to assess problematic Internet or video game use (e.g., Gentile 2008; Young 1998a, b). For example, Young's (1998b) Diagnostic Questionnaire to assess Internet addiction omits chasing, engaging in illegal acts to get money to play, and requiring financial bailout, but includes preoccupation with Internet use, tolerance, withdrawal, unsuccessful attempts to control or stop use, use to escape from problems, lying about use, and use interfering respectively with a significant relationship or a job, educational or career opportunity. Scores of five or more symptoms present in the past six months indicate pathological use. Young's (1998a) Internet Addiction Test also assesses a variety of problems using Likert scales; scores of 70 and up indicate problematic use.

Other studies of problematic video game use (e.g., Grűsser et al. 2007; Rehbein et al. 2010) have modified the World Health Organization's (1992) International Classification of Diseases and Health Problems (ICD-10) criteria for substance use dependence. These include a strong desire or compulsion to use; difficulties controlling onset, termination, or levels of use; tolerance; withdrawal; neglect of other pleasures or interests; or persisting despite harmful consequences. Dependence is scored for reports of three or more symptoms present together for at least a month or, if persisting for less than a month, occurring together repeatedly in the past year. Griffiths' (2005) six-item measure of problematic video game use also includes withdrawal, tolerance, and relapse (unsuccessful attempts to stop and reverting to earlier patterns of behavior). A strong desire or compulsion to play is defined as salience: games' becoming the most important activity in life, dominating behavior (behavioral salience), thoughts (cognitive salience), or feelings (e.g., cravings). Mood modification is defined as experiencing a buzz, high or feelings of numbing or escape. Conflict is defined as internal or interpersonal conflict associated with play, or conflict between play and other activities. Players are scored as dependent on games if they agree or strongly agree with all items in the measure.

A plethora of measures to assess problematic video game use and different locations and methodologies for recruiting samples have all contributed to varying estimates of the prevalence of problematic use in children and adults. However, it appears prevalence is relatively low. For example, in a study of pathological video game use in a national random

sample of 1,178 U.S. youth aged 8 to 18, Gentile (2008) modified criteria for pathological gambling; he omitted chasing, asked about withdrawal and loss of control separately, and measured disruption in terms of skipping chores or homework, or doing poorly on a test or schoolwork. Gentile found that 8.5% of the children had scores of six or more out of 11, indicating pathological use. An even greater percentage reported being addicted to games—21% of children classified with non-pathological levels of use and 65% with pathological levels of use. Overall, 33% and 23% of children respectively reported skipping household chores or homework to play, 20% doing poorly on schoolwork or a test because of play, and 25% playing to escape problems. A study of 15,168 German ninth-graders (every third child in a large self-selected sample) instead used a variant of the ICD-10 and found that only 3% of boys and 0.3% of girls scored as dependent on video games; however, 8% of online players scored as dependent (Rehbein et al. 2010). Also, among 3,048 on-line players (50% boys, mean age 14) from a stratified random sample of Dutch schoolchildren aged 13–16, 3% scored as dependent (Van Rooij et al. 2010).

Studies have also asked about adults' problematic video game use, including two using a modified version of the ICD-10 (Cypra 2005; Grűsser et al. 2007). Cypra (2005) recruited 11,442 MMO players (90% male, mean age 22.5, average play 22.5 h/week) from game or fan web-sites or via e-mail. Of these, 5% scored as pathological video game users, but 20% reported being addicted to games. Grűsser et al. (2007) also recruited 7,069 players (94% male, mean age 21) from an online gaming magazine and found that 11.9% scored as pathological gamers. These players tended to report the most daily play and were especially likely to report withdrawal and craving. However, the estimate of problematic use could have been especially high if those reading gaming magazines are especially dedicated to games. Hussain and Griffiths (2009a) also studied 119 MMO players (69% male, mean age 28.5) recruited from forums of eight MMOs, including a woman gamers' site. Of these, 7% scored as dependent on Griffiths' (2005) measure of video game addiction. The relatively low estimate of problematic use may be due to the study's including relatively more women than other studies have done. In general, Griffiths (2008) thinks current measures of video game addiction do not adequately assess severity, temporal aspects of play, or the role of context in play, and overstate prevalence.

Charlton (2002) also thinks that checklist models of addiction which include seemingly mild signs (such as euphoria while playing, tolerance, or cognitive salience) might overstate the prevalence of addiction. Charlton surveyed 404 English undergraduates about their experience with computers, including computer apathy-engagement and computer anxiety-comfort (Charlton and Birkett 1995), as well as items meant to tap behavioral addiction: e.g., cognitive preoccupation with computers, euphoria while playing, tolerance, behavioral salience, feelings of withdrawal when not playing, relapse, and conflict between computer use and other activities. Responses were submitted to a principle axis factor-analysis to examine the statistical association of these items and see if different items were answered in similar ways.

The survey items clustered statistically in three patterns, reflecting engagement with computers, addiction to computers, and comfort with computers (Charlton 2002). Items loading on the addiction factor included behavioral salience, withdrawal, relapse, and conflict between computer use and other activities. Reports of euphoria, tolerance, and cognitive salience clustered on both the engagement and addiction factors but more strongly on the engagement factor. Items on the engagement and addiction factors correlated moderately strongly. Charlton proposed a developmental model where high engagement might later be associated with addiction if negative symptoms associated with play led players to define it as addictive (cf. Orford 1985). Yet the study did not ask about players' own views of problematic use.

