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A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems

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ABSTRACT

Background: Mental health professionals, policy makers and the general public continue to debate the issue of pathological video gaming. Scholars disagree on the prevalence and diagnostic criteria for this potential new disorder. The current meta-analysis considers existing scholarship to examine how differing measurement methods influence prevalence rates and associations with other mental health problems.
Method: Thirty three published studies and doctoral dissertations were analyzed in meta-analysis. Prevalence rates and comorbidity with other mental health problems were examined according to measurement method.
Results: Prevalence estimates and comorbidity with other problems varied widely between studies. Measurement which attempted to replicate "pathological gambling" approaches produced higher prevalence estimates and lower comorbidity estimates than methods which focused on the interfering nature of pathological gaming. The most precise measures produce an overall prevalence rate of 3.1%.
Interpretation: Diagnostic analogies with pathological gambling may produce spuriously high prevalence estimates, potentially over identifying non-pathological players as pathological. Diagnostic approaches focused on the interfering nature on other life needs and responsibilities may have greater validity and utility.

1. Introduction

Given the increasing sales of video games and the popularity of this new medium particularly among youth and young adults, policy makers, scholars and the general public have expressed concern that some players may present with pathological patterns of video game use that interfere with life functioning. Despite a decade of research, much debate remains in the scholarly community regarding the prevalence and proper diagnostic criteria for pathological gaming (Barnett and Coulson, 2010; Griffiths, 2008; Wood, 2008). Although most scholars acknowledge the potential for some video game players to engage in pathological use (Block, 2008; Desai et al., 2010; Griffiths, 2008; Van Rooij et al., 2010), some have expressed concern that video games are currently in a cycle of "moral panic" common to all new media, and the potential for exaggeration of a real but uncommon problem should be carefully guarded against (Barnett and Coulson, 2010; Ferguson, 2010; Olson, 2010). Perhaps with these cautionary notes in mind, the American Psychiatric Association has thus far taken a conservative approach to proposing specific new diagnoses for electronic media in the forthcoming DSM-V (American Psychiatric Association, 2010). Such discussions have focused on internet addiction, although given a large percentage of gaming occurs on the internet, the adoption of an internet addiction diagnostic category would likely set a precedent for a video game category. Given the increasing prevalence of video gaming, particularly among younger generations, the potential misuse of a "video game addiction" category, particularly among older professionals who may be unfamiliar with gaming warrants this caution (for example a single on-line game, *World of Warcraft*, now boasts a community of 12 millions players, Blizzard, 2010, without any evidence to support the notion of a mass increase in "addicted" gamers).

One issue for pathological gaming is that despite widespread agreement among most scholars (including the present authors) that the potential for pathological gaming in some players does

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[1] Dr. Ferguson had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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indeed exist, there are no agreed upon set of diagnostic criteria. In our review of the literature we note two basic approaches. The first of these has been the application of a "pathological gambling" model, in which the DSM symptoms for pathological gambling are simply reworded to reflect pathological gaming. The assumption is that compulsive behaviors symptomatic of pathological gambling can be easily reapplied to other classes of behavioral addictions. Although this approach certainly has its supporters (Gentile et al., 2011; Lemmens et al., 2011), it also has detractors who express concerns about whether the symptoms of pathological gambling may be misapplied to pathological gaming, overidentifying non-pathological behavior in gamers (Olson, 2010; Wood, 2008). This is particularly true when individual symptoms do not explicitly examine the interfering nature of the symptoms. Questions such as "I argue with my family about my video game habits" or "I think about video games even while I'm not playing them" or "I use video games to relax" may not represent pathological behavior for gamers, may evidence little or no association with negative outcomes, and indeed may be normative, while their original wording is still indicative of a problematic obsession in gamblers (Olson, 2010; Wood, 2008). For instance, arguing with one's parents about when to turn off the XBOX may be far more normative and far less interfering than arguing with one's spouse about thousands of dollars lost gambling. In some studies (e.g. Gentile et al., 2011; Johansson and Götestam, 2004), cut-off points (e.g. 5 out of 10 symptoms, or 5 of 8 symptoms indicating "pathological gaming") are established without any data on the specificity and sensitivity of these cut-off points. Without understanding the specificity and sensitivity of these cut-points, and with the potential for numerous questions to tap into normative rather than pathological behavior, the risk of overidentification and inflated prevalence estimates remains high.

