

Are some video games associated with more life interference and psychopathology than others? Comparing massively multiplayer online role-playing games with other forms of video game

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Abstract

Massively multiplayer online role-playing games (MMORPGs) are a type of video game that is considered to have particular potential to be associated with life interference and psychopathology when played frequently and intensively. This study sought to compare players of MMORPGs with players of other types of video game in terms of problematic use, life interference, and levels of psychopathology. An international sample of 1,945 video game players completed a series of questionnaires online. While MMORPG players reported increased rates of problematic use and life interference compared with non-MMORPG players, there were no differences in levels of psychopathology. Differences between MMORPG players and non-MMORPG players appeared to be associated with the increased amounts of time that MMORPG players played for: The amount of time spent playing appeared to mediate the relationships between type of game played and each of the problematic use and life interference variables. The implications of these findings are discussed.

Key words: life interference, MMORPG, problem video game use, psychopathology, video game, video game addiction

INTRODUCTION

Video games have become a popular pastime in recent years to the extent that the annual revenue of the video games industry exceeds that of the film and music industries (Chatfield, 2009). A growing literature attests to the fact that for some individuals, high levels of video game use are associated with interference in work and study (Gentile, 2009), interference in relationships and social functioning (Achab et al., 2011), psychological difficulties (Starcevic, Berle, Porter, & Fenech, 2011), and health morbidities (Achab et al., 2011).

Research investigating the effects of high levels of video game use has not always distinguished different types of video game use (whether online or offline, or console, or computer based) or different genres of video game (e.g., role playing, first-person shooter). Different types and genres of game may be associated with very different patterns of problems.

Massively multiplayer online role-playing games (MMORPGs) are considered to be particularly likely to be associated with problematic use and life interference (Collins, Freeman, & Chamarro-Premuzic, 2012). In this regard, problematic use is considered to include tendencies to play longer than planned, playing although one does not want to, recurrent thoughts about playing or urges to play when not playing, and restlessness or irritability when unable to play. Life interference refers to impairments or disruption in key domains of life associated with video game use, such as work and study performance, social functioning, and physical health.

There are numerous distinct features of MMORPGs that suggest that these video games may be more closely associated with harm than other types of games. These include characteristics that motivate players of MMORPGs to play for long periods that are not present in other forms of video game. For instance, in MMORPGs, the game play unfolds within a virtual world that persists even when the player is offline, the number of levels and achievements that a player can reach within the game are forever changing (such that many MMORPG games never reach a conclusion like other types of games), and many achievements require cooperative play with other participants, thus increasing a sense of social obligation to play (Collins et al., 2012). If MMORPG

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Received 21 August 2013. Accepted for publication 2 May 2014.
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participants spend longer amounts of time playing, then they might also experience greater levels of life interference compared with players of other types of video game. An alternative possibility is that players of MMORPGs may to some extent be self-selected in that they may have particular pre-existing characteristics that lead them to favour playing such games. For instance, MMORPG games may seem more attractive to individuals who have sufficient time available to invest in understanding and mastering them.

Most reports of problematic video game use have not described the composition of the sample that was playing particular types of games (e.g., Gentile, 2009; Tejeiro Salguero & Bersabe Moran, 2002). Some authors described the inclusion of users of offline 'casual' games (Haagsma, Pieterse, & Peters, 2012) or coin-operated video game machines (Tejeiro Salguero & Bersabe Moran, 2002). However, these games have very few of the features of MMORPGs. Thus, it is difficult to determine from the existing literature whether life interference associated with video game use is specific to any particular type of video game. This is despite the distinct differences between games that are played online in home environments and those that are played in public video game arcades.

One study that only included MMORPG players was conducted by Achab *et al.* (2011). The results confirmed that a sizable minority of MMORPG users experienced marital difficulties (17.3%), family difficulties (20.4%), or work difficulties (16.3%), or saw fewer friends (24.6%). The majority (54.0%) of MMORPG users in that study described themselves as 'hardcore' users or as having 'no life'. In this respect, we understand the term 'no life' to suggest that these participants were spending so much time playing MMORPGs that they were not as involved in other activities as they otherwise would be. Other studies restricted to MMORPG users have reported similar results (e.g., Liu & Peng, 2009).

