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ORIGINAL ARTICLE

A Stress-Coping Model of Problem Online Video Game Use

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Abstract It is argued that problem video game use (PVGU) has similarities with behavioral addictions such as problem gambling. Unlike other addictions, the predictors of online PVGU have not been studied extensively. We applied a stress-coping model, previously developed for electronic gambling addiction, to PVGU. In this model, stressors lead to excessive behavior via maladaptive coping strategies involving the behavior. Video game players ($N = 2261$) completed an online questionnaire about their gaming habits, and self-report measures of depression, loneliness, social anxiety, and escapism and social interaction motives for gaming. Consistent with the stress-coping model, depression, loneliness, and social anxiety predicted levels of PVGU, these effects being partially mediated by escapism and social interaction motives for gaming. The pattern of mediation differed by gamers' preferred game genre in a way that suggested "First Person Shooter" games provide an escape from aversive states, while, in addition to providing escape, massively multiplayer online role playing games, which emphasize collaborative play, may also be supplementing or substituting for face-to-face social interactions.

Keywords Problem video game use · Video game addiction · Gaming disorder · Online · Stress · Coping

Given the popularity of video games, the ease with which they can be accessed, and anecdotal reports of extreme use occasionally leading to severe health issues, it is legitimate to be

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concerned about the potential for problem video game use (PVGU) and understand factors leading to its development. While there has been debate over whether PVGU constitutes a distinct diagnostic entity (e.g., Griffiths 2010; Hsu et al. 2009; King et al. 2011, 2013), research by Griffiths (2010) has identified a pattern of PVGU characterized by addiction-like symptoms including elevated salience of games, use of games for mood modification, playing of games leading to conflict, and addiction-like tolerance, withdrawal, and relapse effects. These similarities with addiction suggests that models for other addiction disorders, such as problem gambling, may be useful for understanding PGVU structure and causes. In this paper, we examine one such influential model—the stress-coping model.

There are many video game genres, and this complicates the study of PVGU. Little is known about whether the mechanics of specific games influences the outcomes of playing. Two of the most popular online game genres are massively multiplayer online role playing games (MMORPGs) and first-person shooters (FPSs). MMORPGs are sophisticated "virtual universes" with detailed graphics and sound. They are designed to accommodate large numbers of players at once (Cole and Griffiths 2007) and have game mechanics that demand cooperation. MMORPGs have been linked to PVGU more often than other games (Peters and Malesky 2008; Ng and Wiemer-Hastings 2005; Yee 2006), possibly because their immersive nature offers a greater depth of escape. FPS games involve players combating enemies from a first-person perspective. Games typically involve achieving objectives (e.g., reaching a "kill-count"), and interactions with other players can be cooperative or competitive (Xu et al. 2011). To contribute to the understanding of the psychology of PVGU, our study will examine whether gaming behavior and the predictors of PVGU differ between players of these game types.

Stress-Coping Framework, Disengagement, and Addiction

Stress, and the ways in which people deal with it, has been linked to mental and physical health problems (Lazarus and Folkman 1984). The most widely cited framework is that of Lazarus and colleagues. This defines stress not as an event, but rather in terms of negative affective states associated with a perceived inability to cope with a challenge (stressor), and defines coping as "cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus and Folkman 1984, p. 141). This broad definition encompasses many approaches to coping, including the so-called engagement/disengagement coping paradigm (Compas et al. 2001). Engagement coping involves attempting to actively confront the stressor and thus overcome it, for example, using problem-solving techniques to adapt to or remove the stressor. Conversely, disengagement coping involves withdrawing from or avoiding confrontation with a stressor, through strategies such as seeking distraction or denial. Different coping strategies may lead to different psychosocial outcomes.

Cooper et al. (1992) suggested that ineffective coping techniques underpin alcohol abuse, usually following the failure of engagement-focused techniques. Their study found that stressors did predict alcohol use and drinking problems among men who relied on avoidant forms of coping and who perceived alcohol to yield positive effects. Cooper et al. (1995) extended this work, identifying two pathways to drinking: one via "positive" drinking motivations such as social enhancement and one via "negative" motives such as problem avoidance. Both pathways lead to greater alcohol use, but only avoidant drinking to cope was associated with problem alcohol use. Negative emotions and the expectancy that alcohol

would be effective at reducing tension were directly related to drinking to cope, which in turn was positively related to alcohol use and drinking problems. These studies suggest that when experiencing negative emotions, expectations that alcohol will reduce tension or stress may lead to drinking as a means of coping.