The alternative approach identified in other studies (Desai et al., 2010; Liu and Peng, 2009; Van Rooij et al., 2011) is to focus to a greater extent on the interfering nature of gaming behavior, rather than on a strict parallel with established symptoms of pathological gambling. For instance, questions in this approach may ask about missed work or school, declining grades, feelings of personal distress over gaming habits, etc. This approach has an intuitive appeal at getting closer to potential intrusive and interfering symptoms than does the pathological gambling analogy approach. However it might reasonably be argued that in divorcing itself from an established diagnostic framework, this type of instrument may lack consistency.

We note also that some studies examine pathological gaming simply from the perspective of mere exposure, or time length of exposure to video games (e.g. Allahverdipour et al., 2010; Chan and Rabinowitz, 2006). Although such work is useful in determining the presence or absence of negative effects due to general use of video games, time only approaches may not be adequate for assessing the interfering nature of the activity.

A recent narrative review of the field has been provided by Kuss and Griffiths (2011) representing the most comprehensive overview of this topic to date. The authors noted that pathological gaming occupies a continuum from mild issues to "full blown" problem behavior. This continuum approach differs from many studies which have considered pathological gaming from a categorical perspective. Risk factors for the development of pathological gaming included personality styles marked by neuroticism, social isolation, and diminished self-control, as well as mental health problems related to depression, anxiety and ADHD. Their review also noted discrepancies among prevalence estimates, ranging from low single digit prevalence figures through just over 10% as high figures, and noted the differences in prevalence estimates were often the result of differing definitions and measuring instruments used to assess pathological gaming.

2. Distinguishing engagement from pathology

One key issue often overlooked regarding the issue of pathological gaming is differentiating gaming behavior which is pathological and potentially interferes with everyday real-world activities such as schoolwork or occupation, from gaming behavior that is not. For instance it may be assumed that gaming for long hours is pathological, but to the extent that such behavior does not interfere with other responsibilities the degree to which frequent gaming is pathological is unclear. Similarly items used to assess pathological gaming built upon the pathological gambling model such as "I think about video games even while I'm not playing them" or "I use video games to relax" may reflect positive engagement with video games rather than anything pathological.

Briefly, the concept of engagement posits that a high degree of video game use can be a positive and non-interfering experience for many users (Charlton, 2002). Factor analyses of video game users have verified the distinction of engagement from pathological gaming (Charlton, 2002; Charlton and Danforth, 2007). However, some criteria used to measure pathological gaming in some prevalence studies may erroneously tap into engagement and spuriously elevate prevalence scores. For example, items which tap into feeling pleasure at playing the game, the desire to increase time spent on the game, thinking about and feeling drawn to the game even when not playing seem to particular tap into engagement rather than pathological behavior (Charlton and Danforth, 2007). Skoric, Teo and Neo (2009) have found that while characteristics of pathological behavior do predict negative scholastic outcomes, neither time spent playing games nor engagement were negatively related to scholastic achievement, and engagement may have been associated with some benefits with some scholastic outcomes. Table 1 presents common assessment criteria used under the engagement, pathological gambling analogy and interference measurement approaches using the terminology of Charlton and Danforth. Even within these categories specific items may differ between measurement tools, but this table provides a general comparison of approaches. As can be seen, the problematic gambling analogy approach in essence combines elements identified by Charlton and Dansforth (2007) as belonging to separate interference and engagement categories, and, in doing so, potentially over identifies cases.

Unfortunately, at present, scholars and practitioners have little guidance in regards to the most valid measurement approach for pathological gaming. This meta-analytic review seeks to address

Table 1
A comparison of engagement, pathological gambling analogy and interference approaches.

Engagement	Interference	Problematic gambling analogy
Cognitive Salience		Cognitive Salience
Tolerance		Tolerance
Euphoria		Euphoria
	Conflict	Conflict
	Withdrawal	Withdrawal
	Relapse	Relapse
	Reinstatement	Reinstatement
	Behavioral Salience	Behavioral Salience

Note: Uses factors identified by Charlton and Dansforth (2007) to illustrate how the problematic gambling analogy approach may overidentify cases by combining items reflecting true interference with those representing non-problematic engagement.

some of the existing questions and controversies in the pathological gaming research field. Specifically the following issues will be examined:

1) How are prevalence estimates of pathological gaming influenced by measurement method used?
2) Do on-line survey methods used in some studies influence prevalence estimates?
3) Are prevalence differences observed between adults and children or between individuals in the East (i.e. Asia) and West (i.e. North America, Europe)?
4.) Do measurement methods influence observed relationships between pathological gaming and mental health sequelae?