These findings do not clarify whether MMORPG use is particularly associated with life interference when compared with other types of video games. Studies that directly compare users of different types of game are needed. Three studies provide light on this issue. One study, by Ng and Wiemer-Hastings (2005), compared MMORPG players with offline players. Compared with offline players, the MMORPG users tended to play more often for 8 hr continuously, more often lost sleep, and were more likely to report that they felt that they spent too much time playing (Ng & Wiemer-Hastings, 2005). They also reported feeling that it was easier to converse with others online, that they had more in-game friends than in real life, and that they would rather spend more time in the game than with friends (Ng & Wiemer-Hastings, 2005). Whether it was the type of game (i.e., MMORPG) or the way in which the game was played (i.e., online or offline) that was most associated with inter-

ference could not be determined from this study. A second study (Haagsma *et al.*, 2012) found that, compared with players of 'browser games' or offline games, MMORPG players spent more time playing and were more likely to be male; however, few other variables were investigated.

A third study is the only study that we are aware of that has comprehensively compared different types of video games in terms of their interference (Smyth, 2007). Smyth allocated 100 participants, who were not necessarily previous users of video games, to play arcade, console, offline computer, or MMORPG games for a month. After a month, the MMORPG players reported significantly greater interference in overall health, sleep quality, social functioning, and academic functioning, but had made more friends and experienced greater game enjoyment (Smyth, 2007). However, the four groups each differed greatly in the amount of time that they spent playing games during the month, leaving open the possibility that these differences were associated as much with the amount of time spent playing as they were with the type of video game used. Also, the total amounts of playing time in the sample were relatively low compared with those typically reported by self-selected samples who have a pre-existing interest in video games. Perhaps the detrimental effects of MMORPGs compared with other games become magnified in frequent, high-duration users.

A number of studies have also investigated levels of psychopathology in video game users, but again, these studies have not typically differentiated between the type of video game predominantly used by participants in their samples. Given that MMORPGs provide opportunities for interaction with other players as well as the development of supportive online social networks, perhaps frequent players of this format of game would be less likely than other video game players to experience depression or social anxiety. The study of Achab *et al.* (2011) found that 24.0% of participants felt happier from playing MMORPGs and that only a small proportion of their sample reported feeling more irritable (12.5%), more anxious (2.2%), or more sad (4.7%). Other studies have reported that high levels of video game use are associated with increased social anxiety (Lo, Wang, & Fang, 2005) and aggression (Kim, Namkoong, Taeyun, & Kim, 2008). Whether some types of games are especially associated with dimensions of psychopathology then remains an open question.

The purpose of the present study, then, was to determine whether MMORPGs are associated with greater levels of life interference and psychopathology compared with other game genres. We hypothesised that compared with other types of games, the use of MMORPGs would be associated with greater duration and frequency of game play and more signs of problematic video game use (such as strong urges to play, unsuccessful attempts to limit play, and feelings that video game use is a problem). The findings of Smyth (2007)

led us to hypothesise that compared with other types of game, MMORPGs would also be associated with greater frequencies of self-reported interference in occupational functioning, relationship functioning, financial situation, social functioning and physical health domains. So far as psychopathology is concerned, the dearth of research comparing types of video game use with dimensions of psychopathology led us to be purely exploratory. We also wanted to conduct other exploratory and more nuanced analyses to investigate the degree of life interference associated with MMORPG and other types of video game use when controlling for the possibility that participants may play multiple types of game, controlling for the amount of time spent playing, and controlling for the genre of game. While the cross-sectional and correlational design of the present study does not allow any causal relationships to be determined, we hoped that it might nonetheless reveal important associations for further investigations.

MATERIAL AND METHODS

Participants were recruited as part of a large international online survey. The present investigation forms part of a larger study, the methods of which have been reported in detail elsewhere (Porter, Starcevic, Berle, & Fenech, 2010).