Cognitive theorists Lee and LaRose (2007) also proposed a developmental model of problematic video game play. Bandura (1991, 2001) has written about the way individuals observe their behavior, judge it according to norms, and adjust it accordingly; deficient self-regulation may occur when individuals stop judging their behavior according to norms or stop adjusting it based on their reactions to it. Lee and LaRose suggested that players initially consciously choose to play video games based on a sense of flow in the game (as measured by enjoyment, concentration, and a sense of merging with the game; see Csikszentmihalyi 1990) and based on expectancies of outcomes—for example, that games will help them pass time or get away from problems. However, while playing to deal with psychological states, players may develop habits of play, and less often attend to why or how they play. They may also find it hard to regulate play if they stop judging it according to social norms for play time or stop using reactions to play (such as guilt) to modify what they do (see LaRose et al. 2003).

When Lee and LaRose used structural equation modeling to test their ideas in a study of 388 U.S. college student video game players (59% male, average play 11.72 h/week), they found that a sense of flow while playing was positively associated with outcome expectancies (e.g., reports of playing for escape). Players' self-reported video game usage correlated positively with these expectancies, but also with perceptions of play as a habit and with perceptions of deficient self-regulation (e.g., play is out of control or interferes with other activities). Although behavioral measures of video game use would still be needed to validate the self-report measures, the study suggested a model for and three components in the way excessive play develops. Yet players were not asked how they would define problematic play.

Players' Notions of Video Game Addiction

Indeed, little research has asked how players themselves perceive problematic video game play or addiction. In an interview study of ten Taiwanese players who reported being addicted to the Internet, the players said that games were a major focus and that they would be bored without them (Wan and Chiou 2006). They reported playing for leisure, entertainment; excitement or challenge; to cope with loneliness, isolation, boredom, stress, anger or frustration; or to escape reality. Games also reportedly satisfied needs for achievement, power, or social life. The researchers suggested that game roles compensated for real relationships or situations that were not as the players had hoped. Since the sample was small and came from one country, it was not clear if themes would generalize to other players. Interviewees may also have presented an unrealistically positive view of their experiences.

Rather than conducting interviews, Chappell et al. (2006) instead culled EverQuest game forums for spontaneous descriptions of play and coded themes in the accounts of 12 individuals who were long-time players; had stopped playing but resumed; or had quit. As in the Wan and Chiou (2006) study, players said that games were the main activity of their lives. However, in the forums players also wrote that initially positive views of video games as challenging and fun social events could turn to strong negative views as games took over their lives and they stopped attending school or work, lost relationships, or gave up on eating well. Some said they felt addicted to games as soon as they started playing; others felt addicted over time; games might even remain on one's mind after quitting. Players also noted withdrawal symptoms and changes in mood associated with play. However, it was not clear that the players were addicted to games, nor how representative findings from the small sample were.

In a larger study, Hussain and Griffiths (2009b) recruited 71 players from online gaming forums and in-game WoW posts and then used e-mail or an online chat format to conduct interviews about daily play. Gamers could bring up their own topics, from which six emergent themes were coded. Noting the psychosocial impact of games, most players cited both positive (72%) and negative (63%) effects, such as neglecting sleep, work, school, or friends to play. Players also mentioned playing to relieve negative feelings (31%) or experiencing time loss and playing longer than intended (35%). A majority (61%) discussed integrating games into daily life, but 31% found their play excessive and 20% considered games potentially addictive. These players attributed excessive play to belonging to a guild, raiding, trying to achieve new levels of play, or completing game tasks. With a larger sample than previous qualitative studies and no specific focus on problematic play, this study showed that players' views of games tended to be more positive than negative and that relatively few players considered games addictive. However, players were not asked to define behaviors they considered to be addictive.

To summarize, studies have generally not asked players about their own definitions of addiction or problematic use, nor how these relate to player reports of being addicted themselves. This study asked 438 players of the online role-playing game WoW to complete an open-ended question about behaviors they considered characteristic of video game addiction; additionally, the coded themes were correlated with self-reports of addiction and scores on a video game addiction scale. Because the study is exploratory, no specific hypotheses are proposed.

Method

Procedure and Sample

WoW players were recruited for a study about players' demographic characteristics, play, and happiness through online postings on the general WoW web-site and each of its "realm" forums. Interested players could click on a link to the survey administration web-site where they could give informed consent and fill out the survey. To limit duplication of responses, respondents were asked to give an e-mail address or create a new one. No measures were taken to ensure that subjects remained focused during the survey, nor were players paid. Subjects were later directed to a webpage about the study and to http://netaddiction.com, which lists referrals for help with depression or addiction. No potentially problematic players were referred for help.