Problem gambling has also been associated with this kind of disengagement coping. Thomas et al. (2009) conducted a qualitative study of the onset of gambling problems in electronic gaming machine (EGM) gamblers, finding that these gamblers often begin gambling for non-problem entertainment-based reasons, but when confronted with life issues, those with a tendency to rely on disengagement coping techniques begin using EGMs to manage problems or negative emotions. Over time, this leads to addictive use. Thomas et al. (2011) found support for this model in a large community sample, where stressors predicted problem gambling, with the effect mediated by avoidance coping habits and access to EGMs.

Stress-Coping Model and PVGU

Stress-coping theory predicts that addiction-like problem behaviors can arise when a person experiences a significant stressor, the person's previously effective coping mechanisms fail, and when the person has regular exposure to potentially addictive behaviors (e.g., drinking alcohol or gambling). This fosters a maladaptive process where excessive behavior becomes a means of disengaging from the stressor, and a failure to regulate it ultimately leads to addiction. King et al. (2010) suggested that this maladaptive coping process could underpin video game addiction.

Video games can be a diversion from problems, and thus could operate like alcohol and gambling in the development of addiction. Wood et al. (2004) found that, compared to low-frequency players, heavy video game players were more likely to use games to relax, alleviate depression, and escape negative states. Ng and Wiemer-Hastings (2005) compared problem video gaming in MMORPG players and non-MMORPG players and found that MMORPG players tended not to use video games to escape negative feelings, while non-MMORPG players did. However, FPS games have not been researched specifically in the context of PVGU. Even though FPSs could be used for escapism, their strong focus on competition, and lower emphasis on story and immersive environment, might not provide as strong a diversion as MMORPGs. Such finding underscores the need for further studies of different game types.

Many stressors—such as work, relationship, and financial problems—could trigger PVGU, but past research indicates that depression, loneliness, and social anxiety are specific aversive states associated with PVGU and thus warrant more immediate investigation. Several studies have found a significant positive relationship between PVGU and depression (Gentile et al. 2011; Griffiths 2010; Mentzoni et al. 2011; Whang et al. 2003; Wood et al. 2004). Other research has linked loneliness with PVGU in the context of online games (Hussain and Griffiths 2009; Shen and Williams 2011; Wan and Chiou 2006; Young 2009). While FPS games can have a strong social component (Frostling-Henningsson 2009; Xu et al. 2011), they may not be as effective in this regard as are the more cooperative and immersive MMORPGs. Finally, McKenna and Bargh (1999) argued that socially anxious "gamers" might use the physical distance of Internet-mediated interaction to temporarily reduce, or disengage from their social anxiety. If relied upon too often, this could lead to PVGU. This idea has received some support in the context of video games (Lo et al. 2005) and—more generally—problem Internet use (Amichai-Hamburger et al. 2002).

Summary and Hypotheses

Drawing on Internet literature to identify potential antecedents to problem gaming and using frameworks from gaming addiction studies to suggest pathways through which problems develop, we propose a simple mediation model for problem video game playing. We expected that levels of psychosocial stressors of negative affect (depressive symptoms), loneliness, and social anxiety would be positively correlated with problem video game use. Based on the addiction models of Thomas et al. (2011) and Cooper et al. (1995), we expected that the effects of these predictors would be mediated maladaptive coping strategies, namely, game playing as a means of escape from problems or as a means of accessing social interaction. The model is shown in Fig. 1.

Method

Participants

There were 2261 participants (2005 men) aged 18–64 ($M = 23.78$, $SD = 5.47$). Participants responded to online advertisements placed on online gaming forums asking them to take a survey about mood and anxiety and motivations around video game use. There is no analytic power model for the modeling technique, but empirical studies (e.g., Fritz and McKinnon 2007) have shown that around 550 cases can detect very small mediation effects with a power of 80%. Furthermore, the method is generally robust with much smaller samples (Hayes 2013). We aimed to recruit at least 500 participants, and deployed the survey for 25 days. During this time, nearly 7500 hits were recorded on the consent information page, with approximately 30% of hits resulted in a survey