The survey was administered using the 'QuestionPro' online survey program (www.questionpro.com). Participants were recruited from 53 different English-speaking computer game forums across a 4-month period. The forums covered multiple game genres (including MMORPGs, first-person shooters, strategy, and simulation games). The forums were based in Europe, Australia, and the USA. In addition, advertisements were also placed in video gaming magazines (PC Powerplay and Atomic), and a link to the survey was placed on the web site of the University of Sydney Nepean Clinical School, Penrith, NSW, Australia (www.nepean.med.usyd.edu.au).

Individuals aged 14 or over with a good understanding of English were eligible to participate (participants between the ages of 14 and 18 were required to have parental consent). To preserve anonymity, names and email addresses of participants were not recorded, although the survey programme registered a digital signature for each participant to prevent multiple responses from the same computer. Ethics committee approval for the study was obtained from the University of Sydney prior to the commencement of the study.

Measures

A 33-item Video Game Use Questionnaire (VGUQ) was devised for the purpose of the study. It was used to obtain information about demographic characteristics (age, gender,

place of residence, relationship, and occupational status) as well as patterns of game use and associated problems. For instance, items pertaining to game use required respondents to rate the number of hours a day that they play (less than 1, 1–3, 4–8, more than 8), the frequency of play (every day, every other day, once or twice a week, once or twice a month or less), type of game played most often (first-person shooter, role-playing game (RPG), MMORPG, strategy, sport, action/adventure, other), mode of playing (mainly offline or online), and the number of games currently played. Other items asked about features of problematic or 'addictive' video game use, including playing for longer than planned, feeling restless or irritable when unable to play, and interference with school and work performance. Participants rated each of these problematic video game use items as 'yes' or 'no'. These questions were included to obtain important information regarding video game use and were developed by a consensus of what the authors considered important based on previous clinical experience. Thus, the VGUQ assessed a range of disparate participant demographics and video game use characteristics, and it was not assumed that it measured a unitary construct or was reducible to a limited set of dimensions. For this reason, a total score for the scale was not generated, but items were instead considered in light of their individual content. For example, the item regarding type of game played (first-person shooter, RPG, MMORPG, strategy, sport, action/adventure, other) was used to categorise participants as MMORPG players and non-MMORPG players for the purpose of the present study. Although the reliability for such a single item is indeterminate, it is reasonable to assume that participants knew which type of game they play the most and could provide reliable responses to this.

The Symptom Checklist-90 (SCL-90; Lipman, Covi, & Shapiro, 1979) was also administered to assess current symptoms of distress and psychopathology. Respondents rate the degree of distress or discomfort associated with symptoms during the preceding 7 days on a 5-point Likert scale ranging from 'not at all' (1) to 'extremely' (4). The SCL-90 has nine subscales (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, anger-hostility, phobic anxiety, paranoid ideation, and psychoticism). A global severity index can also be derived from the mean ratings for all 90 items, and it reflects overall distress and psychopathology. The SCL-90 was included in the present study as it is a freely available and well-established measure of a broad range of psychopathological symptoms (ranging from internalising symptoms of anxiety and depression, to anger-hostility and also psychosis-like symptoms of paranoia and psychoticism; Holi, 2003; Hunter et al., 2005). The internal consistency values obtained for the SCL-90 in the current sample are reported in Table 1.

Table 1 Means, standard deviations, and Mann–Whitney *U*-test results for MMORPG and non-MMORPG players