The study excluded youth under 18 (who did not have parental consent to participate), and also removed data from 20 adults from Asia, Africa, the Middle East and Europe because it was not clear how well they spoke English. Since Australians (N=47) differed on several demographic dimensions from North American participants, they were also removed from the sample to reduce variance. Four players' responses were removed due to specious answers. The study thus pertained to 644 North American WoW players, of whom 438 (68%) completed the survey, including its last question about characteristics of addiction. Completers were less likely to report being addicted to video games (44%) than non-completers (61%), $X^2(1, 599)=13.59$, $p<.0001$, but did not otherwise differ in terms of addiction scale scores, reported video game play per day, age, country, gender, minority status, or whether they were employed or had a partner.

Of these 438 players, 383 (87%) came from the U.S. and 55 (13%) from Canada. Participants' age ranged from 18 to 55 (M=22.80, SD=5.14). Most were male (84%) and

Caucasian (86%); others were Asian-American/Pacific Islander (5%), Latino (5%), African-American (1%), Native American (1%) or of another ethnicity (2%). Over half reported having a high school degree (59%) or less (2%) education, and 39% reported being students. About one-quarter (28%) reported being unemployed; others said they worked part-time (30%), fulltime (37%) or were self-employed (6%). About three-quarters (76%) reported not having a partner (2% were separated or divorced), with 10% reporting being married and 14% having a partner.

Measures

Participants completed a 63-item survey that took about 20 min to fill out. It asked about demographic characteristics, daily hours spent using computers or video games, the games typically played (summed as Number of games), perceptions respectively of being addicted to video games or depressed, and perceptions of behaviors characteristic of video game addiction. A single item, Admit addiction, asked players if they were addicted to video games. The question did not define addiction, so players answered based on their own views of addiction.

Video Game Addiction Scale This study also assessed video game addiction using a modified version of Young's (1998a) 20-item Internet Addiction Test (IAT). The IAT asks how often one uses the Internet, is preoccupied with using it or experiences consequences of using it (1 = not at all to 5 = always). Scale totals are scored: <40 = average, 40–69 = frequent problems, may be developing an addiction; 70–100 = significant impairment, most likely have or are developing an addiction. The IAT shows good reliability and validity. In a study of a stratified random sample of 328 Korean senior high school students (Yang et al. 2005), Cronbach's alpha for the IAT was .92, and test–retest reliability, assessed with 60 youth after two weeks, was .85. Convergent validity for the IAT was demonstrated in that excessive users (5% of the sample) had the highest scores on the Symptom Checklist-90-R (Derogatis and Savitz 2000). IAT items have also been shown to load on one factor in confirmatory factor analysis, have high internal reliability, and show construct validity in correlating highly with reports of excessive online play (Khazaal et al. 2008).

For this study, the IAT was modified to assess video game addiction, with the words "video games" substituted for the word "Internet." Cronbach's alpha was .89. In a study of 72 self-selected 9th and 10th grade students at a U.S. school, Chan and Rabinowitz (2006) modified the IAT in similar fashion and reported Cronbach's alpha of .82 and the scale's significant correlation with reported time playing Internet or console video games. King et al. (2009) similarly modified the IAT to create the Problem Video Game Playing Test (PVGT) and validated the measure in two studies: one of 373 college student gamers from South Australia, and the other of 416 Australian video game players recruited from video game retail outlets, Internet cafes, and gaming businesses. PVGT items loaded on one factor in confirmatory factor analysis and had Cronbach's alpha of .93 and .92. The scale also showed good construct validity (correlating significantly with reported hours of play per session and per week) and moderate convergent validity, correlating with Depression Anxiety Stress Scale measures (Lovibond and Lovibond 1995) at between r=.18 to r=.29, all p<.01. King et al. recommended using the PVGT as a continuous measure, since recommended thresholds for problematic play require further research. Similarly, this study used the modified IAT as a continuous measure.

Perceptions of Addiction Participants were also asked "What behavior would I have to see in myself to consider myself addicted to video games?" Responses did not necessarily

indicate that participants showed those behaviors. Sentences or phrases reflecting a discrete idea were coded into categories (e.g., "play many hours daily" coded as "play a lot"), with the meaning of the text and already existing categories being constantly compared (Strauss and Corbin 1998). If an idea did not fit an existing category, a new category was generated until all text could be categorized in terms of emergent themes (see Appendix 1 for themes and examples of items). A player's answer could be coded into more than one category if several ideas were noted. Two coders coded the themes, and inter-rater reliability calculated for 20% of the responses exceeded .80. Nine players whose responses were general or hard to interpret were included in the sample but not scored as having themes.

Data Analysis

Frequencies were run for items reflecting perceptions of video game addiction (coded 1 = theme mentioned, 0 = theme not mentioned), and Spearman's two-tailed correlations were then run to examine correlations of addiction perception items with each other, and with self-reports of addiction and the modified IAT. Spearman's two-tailed correlations were also run to examine correlations of self-reported addiction with the modified IAT and demographic items.