3. Methods

3.1. Study selection and categorization

PsycINFO and Digital Dissertations were searched for all articles published between the years of 2001 and early 2011 that included the following search terms: (video* or computer) and (pathol* or addict*). Peer-reviewed indexed journal articles and indexed dissertations were included as, being indexed, they are not highly susceptible to selection bias. Other forms of unpublished articles were not included out of concern for selection bias problems due to the non-indexed nature of these sources (Cook et al., 1993; Egger and Smith, 1998).

Several criteria were used to maximize the homogeneity of the included studies. Articles were judged relevant if they met the following criteria:

a) Articles had to have been published between the years of 2001–2011. Limiting meta-analyses to a recent time span (5 or 10 years) is a fairly common practice, to examine the effects of the latest research. This will also allow for an examination of the most up-to-date and sophisticated video games.
b) Articles had to include data relevant either to the prevalence of problematic gaming and/or the association of problematic gaming with mental health concerns (primarily depression, anxiety or attention deficit symptoms), social problems or academic problems.

A total of 30 published journal articles and three doctoral dissertations were included in the current analyses. Together these articles included 17 independent estimates of problematic gaming prevalence and 37 independent estimates of relationships with associated mental health, social or academic problems. All samples were with youth or young adults (e.g. college students), among whom gaming prevalence is high, reducing the risk that prevalence rates might be artificially deflated by the inclusion of older adult samples among whom gaming is less common. A table with included studies in the current meta-analysis is available on request to the current author.

3.2. Effect size Calculation

Pearson's *r*, a flexible and easily interpreted index of effect size, was used as the effect size estimate in this study. Correlation coefficients were transformed to Fisher's *z*, weighted, averaged and transformed back to a pooled *r*, denoted r_+. In the case in which a study reported non-significant results but failed to provide statistical information (e.g. *F*-value) the effect size was calculated using the provided means and standard deviations. In the event of multiple measures for the same construct occurring within a study (i.e. multiple dependent or independent measures) simple mean correlations were computed.

For the meta-analysis of prevalence statistics, prevalence data were transformed into logit event rate data and weighted by sample size. Results were then converted back to non-logit prevalence data for ease of comprehension.

3.3. Statistical and publication bias analyses

In accordance with recommendations of Hunter and Schmidt (2004) random effects models were used. General agreement between publication bias measures was considered to be evidence for or against publication bias, particularly related to a low Orwin's FSN (indicating fragility of the results), significance for either the rank correlation or Egger's regression, and significance for Trim and Fill. Ferguson (2007) discusses these publication bias analyses in some detail, although they are discussed briefly below:

a) The Fail-safe N. This technique involves computing a combined *p*-value for all of the studies included in the meta-analysis, and calculating how many additional studies with a zero effect (average *z* of zero) would be necessary to create a non-significant *p*. Fail-safe N is not used in the prevalence data as there is no true "statistical significance" level for prevalence.
b) Orwin's fail-safe N. An alternate formula for calculating the number of studies necessary to bring the effect size down to trivial levels (e.g. $r < .10$). Orwin's fail-safe N is not used in the prevalence data as there is no true "trivial" level for prevalence.
c) Begg and Mazumdar's rank correlation test provides a rank-correlation for the relationship between effect size and the standard errors of the effects.
d) Egger's Regression attempts to quantify the bias captured in the funnel plot.

Table 2
Meta-analytic results for prevalence of problematic gaming behavior.

Effect sizes	k	$Prev_+$	95% C.I.	Homogeneity test	RCT	RT	Bias?
All observations	17	.060	(.041, .089)	$X^2(16) = 1208.79$, $p < .001$	NS	NS	No
Measurement Approach[a]							
P. Gambling	9	.089	(.062, .127)	$X^2(8) = 325.59$, $p < .001$	NS	NS	No
Interference	7	.031	(.017, .057)	$X^2(6) = 296.85$, $p < .001$	NS	NS	No
Sampling Approach							
On-Line	7	.096	(.072, .126)	$X^2(6) = 84.95$, $p < .001$	NS	NS	No
Off-Line	10	.044	(.026, .074)	$X^2(9) = 580.43$, $p < .001$	NS	NS	No
Age							
Adult	8	.089	(.064, .121)	$X^2(7) = 125.10$, $p < .001$	NS	NS	No
Child	9	.042	(.024, .072)	$X^2(8) = 602.49$, $p < .001$	NS	NS	No

Note: NS = Non significant.
[a] 1study employed a single item measure of problematic gaming and did not fit into either measurement approach.