SCL-90 subscale	MMORPG players (<i>n</i> = 332)			Non-MMORPG players (<i>n</i> = 1,613)			Total sample of participants (<i>N</i> = 1,945)			Comparing MMORPG and non-MMORPG players		
	Mean	<i>SD</i>	Median	Mean	<i>SD</i>	Median	Mean	<i>SD</i>	Median	α^a	Mann–Whitney <i>U</i> -test z-value	<i>p</i> -value ^b
Somatization	.35	.43	.25	.33	.46	.17	.33	.46	.17	.86	1.98	.047
Obsessive-compulsive	.62	.67	.40	.60	.67	.40	.61	.67	.40	.87	.76	.450
Interpersonal sensitivity	.63	.73	.33	.63	.72	.44	.63	.72	.44	.87	.10	.918
Depression	.65	.73	.38	.58	.68	.38	.59	.69	.38	.91	1.62	.106
Anxiety	.31	.47	.10	.32	.52	.10	.32	.51	.10	.87	.25	.797
Hostility	.46	.62	.17	.45	.63	.17	.45	.63	.17	.83	.20	.838
Phobic anxiety	.25	.48	.00	.23	.50	.00	.23	.50	.00	.84	.46	.643
Paranoid ideation	.49	.68	.17	.52	.71	.17	.51	.71	.17	.82	.65	.514
Psychoticism	.33	.49	.10	.36	.57	.10	.35	.55	.10	.85	.37	.709
Total GSI	.47	.49	.30	.46	.52	.28	.46	.52	.29	.98	1.10	.272

Note. GSI = global severity index; *SD* = standard deviation.

^aCronbach's alpha for total sample.

^bNo *p*-values remained significant after applying the False Discovery Rate for multiple comparisons.

Data analyses

Comparisons between MMORPG and non-MMORPG players were conducted using chi-square analyses for categorical variables (pertaining to video game use characteristics, problematic video game use, and interference in occupational, relationship, financial, physical, and social functioning). Given that subscale scores on the SCL-90 reflected a positively skewed distribution, Mann–Whitney *U*-tests were used for the purpose of comparing MMORPG and non-MMORPG players. The respective analyses for more refined subsamples also used Chi-Square and Mann–Whitney *U*-tests.

The False Discovery Rate method of Benjamini and Hochberg (1995) was used to control the family-wise type 1 error rate in instances where multiple comparisons were made. Thus, the False Discovery Rate was calculated for each group of analyses, that is, for video game playing characteristics and problematic video game use; for interference in work/study, relationships, social functioning, and physical health; and for comparisons on the SCL-90. When analyses of refined samples were conducted, the False Discovery Rate was again calculated within each group of analyses. Given that within each 'family' of analyses there were somewhat distinct questions being asked, in the Results section we report the *p*-values for each individual analysis within each table, as well as indicate whether the result of the particular analysis was considered significant after applying the False Discovery Rate.

Mediation analyses were conducted to determine whether time spent playing mediated the relationship between type of video game played and each of the outcome variables¹. These analyses were conducted using the 'Indirect' SPSS macros of Preacher and Hayes (2008) to calculate bias-corrected 95% confidence intervals of the indirect effect using a bootstrapping procedure where 1,000 samples were

generated. Importantly, the macro of Preacher and Hayes can accommodate dichotomous dependent variables, such as those included in the present set of analyses.

RESULTS

Of the 2,396 participants who commenced the survey, 451 (18.8%) discontinued before the end, leaving 1,945 participants (81.2%). There were no statistically significant differences between completers and non-completers on any of the variables investigated in the present study. Thus, the sample comprised 1,945 participants.

Most participants were male (*n* = 1,801, 92.6%), under 30 years of age (*n* = 1701, 87.5%), and from Australia (*n* = 356, 18.3%), Europe (*n* = 492, 25.3%), or the USA or Canada (*n* = 937, 48.2%). The majority reported that they were students (*n* = 1,203, 61.9%) and that they were currently living with their parents (*n* = 1,207, 62.1%).^{2,3}

Video game playing characteristics as well as indicators of problematic video game use are reported in Table 2. Compared with non-MMORPG players, a significantly greater proportion of MMORPG players played more than 8 hr per day and played at least once every day.⁴ So far as problematic video game use is concerned, a significantly greater proportion of MMORPG players endorsed the statements that playing was so important to them that they could not imagine life without it and that they played despite not wanting to play. Likewise, a significantly greater proportion of MMORPG players had recurrent thoughts/urges to play when not playing, felt restless or irritable when unable to play, and believed that playing video games was a problem or that they should play less.