Results

On average, respondents reported using computers 8 hours a day (M=8.13, SD=3.51), playing video games 5.5 h a day (SD=2.75), and typically playing three different games (M=2.96, SD=1.55). The average modified IAT score (M=49.47, SD=12.01) and almost three-quarters (73%) of IAT scores fell in the range "frequent problems, may be developing an addiction;" another 6% of players scored in the highest range "most likely have or are developing an addiction." Responding to a single-item question about whether they considered themselves addicted to video games, 44% of players said they did. Those who considered themselves addicted to games tended to report more daily play, $r(432)=.33$, $p<.0001$; higher scores on the modified IAT, $r(437)=.54$, $p<.0001$; not having a partner, $r(434)=.14$, $p<.004$; being unemployed, $r(437)=.11$, $p<.02$; and not being Caucasian, $r(436)=-.13$, $p<.008$.

Perceptions of Video Game Addiction

Salience Frequencies for coded items reflecting players' views of video game addiction are shown next (Table 1). About 40% of players thought video game addiction involved behaviors suggesting the salience of video game play in one's life, including playing or thinking about games a lot, craving games, scheduling around them, and games' being central in life.

About one-fifth of players (22%) mentioned that addiction would involve playing many hours, constantly, or to excess. Some who thought addiction involved playing a lot or "way too much" listed the amount of play they found excessive—on average 8 h a day (range: 2 to 18 h). Others evaluated excessive play in terms of staying up all night to play or in terms of time spent on trivial goals, including conducting game raids. "Doing an all-nighter to get a goal on a video game seems to be addicting." "I guess the behavior I would have to see in myself to be considered addicted to video games would be myself running home just to catch a raid."

Table 1 Perceived signs of video game addiction: salience, mood modification, relapse, withdrawal

Behaviors perceived to show addiction (n=429)	N	%
Salience of video games	170	40%
Play a lot	95	22%
Think about games a lot	49	11%
Crave games	37	9%
Don't do anything but play video games	13	3%
Only source of happiness	8	2%
Schedule around games	7	2%
Stay home to play	5	1%
Blurring of games and reality	5	1%
Mood modification	45	11%
Play for fun or to fill time	26	6%
Emotional escape	16	4%
Play to socialize	14	3%
Can't stop playing/Relapse	42	10%
Withdrawal symptoms	23	5%
Video game addiction is like a chemical addiction	8	2%
One cannot become addicted to video games	7	2%

Yet others (11%) said that addiction involved games' cognitive salience—constantly thinking about, talking about or fantasizing about games even when one wasn't playing: "When I am not playing, I often think about playing." Players noted "calculating gaming statistics in my head before I sleep," reading forums about games, or daydreaming about or discussing them: "The video game subject is a major part of conversation between you and friends, who might or might not play." Some (9%) also wrote of constantly craving or longing to play—"craving a game over anything else," "an inability to live without them" or "a desire to play at all times."

For a small number of players (1% to 3%), addiction could also be defined in terms of the centrality of games in one's life. Some said addiction involved play to the exclusion of any other activities ("Can't think of anything else to do when video games are taken away") or mentioned scheduling around games (e.g., "scheduling chores and errands or even dates and appointments around raid times"). One player wrote, "Video games are no longer simply recreational and no longer occupy 'free time.' I consciously set aside time every day to play." Others said addicted players might think games were only one's source of happiness, or might not leave the house in order to play. Addiction could even involve the blurring of life and games, some said. Those immersed in games could lose track of reality —"failure to remember that the game I play is a game"—or could treat life as a game: "relating to real life in terms of a video game" or "wanting to do the things I do in video games on regular people."

Mood Modification About 12% of participants also gave answers indicating that video game addiction might involve playing to alter one's mood. They mentioned playing to have fun and fill time, playing socially, or playing to reduce depression and escape problems.

Some (6%) said that games were fun, interesting, relaxing, or a way to spend free time. "Nothing else seems to pass the time as fast." Yet, some (4%) thought it a sign of addiction

to play games to escape problems or depression. "Hey, if there is a problem, just hit the ignore button or change servers." One player wrote:

> Whenever I am depressed or wanting to escape from the real world into something I can manage and control is when I will resort to playing video games. That is addiction in that some aspects of life are undesirable and the only true escape is to escape to another world where you are something else and can enjoy the sense of fantasy that can exist only in those imaginary worlds.

Those who mentioned playing to socialize with friends or people online (3%) also generally said they enjoyed meeting people online and working toward common goals. "Many of the people that I game with are now considered some of my closest friends, despite the fact that we have not met in person. I call them on the phone and have out-of-game contact with them." A person who played online with real-life friends said, "It is like you are hanging out with your friends, just over the Internet."

Yet loyalty to online friends or one's guild could contribute to a sense of being addicted to games. "The only video game I got addicted to was WoW because of my dedication to my guild." "I don't look forward to any prolonged time away from my online friends, even to spend time with friends I have in real life." Another person wrote, "I am quite well known, and my avatar's name would be recognized by more than 10,000 people; I directly manage/lead people with online time similar to my own. This is a facsimile of a social life, I know." Views that addiction involved playing for social life and for fun/to fill time correlated positively, $r(429)=.34$, $p<.001$, and a combined item in turn correlated positively with reports of playing for emotional escape, $r(429)=.13$, $p<.006$.