Table 3
Meta-analytic results for main analysis and moderator variables, including publication bias analysis.

Effect sizes	*k*	r_+	r_u	95% C.I.	Homogeneity test	FSN	OFSN	RCT	RT	Bias?
Overall by Outcome Type										
Mental Health	18	.19	.19	(.13, .24)	$X^2(17) = 277.91$, $p < .001$	2956	18	*NS*	NS	Yes
Social	8	.25	.32	(.04, .44)	$X^2(7) = 791.44$, $p < .001$	1250	10	$p < .05$	NS	Likely
Academic	10	.12	.15	(.02, .21)	$X^2(9) = 161.68$, $p < .001$	318	1	NS	NS	Inc
Problematic Gambling Approach by Outcome Type										
Mental Health	5	.17	.17	(.11, .24)	$X^2(4) = 41.25$, $p < .001$	159	15	NS	NS	No
Social[a]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Academic	4	.08	.17	(−.13, .30)	$X^2(3) = 105.50$, $p < .001$	98	2	NS	NS	Inc
Inteference Approach by Outcome Type										
Mental Health	7	.26	.26	(.16, .36)	$X^2(6) = 134.23$, $p < .001$	982	12	NS	NS	No
Social	5	.31	.31	(.00, .56)	$X^2(4) = 584.94$, $p < .001$	645	10	NS	NS	No
Academic	3	.02	.17	(−.13, .17)	$X^2(2) = 43.80$, $p < .001$	32	0	NS	$p < .05$	Yes
Exposure Amount Only Approach by Outcome Type										
Mental Health	6	.09	.09	(.00, .17)	$X^2(5) = 15.08$, $p < .010$	15	0	NS	NS	No
Social[a]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Academic	2	.08	.08	(−.02, .17)	$X^2(2) = 3.47$, NS	2	0	NS	NS	No
Child Only by Outcome Type										
Mental Health	14	.18	.18	(.11, .25)	$X^2(13) = 264.37$, $p < .001$	2007	15	NS	NS	No
Social	4	.26	.26	(−.10, .55)	$X^2(3) = 672.04$, $p < .001$	413	5	NS	NS	No
Academic	9	.12	.12	(.03, .21)	$X^2(8) = 129.60$, $p < .001$	198	0	NS	NS	No
Adult Only by Outcome Type										
Mental Health	4	.15	.19	(.08, .22)	$X^2(3) = 9.46$, $p < .050$	88	3	NS	NS	Inc
Social	4	.15	.40	(−.14, .41)	$X^2(3) = 119.38$, $p < .001$	223	5	$p < .05$	$p < .01$	Yes
Academic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asia Only by Outcome Type										
Mental Health	7	.21	.21	(.11, .31)	$X^2(6) = 143.22$, $p < .001$	720	8	NS	NS	No
Social	4	.23	.23	(.06, .29)	$X^2(3) = 124.45$, $p < .001$	80	0	NS	NS	No
Academic	4	.09	.09	(.02, .17)	$X^2(3) = 15.30$, $p < .010$	24	0	NS	NS	No
West Only by Outcome Type										
Mental Health	10	.18	.18	(.09, .26)	$X^2(9) = 122.07$, $p < .001$	642	10	NS	NS	No
Social	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Academic	5	.03	.14	(−.17, .23)	$X^2(4) = 105.24$, $p < .001$	78	2	NS	NS	Inc

Note: k = number of independent studies; r_+ = pooled correlation coefficient (corrected); r_u = uncorrected effect size estimate; C.I. = corrected confidence intervals; FSN = Fail-safe N; OFSN = Orwin's Fail-safe N; RCT = significance of Begg & Mazumdar's rank correlation test; RT = significance of Egger's Regression; NS = Non-significant; Inc = inconclusive.

[a] Analysis not possible due to small *k*.

e) Duvall and Tweedie's Trim and Fill. This iterative procedure provides an estimate of what the effect size would be if there was no publication bias in the meta-analysis.