Table 3 summarises the results comparing MMORPG players with non-MMORPG players in the domains of

Table 2 Video game playing characteristics and problematic video game use of MMORPG and non-MMORPG players^d

	MMORPG players (<i>n</i> = 332)		Non-MMORPG players (<i>n</i> = 1,613)		Total sample of participants (<i>N</i> = 1,945)	χ^2	<i>df</i>	<i>p</i> -value ^a
	<i>n</i>	% ^c	<i>n</i>	% ^c	<i>N</i>			
Game playing characteristics								
Hours per day spent playing video games								
<1 hr	8	2.4	165	10.2	173	76.61	3	<.0001 ^b
1–3 hr	113	34.0	828	51.3	941	20.78	1	<.0001
4–8 hr	162	48.8	477	29.6	639	32.98	1	<.0001
>8 hr	49	14.8	143	8.9	192	46.12	1	<.0001
Frequency of video game playing								
Every day	254	76.5	954	59.1	1,208	39.32	2	<.0001 ^b
Every other day	63	19.0	442	27.4	505	35.26	1	<.0001
Once or twice a week or less	15	4.5	217	13.5	232	10.17	1	.0014
Problematic video game use								
Person considers playing so important that he/she cannot imagine life without it	132	39.8	534	33.1	666	5.41	1	.02 ^b
Person plays longer than planned	198	59.6	966	59.9	1,164	.007	1	.93
Person plays even though he/she does not want to do it	76	22.9	201	12.5	277	24.53	1	<.0001 ^b
Person plays despite knowing that he/she should not do it	182	54.8	830	51.5	1,012	1.25	1	.26
Person has recurrent thoughts about playing, or urge to play when not playing	161	48.5	507	31.4	668	35.55	1	<.0001 ^b
Person feels restless or irritable when unable to play	85	25.6	239	14.8	324	23.07	1	<.0001 ^b
Person has made repeated unsuccessful attempts to control, cut back, or stop playing	32	9.6	108	6.7	140	3.57	1	.06
Person believes that playing video game(s) is a problem or that he/she should play less	83	25.0	202	12.5	285	34.27	1	<.0001 ^b

^aChi-square results compare the proportions of participants with and without problem video game use within each category for each item (where *df* = 1) and across all categories for each item (where *df* > 1).

^bSignificant at *p* < .05 after applying the False Discovery Rate for multiple comparisons. Chi-square tests for each of the categories within the game playing characteristics items were not included in the False Discovery Rate calculations.

^cNot all percentages add up to 100% because of rounding.

^dCategory of game player was determined by the type of game that participants most often played. Thus, some MMORPG players may have also played other types of games at times and some non-MMORPG players may have played MMORPG games at times. See the Results section for a refined analysis of participants who reported that they were only playing one type of game.

Table 3 Proportions of MMORPG and non-MMORPG players reporting interference in work/study, relationships, social functioning, and physical health^a

	MMORPG players (<i>n</i> = 332)	Non-MMORPG players (<i>n</i> = 1,613)	Total sample of participants (<i>N</i> = 1,945)	χ^2 comparisons between MMORPG players and non-MMORPG players	<i>df</i>	<i>p</i> -value
	<i>n</i>	<i>n</i>	<i>N</i>	χ^2		
Work and study						
School or work performance negatively affected	106	387	493	9.16	1	.002 ^b
Relationships						
Person has had major problems in significant relationships because of time spent playing	42	97	139	18.28	1	<.0001 ^b
Person has lied to others about time spent playing	62	146	208	26.70	1	<.0001 ^b
Financial						
Person has had financial problems due to spending a lot of money on games	25	100	125	0.81	1	.37
Social^d						
Person has given up one or more social or recreational activities to increase time spent playing	131	363	494	41.76	1	<.0001 ^b
Person finds it easier to meet people online	203	869	1,072	5.89	1	.015 ^b
Number of friends online						
≤2	60	446	506	21.24	3	<.0001 ^b
3–6	73	340	413	13.12	1	.0003
≥7	199	827	1,026	.14	1	.712
Number of friends offline						
≤2	41	145	186	8.30	1	.0039
3–6	77	329	406	6.89	3	.076
≥7	241	1,139	1,353	3.59	1	.058
				1.30	1	.254
				4.928	1	.026
Physical health sequelae of game playing						
Person has experienced sore eyes, carpal tunnel syndrome, back pain, or other physical problems	126	571	697	.78	1	.38
Person has been sleeping less to increase time spent playing	114	472	586	3.37	1	.066
Person has gained or lost 5 kg because of time spent playing	61	192	253	10.19	1	.0014 ^b

^aCategory of game player was determined by the type of game that participants most often played. Thus, some MMORPG players may have also played other types of games at times, and some non-MMORPG players may have played MMORPG games at times.