Can't Stop Playing/Relapse Another behavior some (10%) thought indicative of video game addiction was being unable to stop playing, whether to leave a game, take extended breaks from playing, or quit playing altogether ("at least one unsuccessful attempt to stop playing video games"). Players said one might want to stop but be unable to, in what one called, "a lack of choice/control about playing games, rather than clearly voluntary use." "I feel like I can't really stop playing the game. It's become more like an occupation or obligation than something optional at the end of the day if I have time." "I'm in a raid guild in World of Warcraft, and I see a lot of people who can't even log out of the game." In contrast, several players said they were not addicted because they could stop playing. "I take them all out of my life for 2–7 days to readjust. If I felt unable to distance myself like that, I would consider myself addicted."

A few players (1%) also said addiction could involve playing regardless of guilt, regret, or boredom: "I log into the game regardless of whether or not I feel like playing." "Even when I'm bored of them, I do not go outside or call a friend, I just switch games and keep going."

Withdrawal and Tolerance Other players (5%) said they would consider themselves addicted to games if they stopped playing and then experienced depression, anxiety, anger, agitation, stress, or physical symptoms. "Amazingly, not playing Warcraft for a few days can send me into withdrawal, similar to my old vice, caffeine addiction." Yet one person thought feeling depressed when not playing instead reflected being away from friends online. "Ceasing playing takes you away from a social group that you feel very comfortable with and leaves you sad and kinda missing those people, just like you would miss friends anywhere else."

Only one person said developing a tolerance to games would show addiction. Instead, another wrote, playing more would help fill time: "An increase in the amount of time I spend playing video games would not alarm me, it would merely be a sign that I have less to do lately." Others (1%) also noted the role of context in their play, including having ample free time (e.g., in the summer), living in places with little to do (e.g., small towns or dangerous areas) or wanting cheap fun. "Where I live there's not a lot to do except go out and spend money I don't have so I spend 15 bucks a month to play WoW instead of $20–$40 a weekend to go to a bar."

Players also differed as to whether video game addiction might generally resemble other kinds of addiction. Some (2%) said yes: "I'm also addicted to drugs and alcohol and I've found lots of the same behavioral patterns occur." "Same as any addiction, gotta have my dose at some point." However, others (2%) thought that since games do not involve a psychoactive substance, they could not be addictive. "People choose to play video games and could also choose not to play them, there is no sort of chemical dependency as there is with drugs and alcohol."

Games Interfere with Daily Life Table 2 also shows that a majority of players (62%) felt addiction would involve games' interfering with other activities, such as socializing (35%), work (20%) or school (11%). Employed individuals and students respectively tended to say that games would interfere with work, $r(429)=.16$, $p<.001$, or school $r(397)=.21$, $p<.0001$.

Of players mentioning video game addiction's impact on social life, half and one-third of players respectively mentioned games' interfering with friendship or going out with others. Another one-quarter mentioned interference with family, marriage or children. "Chores are chores, work is work, not wanting to do them is natural. But not wanting to spend time with my friends or family would make me wonder if I was really addicted." Players said addiction might also be shown by taking out a laptop to play when one had guests or was at

Table 2 Perceived signs of video game addiction: games interfere with other life activities

Behaviors perceived to show addiction (N=429)			N	%
Games interfere with other life activities			264	62%
Socializing			149	35%
Friendships	74 (50%)	Dating, romantic partner	19 (13%)	
Going out, meeting people	47 (32%)	Relationships generally	12 (8%)	
Family, marriage, children	39 (26%)	Sexual relationships	5 (3%)	
Work			85	20%
Skip work	32 (38%)	Lose job	8 (9%)	
Impaired job performance	16 (19%)	Quit work	7 (8%)	
Neglect work	15 (18%)	Play/think about games at work	3 (4%)	
Don't look for work	10 (12%)			
School			47	11%
Skip school	15 (32%)	Neglect school	9 (19%)	
Neglect study/homework	13 (28%)	Quit school	4 (9%)	
Impaired grades/fail	11 (23%)	Play/think about games at school	1 (2%)	

Percentages in parentheses are percentages of those endorsing the broader category above, and not percentages for the sample as a whole

others' houses, or by getting drunk at the computer when playing with friends online. Others mentioned acting moodily or irritably with others during or after games (2%) or lying to hide play (1%).

As for ways that addictive play could interfere with work or school, players were especially likely to note skipping these but also mentioned neglecting work or homework; experiencing negative effects on performance (e.g., due to lack of sleep); quitting work or school; or not seeking work. Players also thought addiction would involve games' interfering with life in general (10%), responsibilities (10%); sleep (5%); eating (4%); other pastimes, such as sports or movies (4%); health and hygiene (3%); sex (1%); or income (1%), such as paying a lot for gear. A few (1%) also mentioned losing all of one's former interests. Another 2% of players thought one would be addicted to games if one played despite known consequences.

Awareness of Addiction Finally, some players (7%) said that addiction involved knowing one was addicted. Such awareness might be related to judgment of one's behaviors ("I would have to see myself making excuses to play video games, which I do") or independent of one's behaviors ("before it took up most of my day, I knew I was addicted to them"). A few players (6%) also explained why they felt they were not addicted, mostly saying they could stop playing if they wanted to, but also reporting an improved self-concept: "Definitely a change in my morale, I never have to stop and think 'Is this all I am?' I have other stuff to do."