4. Results

Meta-analytic results for prevalence data are presented in Table 2. Given our observation of heterogeneity in prevalence data between studies, heterogeneity statistics, not surprisingly, were significant in all analyses, indicating important moderator effects. Overall prevalence data from all studies converge on a prevalence figure of 6.0%, but given the heterogeneity between studies, this figure is unlikely to be particularly informative.

Results suggest that the methodological approach of individual studies has considerable impact on prevalence figures achieved. Studies which employ the "pathological gambling" approach reported much higher overall prevalence statistics (8.9%) than did those which focused more specifically on interference (3.1%). A Spearman correlation between measurement approach and prevalence estimate was significant ($\rho = .57$, $p < .05$). Furthermore on-line samples, arguably not surprisingly, returned higher prevalence estimates (9.6%) than did off-line samples (4.4%) irrespective of measurement method ($\rho = .47$, $p < .05$). Lastly prevalence statistics were lower for child and teen samples (4.2%) than adult samples (8.9%) ($\rho = .45$, $p < .05$). Given the paucity of prevalence data from non-Western samples, ethnic or national differences could not be calculated.

Data on the association of problematic gaming on mental health, social and academic problems is presented in Table 3. Using leading guidelines for the interpretations of effect sizes (Cohen, 1992; Ferguson, 2009), we find that comorbidities between pathological gaming and mental health, academic and social problems are present in the range of small to moderate. However comorbidity estimates themselves varied due to measurement issues. With the exception of academic problems, which were generally weakly correlated with problematic gaming, whatever the measurement method, approaches which focused on interference were more highly correlated with negative outcomes than were those which focused on problematic gambling analogies or which simply measured overall video game exposure ($\rho = .30$, $p < .05$). No clear pattern of differences emerged between children and adults, or people in the West or Asia regarding the impact of problematic gaming on negative outcomes (Spearman rho correlations were non-significant).

Regarding publication bias, overall, most analyses suggested publication bias was not a problem. Positive findings using multiple methods in tandem were most likely when the number of available studies were few, and thus the potential for a single study to skew results was considerable. In general the issue of publication bias would probably not influence the interpretation of the current findings.

5. Conclusions

At least a decade of research has examined the potential for video game playing to reach problematic levels in some individuals. Currently research remains divided about how best to measure problematic gaming, how prevalent the issue is, and how harmful it may be. The current meta-analysis sought to address some of these issues with the goal of providing direction for the American

Psychiatric Association who may potentially consider the inclusion of diagnostic factors relating to problematic gaming in the future.

With regards to prevalence, the estimates varied across studies fairly widely. Across all studies a prevalence estimate of about 6.0% emerges, although methodological differences influence this outcome. Studies which employed the problematic gambling approach reworded for problematic gaming tended to produce higher prevalence statistics. Lower figures were found for surveys which focused on the interfering nature of problematic gaming, that is, questions which focused on lowered grades, work problems, personal distress, etc. Additionally data on negative outcomes suggests that, overall, the interference approach demonstrates higher expected correlations with negative outcomes than does the problematic gambling approach (possibly for the same conceptual reasons outlined above). Taken together this suggests that the problematic gambling approach may be overidentifying non-pathological individuals, concurrently inflating prevalence estimates and decreasing the specificity of the measurement approach. As such, in the future, it may be of greater value to focus on the issue of interference when considering diagnostic criteria of a pathological gaming disorder. Developing sensitive and specific diagnostic criteria for problematic gaming may involve far more than simply rewording and transferring symptoms of problematic gambling or other behavioral addictions to gaming behaviors. Thus we express the concern that some previous studies have produced inflated prevalence statistics.

6. Future research suggestions

At present we observe there is a lack of uniformity and guidance for researchers in examining the phenomenon of pathological gaming. We offer the following suggestions in the hope they may assist with adding rigor to ongoing analyses.

6.1. Increase focus on interference

Results from this meta-analysis indicate that the pathological gambling approach is weaker in relation to approaches measuring pathological gaming that focus on the interfering nature of symptoms. A likely ongoing issue for pathological gaming is the over-identification of non-pathological individuals according to criteria with low specificity. Focusing to a greater degree on interference will likely reduce this phenomenon. As such we recommend that researchers and clinicians focus greater attention to these issues.