^bSignificant at *p* < .05 after applying the False Discovery Rate. Chi-square tests for each category of number of friends online and offline were not included in the False Discovery Rate calculations.

^cNot all percentages add up to 100% because of rounding.

^dAlthough the number of friends online and offline are not necessarily an indicator of self-identified problems, we report these results here for interested readers.

self-reported life interference associated with video game use. Significantly greater proportions of MMORPG players reported interference in work or study, relationships, and some domains of social relationships, particularly giving up social or recreational activities to play games. The only difference in physical health was that a greater proportion of MMORPG players reported having gained or lost 5 or more kilograms because of time spent playing.

We next compared MMORPG players and non-MMORPG players in terms of their scores for each of the SCL-90 subscales (see Table 1). Given that the distributions of scores for each of the respective SCL-90 subscales were positively skewed, we used non-parametric Mann–Whitney analyses for these comparisons. After controlling for multiple comparisons, there were no significant differences between MMORPG and non-MMORPG players on any of the SCL-90 dimensions.

Refined sample of single game players only

The vast majority of the overall sample reported playing more than one video game. It remains possible then that some of the MMORPG players may have also been playing non-MMORPG games and vice versa. We therefore repeated the above analyses for the 281 (14.4%) participants who reported that they were currently only playing one game, as we could be certain that their responses were not in part influenced by other types of game use.

When we conducted these analyses, the patterns of significance for the results in Table 2 (problematic video game use) remained the same. For Table 3 (life interference), the pattern of results was also the same, with the exception that the overall chi-square test result for the reported number of online friends was no longer significant after applying the False Discovery Rate. With regards to psychopathology, again there were no significant differences

between MMORPG players and non-MMORPG players. However, an exception was that in this more refined sample, MMORPG players scored significantly higher on the SCL-90 Depression scale (and their rank score was significantly higher; Mann–Whitney $z = 3.14$, $p = .002$) than non-MMORPG players.

Does time spent playing mediate the relationship between type of game played and impairment?

Findings from previous studies suggest that the degree of impairment in video game players is associated with the amount of time spent playing (Achab et al., 2011). Given that MMORPG players in our sample reported playing for more hours each day than did non-MMORPG players (see Table 2), this may have accounted for many of the between-group differences. We thus conducted a series of mediation analyses to determine whether the number of hours spent playing each day mediated the relationship between type of game played (MMORPG or non-MMORPG) and each of the variables for which there were significant between group differences in the initial analysis (see Table 4 for a list of these variables). Conducting a series of mediation analyses as opposed to conducting a series of analyses based on a refined sample allowed us to investigate this question without a reduction in sample size.

The results of the mediation analyses, summarised in Table 4, suggest that the number of hours spent playing video games each day mediated the relationship between type of video game played (MMORPG vs non-MMORPG) and each respective problematic video game use and life interference variable. In other words, problems and life interference associated with video game use could be partially explained by the amount of time that participants spent playing video games.

Table 4 Confidence intervals for bootstrap mediation analyses^a

	95% bias-corrected confidence interval for the indirect effect	
	Lower	Upper
Characteristics of problematic video game use		
Considers playing so important that he/she cannot imagine life without it	.14	.28
Plays even though he/she doesn't want to do it	.16	.32
Has recurrent thoughts about playing or urge to play when not playing	.18	.33
Feels restless or irritable when unable to play	.15	.31
Believes that playing video games is a problem or that he/she should play less	.14	.29
Interference in occupational functioning, relationships, social functioning, and physical health		
School or work performance negatively affected	.09	.22
Has given up one or more social or recreational activities to increase time spent playing	.09	.22
Finds it easier to meet people online	.09	.21
Number of friends online	.07	.13
Has gained or lost 5 kg because of time spent playing	.18	.35

^aType of game played was the independent variable and hours played per day was the mediating variable for each respective analysis.