Correlations of Perceptions of Addiction with Each Other

In Spearman's two-tailed correlations, several items about views of addiction correlated significantly with each other. Play a lot correlated positively with Think about games a lot, $r(429)=.18$, $p<.01$, and with Blur of games and reality, $r(429)=.10$, $p<.04$; it also correlated negatively with mention of Withdrawal symptoms, $r(429)=-.10$, $p<.04$. Reports of Craving games also correlated marginally with reports of doing nothing but playing games, $r(429)=.09$, $p<.06$, which in turn correlated positively with reports of games as one's only source of happiness, $r(429)=.18$, $p<.01$. Further, Games interfere with other life activities correlated negatively with Play a lot, $r(429)=-.20$, $p<.01$; Think about games a lot, $r(429)=-.17$, $p<.01$; and Crave games, $r(429)=-.18$, $p<.01$, as well as with mention that addiction involves respectively withdrawal symptoms or an inability to stop play, both $r(429)=-.11$, $p<.02$. Views that gaming is not an addiction correlated positively with mentions of the context of play, $r(429)=.10$, $p<.04$ and playing for fun or social reasons, $r(429)=.17$, $p<.01$.

Correlations of Perceptions of Addiction with Self-Reported Addiction

Items about views of addiction were also associated with self-reports of addiction (Table 3). Players tended to endorse a single-item measure about being addicted to games and had higher modified IAT video game addiction scores if they thought video game addiction involved games' salience in one's life, including playing a lot, thinking about games a lot, or scheduling activities around games. Self-reported addiction also correlated positively with views that addiction involved playing to escape problems. However, those who said that addiction involved seeing games as one's only source of activity or happiness tended not to report being

Table 3 Significant correlations of reported signs of video game addiction with addiction measures

Perceptions of video game addiction	Admit addiction *r*	Video game addiction scale (Modified IAT) *r*
Salience		
Play a lot	.30**	.13**
Think about games a lot	.26**	.14*
Schedule around games	.11*	.10*
Don't do anything but play games	−.11*	−.02
Only source of happiness	−.09*	−.02
Emotional escape	.10*	.08
Games interfere with other life activities		
Work	−.27**	−.15**
Socializing, relations with friends	−.23**	−.13**
Family, marriage, children	−.16**	−.13**
Dating, romantic partner	−.12*	−.05
Responsibilities, tasks	−.02	−.11**
Can't stop playing/Relapse	−.15**	−.05

N for correlations with Admit addiction = 428, modified IAT = 429
*$p<.05$ **$p<.01$.

addicted. Self-reported addiction and video game addiction scale scores also correlated negatively with reports that addiction involved games interference with other activities (especially work, friendship, or other social activities). Further, self-reported addiction correlated negatively with views that addiction involved an inability to stop playing.

Discussion

Among the WoW players in this study who described characteristics of video game addiction, over 40% reported being addicted to video games, although only 6% scored as being at high risk on a video game addiction scale (a modified IAT, see Young 1998a). Similarly, based on symptom-checklist measures of problematic use, Gentile (2008) and Cypra (2005) have reported low prevalence of problematic video game use in children (8.5%) and adult MMO users (5%), but higher self-reported rates of addiction (respectively 21% and 65% for children with non-pathological or pathological levels of use; and 20% among adults). Also, in Yee's (2006b) study of over 5,500 MMO players, nearly half reported being addicted to their chosen MMO. Compared to MMO players in other studies (e.g., Williams et al. 2008; Yee 2006b), WoW players in this study were relatively young (mean age 23 vs. 26–31) and reported more play/week (37.5 h vs. 23–26 h). Video game play may have been especially salient to these players, contributing to especially high rates of self-reported addiction.

Players' Notions of Addiction

Players in this study most often defined video game addiction in terms of the positive or negative salience of games in one's life—playing or thinking about video games a lot, or

play that interfered with other activities—as well as playing to enhance mood and escape problems. These findings tally with Lee and LaRose's (2007) study (see above), which found that college student players' reported video game usage was significantly associated with expectancies for play (e.g., playing to escape problems), perceptions of habitual play, and views of being unable to regulate play. Lee and LaRose suggested that players initially consciously choose to play, but that play may become more habitual and less regulated as players are conditioned to play and less often judge their play or reasons for it. Perhaps WoW players in this study also based their ideas of addiction on similar views of how addictions develop. In contrast, only 10% or fewer listed withdrawal or tolerance as signs of addiction, although researchers commonly consider these signs of problematic use. If researchers use relatively stringent criteria to assess problematic use, this could help explain the lower rates for problematic use or addiction reported by researchers compared to rates based on player self-reports (e.g., Cypra 2005; Gentile 2008).

Other studies also suggest that players' notions of addiction may be related to ideas about how it develops. In a study of 12 players posting on game forums, Chappell et al. (2006) found that players initially had positive views of games that became increasingly negative as they saw games taking over their lives. Mention of withdrawal and tolerance were less central in player narratives, although surveys might have elicited reports of such symptoms. In Charlton's (2002) study of college students' computer use (see above), factor analysis also differentiated reported engagement with computer (e.g., euphoria) and addiction to them (e.g., withdrawal). Charlton thought high engagement might come to be defined as addictive if one experienced negative consequences of use, but the study did not collect longitudinal data to address the question.