6.2. Increase use of longitudinal studies

Longitudinal studies are invaluable when distinguishing whether pathological gaming is a unique condition, or symptomatic of underlying mental health issues. At present longitudinal studies have been relatively few and often limited by the use of poorly validated outcome measures, not only for pathological gaming, but for other clinical constructs. We note that establishing pathological gaming as a valid construct should not hinge upon "statistical significance" particularly where large samples are used as these can cause spurious results and type 1 error. Consistent with previous work (Ferguson, 2009) we argue for concentration on robust effect sizes with a minimum of $r = .20$ or $OR = 2.0$ with clinically relevant mental health outcomes as strong evidence for the validity of an independent pathological gaming construct. We also note that such longitudinal studies should take care to account for other relevant variables that may contribute to mental health problems such as family environment or family risk of mental health problems, so as to control for type I error and prevent spuriously high correlations.

6.3. Sensitivity and specificity data

Currently available measures of gaming pathology, while representing a promising start, particularly where focusing on interference, lack data on sensitivity and specificity. Thus a primary goal of future research should work to establish the sensitivity and specificity of assessment instruments and diagnostic criteria against clinically significant outcomes (school failure, depression, social withdrawal, etc.) Such a line of research may assist in identifying a set of diagnostic criteria that will provide maximum reliability and validity.

6.4. Treatment outcome data

It may be worth considering treatment approaches to problematic gaming, to see whether treatments that focus on these symptoms are superior or inferior to treatment approaches that do not focus on gaming as a primary problem (and instead, perhaps, focus on other issues such as depression or social skills). If intervention research demonstrates that treatment of problematic gaming symptoms is robust in relation to other treatments in reducing depression, school failure, etc., this would provide further evidence for the problematic gaming construct. We take care to note that treatment outcome research can be prone to type I error (as can all research), thus registered clinical trials are particularly valuable, as are meta-analyses of treatment research that carefully analyze for publication bias.

7. Concluding statements

Given the issues identified in this paper, the prevalence statistics provided by the interference measures, of about 3.1% are probably most accurate. However, this review of the current studies, which varied widely in terms of methodology and conclusions, supports the APA's cautious stance that more research needs to be done before diagnostic criteria for electronic media related phenomenon such as problematic gaming are rigorous enough to support the inclusion of these phenomena as a new set of disorders. In particular, the potential for the misuse of a problematic gaming label may inflame a new media moral panic regarding the potential effects of video games. Therefore, the importance of good sensitivity and specificity data is tantamount prior to endorsing any diagnostic criteria. Furthermore we caution researchers from making expansive statements regarding problematic gaming and its 'potential harm' until further data is collected. This is not to say we fail to acknowledge the potential harm of problematic gaming; rather the current research rigor is not capable of supporting conclusive statements.

Lastly it remains unknown whether problematic gaming is truly a unique phenomenon or rather simply the symptoms of underlying mental health problems as some have concluded (e.g. Desai et al., 2010). We note that previous scholarship (Gauntlett, 2005; Ferguson, 2010) has expressed concern that media-based moral panics result in crises being manufactured by well-meaning but ideologically biased scholars and advocates, regardless of evidence to the contrary. During such occurrences the existence of a crisis of mental health may be declared prior to evidence to support such claims (and sometimes despite evidence to refute such claims). Through processes of confirmation bias, publication bias and citation bias, data is then selectively assembled or highlighted to continue to fuel a priori beliefs in the existence of the crisis. That media and video games have already been the source of such non-scholarly panics among the academic community is well documented (see Ferguson, 2010; Gauntlett, 2005 for discussions). Given that pathological gaming is a "hot" topic, not only in the psychiatric community, but in the general populace and among

politicians, the potential for a repetition of the moral panic cycle is considerable. Until it is better known whether pathological gaming represents a unique problem or is merely symptomatic of other underlying mental health problems, conservatism in the approach to problematic gaming may be warranted. so that a new diagnosis does not become a self-fulfilling prophecy in which data is selectively produced and interpreted to support preexisting well intended but irrational fear-based assumptions.

Conflict of interest

The authors have no conflicts of interest or financial relationships past or present to declare.