Are MMORPGs associated with greater problems than RPGs?

A further question pertains to whether the different patterns of problems in MMORPG players compared with other video game players are driven by the online and multiplayer format of these games or instead by the genre (i.e., role-playing games). To determine this, we compared players who played MMORPGs most of the time ($n = 332$) with participants who played RPGs most of the time ($n = 282$). The only aspects that distinguish these two types of video game are whether the games are played online (i.e., MMORPG) or offline (i.e., RPG), or in a multiplayer (i.e., MMORPG) versus solo-player format (i.e., RPGs).

For the analyses of problematic video game use, the pattern of results was the same as for the analyses of the overall sample (see Table 2), except that, after controlling for multiple comparisons, a significantly greater proportion of MMORPG players, compared with RPG players, reported playing despite knowing that they should not ($\chi^2 = 6.72$, $df = 1$, $p = .01$; 54.8% compared with 44.3%, respectively).

With regards to life interference, the pattern of significant findings was identical to that of the overall sample (see Table 3), in that greater proportions of MMORPG players reported interference in the domains of work and study, relationships, social functioning, and health, with the exception that in this refined sample, a significantly greater proportion of MMORPG players also reported sleeping less to increase the time spent playing.

Again, there were no significant differences in terms of SCL-90 domains of psychopathology.

DISCUSSION

There are compelling reasons to expect that frequent players of MMORPGs might endorse characteristics of problematic video game use and experience greater levels of life interference when compared with players of other types of video games. Our results are broadly consistent with this, in that compared with non-MMORPG players, a greater proportion of MMORPG players endorsed statements pertaining to problematic video game use as well as life interference in numerous life domains. There did not appear to be increased levels of psychopathology among MMORPG players, however.

Three aspects of our results are particularly informative. First, the amount of time spent playing appeared to mediate the relationship the type of game played and both problematic use and life interference associated with video game use. This finding suggests that the increased rates of problematic use and life interference reported by MMORPG players are contributed to by the increased amount of time that they play for, rather than other characteristics of the games them-

selves. In other words, playing any type of video game for long periods each day will increase the likelihood of self-perceived problematic use or life interference. Ours is the first study to systematically compare problems and interference associated with video game use between MMORPG players and non-MMORPG players while considering the amount of game play. These findings indicate that addressing factors that increase game playing duration might be the key to reducing problems and life interference associated with video game use.

Second, there are two game-related characteristics that appear to contribute to increased amounts of time spent playing and, in turn, to increased rates of self-perceived problematic use or life interference: the multiplayer aspect and the online nature of some games. This is evident from our finding that the pattern of differences between MMORPG players and other game players remained much the same when we compared MMORPG players with RPG players (thus controlling, in part, for differences attributable to the genre of the game). The multiplayer aspect of MMORPGs might increase a sense of social obligation to play or to keep playing when one otherwise would engage in other activities. The online aspect means that many MMORPGs are continuously evolving (Meredith, Hussain, & Griffiths, 2009), and this might also increase an individual's desire to play or keep playing so as not to miss out on something important happening within the game. In this respect, these two features of MMORPGs may serve to increase the amount of time playing, which, as mentioned above, appears to be a critical determinant in the amount of problems and life interference associated with MMORPGs.

The third noteworthy finding from our study was that MMORPG use was not associated with greater levels of psychopathology when compared with other types of video games. The complex social systems and increased levels of social interaction in MMORPGs when compared with offline games that are played in a solo fashion might even mean that these games help to protect against the development of new psychopathology or the exacerbation of existing psychopathology among MMORPG players. Certainly, many video game players report benefits from online gaming, including meeting new people, learning about other cultures, exercising imagination, facilitating teamwork, and building friendships (Hussain & Griffiths, 2009). These factors could conceivably protect against the development of psychopathology in MMORPG players despite the fact that MMORPG players otherwise appear to have increased levels of problematic use and life interference from their video game play. To the best of our knowledge, our study is the first to compare different types of video game players in terms of psychopathology, so these findings await replication.