Possible Norms for Play In this study, correlations between players' views of addiction and self-reports of being addicted to games also suggested that players might consider some "addictive" behaviors more acceptable than others. Players who thought video game addiction involved habitually playing or thinking about games tended to report being addicted to games and had higher addiction scores. Perhaps in some cases, players confused addiction with non-pathological high engagement with games (see Charlton 2002). Individuals who thought addicted players would play to modify their mood, including playing to escape problems, also tended to admit being addicted. Perhaps they thought they had reasons to continue play that might make it hard to stop. Yee (2006a) also found that MMO players' reports of problematic use correlated positively with reports of playing a greater number of hours per week or playing for escape or achievement. He thought different internal motivations and external reinforcers for play could contribute to different pathways for individual play, and the same could be true for views of addiction to play.

In contrast, players were less likely to report being addicted to games if they tended to define addiction in terms of deficient self-regulation—being unable to stop play or games' interfering with other activities. For some, being able to stop play in the short- or long-run seemed to serve as a criterion to decide they were not addicted. Players who thought addiction involved games' interfering with such activities as work, school, or relationships also tended not to report being addicted to games and had lower addiction scale scores. Lee and LaRose (2007) noted that two cognitive processes involved in regulating play include consulting social norms and evaluating one's responses to play. Some WoW players could have held norms that games should not interfere with other activities or be one's only source of activity or happiness; these views could have contributed to playing less and being less likely to feel addicted to games. In an experimental study of 100 youth aged 16–22 (77% male), Chiou and Wan (2007) also found that players induced to perceive

greater personal responsibility for adverse consequences of online video game play (e.g., on self-esteem, peer relations, or academics) were more likely to report adverse attitudes about play afterward. Still, it is not clear if such changes in attitude would contribute to actual reductions in play. Additionally, the fact that some WoW players said they continued to play even when bored is consistent with the view that deficient regulation of play could be related to ignoring one's reactions to play (see Lee and LaRose 2007).

It is also possible that some players recognize norms for regulating play whereas others do not. In a cross-sectional survey study of 222 MMO players recruited from online forums (86% male, mean age 23, average play 23 h/week), Lafrenière et al. (2009) distinguished between two types of players. Those reporting "harmonious" addictions said they enjoyed games but could play without jeopardizing work or relationships. Players reporting "obsessive" addictions and difficulty controlling urges to play also reported enjoying games but additionally reported more play, more problematic behaviors (such as feeling irritable when they couldn't play) and more physical symptoms (such as lack of sleep). Perhaps players aware of the conflict between games and other activities consider this a sign of addiction; play less, and tend not to consider themselves addicted. However, a longitudinal study would be needed to clarify the relation of players' views of addiction and their behavior.

The Possible Role of Context in Assessing Play It should also be noted that WoW players in this study who reported being addicted to games tended to report being unemployed or not to have a partner, and tended not to think addiction would involve games' interfering with other activities. These players may have had fewer priorities with which games interfered, possibly making it harder to recognize problems regulating play. In particular, players were especially likely to mention that games could interfere with friendship (see also Hussain and Griffiths 2009b). Perhaps concerns about friendship were relevant across players, even for those who didn't work, go to school, or have a partner. In Smyth's (2007) one-month experiment, players assigned to play MMOs were also more likely than other video game players to report making new friends in the game and interference with social life. Because MMOs can involve continually meeting new people, they may be especially absorbing. Yet Smyth's study was a short-term study, and given time, players may find ways to juggle friendships online and offline.

Players also seemed to interpret possible symptoms of withdrawal or tolerance in terms of their life context. Some WoW players (5%) did think one might be addicted to video games if one experienced agitation, depression, or physical feelings of withdrawal when one stopped playing. Similarly, a telephone study of 312 gamblers in St. Louis found that those who reported feeling restless, angry, irritable, guilty or disappointed when trying to quit gambling were most likely to be diagnosed with a gambling disorder (Cunningham-Williams et al. 2009). Yet, a few WoW players (2%) said one could not become addicted to games or thought possible withdrawal symptoms or tolerance might simply reflect sadness about missing gamer friends or playing a lot because one had more time. Players who defined playing a lot as a sign of addiction also tended not to mention withdrawal; some may have played so much they did not experience withdrawal. Perhaps behaviors that reflect games' taking a lot of time (e.g., habitual play or games interfering with other activities) are less ambiguous and more easily recognized as problematic. Indeed, some players listed thresholds for excessive play—on average, eight hours a day. However, it is also possible that avid players could use such high play thresholds to reassure themselves that they were not playing too much.

Implications for Assessment

Larkin et al. (2006) think problematic play is best understood in terms of the interaction of individuals, their behaviors, and their environments, and this study also suggests that players' views of self, behavior and social context all be taken into account when assessing problematic play. Over 40% of players endorsed single-item reports of being addicted to video games, and these reports correlated significantly with scores on a problematic-use scale derived from DSM-IV criteria (Young 1998a). These findings suggest that players should be asked whether they are concerned about problematic play or addiction to games. Even if their definitions of addiction differ from researchers,' the question may elicit players' discussion of their concerns and could provide data that would help clarify which players feel in need of help.