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References

Allahverdipour H, Bazargan M, Farhadinasab A, Moeini B. Correlates of video games playing among adolescents in an Islamic country. BMC Public Health May 27, 2010;10:286.
American Psychiatric Association. DSM-5 proposed revisions include new category of addiction and related disorders: new category of behavioral addictions also proposed, http://www.dsm5.org/Newsroom/Documents/Addiction%20release%20FINAL%202.05.pdf; 2010. Retrieved 2/9/11 from.
Barnett J, Coulson M. Virtually real: a psychological perspective on massively multiplayer online games. Review of General Psychology 2010;14(2):167–79.
Blizzard. World of Warcraft Subscriber Base Reaches 12 Millions Worldwide. Retrieved 8/26/11 from, http://us.blizzard.com/en-us/company/press/pressreleases.html?id=2847881; 2010.
Block J. Issues for DSM-V: internet addiction. The American Journal of Psychiatry 2008;165(3):306–7.
Chan P, Rabinowitz T. A cross-sectional analysis of video games and attention deficit hyperactivity disorder symptoms in adolescents. Annals of General Psychiatry; October 2006:5.
Charlton J. A factor-analytic investigation of computer 'addiction' and engagement. British Journal of Psychology. 2002;93(3):329–44.
Charlton J, Danforth I. Distinguishing addiction and high engagement in the context of online game playing. Computers in Human Behavior 2007;23(3):1531–48.
Cohen J. A power primer. Psychological Bulletin 1992;112(1):155–9.
Cook D, Guyatt G, Ryan G, Clifton J, Buckingham L, Willan A, et al. Should unpublished data be included in meta-analyses? current convictions and controversies. JAMA 1993;269:2749–53.
Desai R, Krishnan-Sarin S, Cavallo D, Potenza M. Video-gaming among high school students: health correlates, gender differences, and problematic gaming. Pediatrics 2010;126(6):e1414–24.
Egger M, Smith G. Meta-analysis: bias in location and selection of studies. British Medical Journal:7124. Retrieved 2/19/11 from, http://www.bmj.com/content/316/7124/61.extract; 1998.
Ferguson C. An effect size primer: a guide for clinicians and researchers. Professional Psychology: Research and Practice 2009;40(5):532–8.
Ferguson C. Blazing angels or resident evil? Can violent video games be a force for good? Review of General Psychology 2010;14(2):68–81.
Ferguson CJ. Evidence for publication bias in video game violence effects literature: a meta-analytic review. Aggression and Violent Behavior 2007;12:470–82.
Gauntlett D. Moving experiences: understanding television's influences and effects. Luton: John Libbey; 2005.
Gentile DA, Choo H, Liau A, Sim T, Li D, Fung D, Khoo A. Pathological video game use among youths: a two-year longitudinal study. Pediatrics 2011;127(2):e319–29.
Griffiths M. Videogame addiction: further thoughts and observations. International Journal of Mental Health and Addiction 2008;6(2):182–5.
Hunter J, Schmidt F. Methods of meta-analysis: correcting error and bias in research findings. Thousand Oaks, CA: Sage; 2004.
Johansson A, Götestam K. Problems with computer games without Monetary reward: similarity to pathological gambling. Psychological Reports 2004;95(2):641–50.
Kuss JD, Griffiths MD. Internet gaming addiction: a systematic review of empirical research. International Journal of Mental Health Addiction.; 2011. doi:10.1007/s11469-011-9318-5.
Lemmens J, Valkenburg P, Peter J. Psychosocial causes and consequences of pathological gaming. Computers in Human Behavior 2011;27(1):144–52.
Liu M, Peng W. Cognitive and psychological predictors of the negative outcomes associated with playing MMOGs (massively multiplayer online games). Computers in Human Behavior 2009;25(6):1306–11.
Olson C. Children's motivations for video game play in the context of normal development. Review of General Psychology 2010;14(2):180–7.
Skoric M, Teo L, Neo R. Children and video games: addiction, engagement, and scholastic achievement. Cyberpsychology & behavior October 2009;12(5):567–72 [serial online].
Van Rooij A, Meerkerk G, Schoenmakers T, Griffiths M, van de Mheen D. Video game addiction and social responsibility. Addiction Research & Theory 2010;18(5):489–93.
Van Rooij A, Schoenmakers T, Vermulst A, Van den Eijnden R, Van de Mheen D. Online video game addiction: identification of addicted adolescent gamers. Addiction 2011;106(1):205–12.
Wood R. Problems with the concept of video game 'addiction': some case study examples. International Journal of Mental Health and Addiction 2008;6(2):169–78.