In our sample, a sizable proportion of MMORPG players endorsed items that could be considered to be indicative of problematic or even 'addictive' use of video games. These included recurrent thoughts about playing when not playing (48.5% of MMORPG users), considering playing so important that they cannot imagine life without it (39.8% of MMORPG users) and playing longer than planned (59.6% of MMORPG users). While the existence of problematic video game use and video game addiction remains highly controversial (Blaszczynski, 2008), these findings indicate that if such terms have utility, MMORPGs may be associated with especially high risk for such conditions.

It is important to note that our hypotheses were not universally supported by our data. Even though users of MMORPGs reported relatively greater life interference than other video game players, the rates of this interference varied greatly according to the particular life domain. For instance, even though close to a third of MMORPG players reported work or study interference (31.9%), health problems such as sleep disturbance (34.3%) or sore eyes, carpal tunnel syndrome, back pain, or other physical problems (38%), a smaller minority reported relationship difficulties associated with their use (in the order of 13–19%). The social domain questions relating to giving up on other activities to play (40% of MMORPG players) or finding it easier to meet people online (61% of MMORPG players) are not necessarily signs of problems in and of themselves, as prioritising activities one enjoys and preferentially socialising with people who may have shared interests is presumably a common experience.

Our conclusions need to be tempered by a number of limitations of our study. For instance, even though we asked participants what type of game they played, we did not collect data on which particular games they played. Given the market share of some especially popular games, such as World of Warcraft, Lineage II, and Diablo (Meredith et al., 2009), it is possible that the MMORPG and non-MMORPG participants were only playing a limited range of games within their respective video game type. This in turn may mean that some of the between group differences were due to particular features of particular games rather than the general type of game played. A second limitation involves the generalisability of our findings: The majority of our sample were adolescents. Further studies should aim to investigate these questions in a sample that is also representative of older video game players. A third limitation is that reduced statistical power may have contributed to some of the results from the comparisons of more refined samples no longer being significant. Despite this, we had adequate statistical power to detect medium-size differences (at $p < .05$) even in our most refined sample. Also, the psychometric characteristics of the VGUQ have not yet been established. Finally, there is the possibility that the type of game

played by participants in our sample was self-selected, in that individuals with particular pre-existing characteristics or problems may have been drawn to playing particular genres of game. For instance, it is possible that relatively sociable individuals who already have existing social networks may be drawn to the interpersonal aspect of many MMORPGs, whereas others may prefer solitary game genres.

These limitations notwithstanding, the findings of our study suggest that while MMORPG use is associated with greater interference in a number of life domains when compared with other video games, this increased interference appears to be driven by the fact that MMORPG players typically play for greater amounts of time than users of other video games. Future studies might assess whether there are other factors (e.g., multiplayer and online aspects of gaming) that independently contribute to problematic use and life interference beyond the duration of game play. Interestingly, there were few differences in psychopathology between different types of video game players, suggesting that either individuals with pre-existing psychopathology are not especially drawn to MMORPG use, or that MMORPG use does not necessarily generate new psychopathology or exacerbate pre-existing psychopathology more than other types of video games. Given that ours is the first study to comprehensively compare users of different types of video game on these variables, replication is necessary.

NOTES

1. Mediation analyses were only conducted for variables that differed significantly between MMORPG and non-MMORPG players in the initial bivariate analyses.
2. Further details of the demographic characteristics of the overall sample are reported elsewhere (Porter et al., 2010).
3. A breakdown of demographic characteristics according to predominant type of game played and whether predominantly played online or offline is available from the authors on request.
4. There were 10 participants who reported that the type of game that they most often played was an MMORPG (i.e., an online game) but who reported that they most often played games offline. Because of this apparent inconsistency, we repeated all analyses after excluding these 10 participants. The pattern of results for all findings was the same.

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