With regard to assessing problem behaviors, this study suggests that players would be able to relate to questions about game habits and salience (e.g., thinking about or playing games a lot); difficulty regulating play (e.g., difficulty stopping play or games' interfering with other activities); and playing to modify one's mood. Players could also be asked if they think their play for social reasons eclipses real-world relationships or their play for fun is used for escape. Asking about thresholds for excessive play or whether game tasks seem to take too much time might also help in assessing players' views of when they are playing too much.

In contrast, players tended not to mention withdrawal or tolerance as signs of addiction. In part, some evaluated possible symptoms in terms of context (e.g., attributing increased play to having more free time) or whether they thought one could become addicted to games. This suggests that assessments of problematic gaming (including of withdrawal and tolerance) ask about both addiction beliefs and players' life context, including whether they work, have a partner, have ample free time, or live in a place with little to do. Researchers and clinicians could then use such information as a guide to possible underreporting of problematic play.

Limitations of the Study and Directions for Future Research

Finally, limitations of this study should be noted. Due to social desirability or problems with recall, players completing self-report measures might not have accurately reported the extent of their problematic play, although it also appears players may be more truthful online than offline (Wood et al. 2004b). Further, this self-selected group of North American WoW players was a largely young, male sample that reported more play/week than that reported in other MMO studies (e.g., Peters and Malesky 2008; Yee 2006b). Not only do MMO players tend to play more than other video game players (see Smyth 2007), but those recruited from game forums may be especially dedicated, or younger players who do not play on consoles at home (see King et al. 2009). Views that video game addiction involves playing or thinking about games a lot may be more typical of avid MMO players than other video game players. Also, participants who did not state views of addiction were disproportionately likely to consider themselves addicted to video games. If more of these players had participated, a greater percentage of players might have mentioned withdrawal or tolerance. Yet players in this relatively large sample were able to offer their own views of addiction, and a mixed-methods approach made it possible to correlate these items with players' self-reports of addiction.

In future research, it would be interesting more systematically to survey players about the notions of addiction elicited here and to examine the relation of these items to each

other and to reports of problematic play, number of years playing, types of games played, or cultural beliefs about addiction. Research on strategies to reduce or stop play would also be useful (see Lewis et al. 2009). In general, such research would complement other recent studies on notions of recovery and their role in health (e.g., Laudet 2007; White 2007).

Video game players may be reluctant to believe that something so fun can come to take up so much time that other areas of life suffer. Researchers and counselors can play an important role in helping players evaluate the impact of their play in their own terms, so that players can find ways to balance and enjoy their activities in both their virtual and real worlds.

Appendix 1

Examples of Items Coded into Categories for Definitions of Addiction

Play a lot: With the amount of time I spend playing Warcraft, it is already apparent to myself that I am addicted; Playing way too much; Playing eight hours or more daily

Think about games a lot: All the time thinking about videogames; Thinking about playing video games when you are doing something else; Daydreaming about them

Crave games. Craving a game over anything else; An overwhelming need to play; A constant desire to play

Don't do anything but play video games: Where I ignore the world outside video games

Only source of happiness: At the point where I couldn't be happy without playing

Schedule around games: Setting aside time to play games on a regular basis is being addicted; Planning EVERYTHING around your habit, not the other way around

Stay home to play: Generally not leaving one's room to play games

Blurring of games and reality: A loss of touch with reality

Play for fun or to fill time: I love playing video games, I suppose it's a bit of an addiction

Emotional escape: I'll be...addicted when I play video games as a form of escape

Play to socialize: I may be addicted to the new social conditions video games have evolved to provide. I like many of the people I have met online, and I enjoy spending time with them

Can't stop playing/Relapse: You're only addicted when you cannot pull yourself away; Unable to stop or quit

Play when don't want to: I think people who are addicted will play a game even when they don't feel like playing it that much; If I felt guilty about playing games, I would feel addicted.

Withdrawal symptoms: Moody or irritated when not playing; Anxiety related to inability to play, begin to feel dependent on games

Tolerance: Gradually increase my time spent playing video games on a daily basis

Video game addiction is like a chemical addiction: I'm also addicted to drugs and alcohol, and I've found lots of the same behavioral patterns occur

One cannot become addicted to video games: An addiction is only possible when it involves a psychoactive substance; I do not believe that it is possible to be addicted to something that does not physically interact with you

Context: I live in a neighborhood with not much to do; An increase in the amount of time I spend playing video games...would merely be a sign that I have less to do lately

Games interfere with other life activities: When I choose video games over real life events; I would consider myself addicted when I sacrificed time with friends to play video games; Skipping work for games; Neglecting school just to play video games

Moody: Yelling at people for bugging me while playing video games

Lying about playing: Sometimes I lie to people saying I'm not presently playing when they ask, when I actually am

Loss of interests: Loss of interests in what I used to like

Play despite known consequences and adverse effects: When you start experiencing consequences as a direct result of playing games, and still choosing to play games.

Awareness of addiction: I know I have an addiction; Being self-aware of my addiction

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