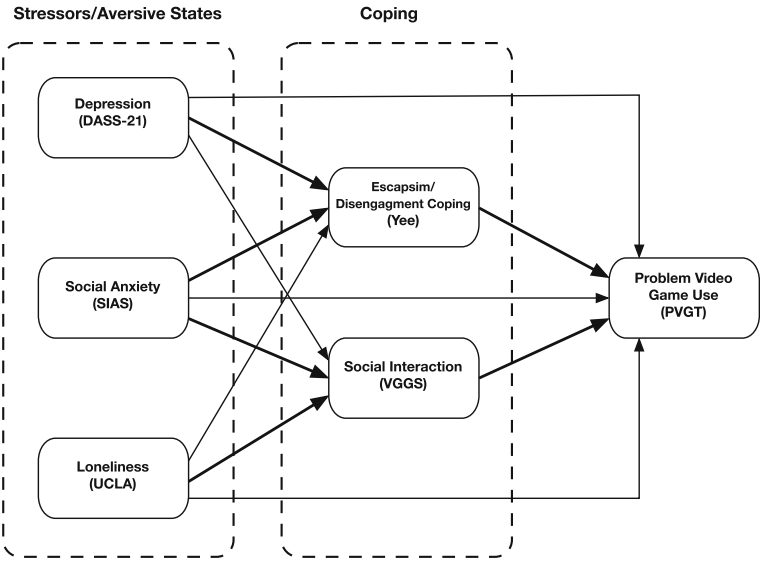

Fig. 1 Conceptual relationship between variables in the model. Heavy lines indicate expected meditational pathway

submission. Most participants were from North and South America (62.6%); the remainder were from Europe (22.6%), Africa (11.5%), and Australasia (9.4%).

Measures

The Problematic Video Game Playing Test (PVGT; King et al. 2011) The PVGT comprises 20 items concerning PVGU based on Griffiths' (2010) video game addiction criteria. Items are rated from 1 (*never*) to 5 (*always*) then summed. Higher scores indicate greater levels of problematic video game use; above 40 indicates problem video game use. The PVGT has shown excellent reliability ($\alpha = 0.93$) and moderate convergent validity (King et al. 2011).

Depression Subscale of The Depression, Anxiety and Stress Scale 21-Item Version (DASS-21; Lovibond and Lovibond 1995) Negative mood was measured using the seven-item depression subscale of DASS-21. Participants rate how well each item describes them over the past week on a four-point scale from 0 (*not representative of me at all*) to 3 (*applies to me very much, or most of the time*). Responses are summed and then doubled, to yield a score ranging from 0 to 42. This subscale has shown excellent reliability ($\alpha = 0.94$) and good convergent and predictive validity against other measures such as the Beck Depression Inventory.

Social Interaction Anxiety Scale (SIAS) and Social Phobia Scale (SPS)—Short form (Peters et al. 2012) The SIAS comprises items tapping social anxiety experienced when interacting in a face-to-face setting, and the SPS comprises items reflecting fears of being scrutinized in social situations. Both employ five-point rating scales 0 (*not characteristic of me at all*) to 4 (*extremely characteristic of me*). This combined inventory has been shown to demonstrate high reliability ($\alpha = 0.92$) and good convergent validity (Johnston et al. 2011) and is a good representation of the full SIAS/SPS scale.

The University of California, Los Angeles Loneliness Scale Revised (ULCA; Russell 1996) The UCLA is a 10-item loneliness measure derived from an original 20-item measure. Participants indicate the frequency with which loneliness-related statements applied to them on a four-point rating scale, from 1 (*never*) to 4 (*always*). Higher scores indicate higher levels of loneliness. The UCLA has shown high excellent reliability ($\alpha = 0.94$) and good concurrent validity.

The Video Game Uses and Gratification Instrument (VGUGS; Sherry et al. 2006) The VGUGS is an inventory with six subscales assessing different motives for video game use. The "social interaction" subscale was used to measure social motivations for video game play. The subscale comprises two items rated on a seven-point Likert scale, and has shown good reliability ($\alpha = 0.81$) and validity (Sherry et al. 2006).

Yee's (2006) Video Game Motivation scale (YVGM)—Escapism Subscale The escapism subscale from the YVGM was selected to assess escapism as a coping mechanism. Participants respond to three items asking how frequently diversion is sought through playing video games. Responses are made using a five-point scale from 1

(*never*) to 5 (*always*). This scale has shown only fair reliability ($\alpha = 0.65$); however, validity has not been reported (Yee 2006).

Procedure

The protocol was approved by the University's Human Research Ethics Committee. The measures listed were placed in a short (approximately 10 min to complete) online survey, and the survey was advertised on Internet sites Facebook, Reddit, and IGN. Informed consent was indicated by return of survey. The survey began with demographic questions and questions about individuals' gaming habits. Participants then indicated whether they tended to play more MMORPGs or FPS games before completing the instruments listed in the "Measures" section, respondents were asked to answer gaming questions in relation to the type of game (MMORPG vs FPS) they played most frequently.

Results

Gamer Characteristics and PVGU

Respondents reported spending an average of 24.05 h per week ($SD = 16.46$) playing video games. MMORPGs were the preferred game type of a slight majority of men (52.40%) and a clear majority of women (70.10%). MMORPG players reported spending significantly more time playing games ($M = 27.35$ h/week, $SD = 17.46$) than did FPS players ($M = 20.17$, $SD = 14.25$, $n = 2257$), $t(2,255.64) = 10.77$; $p = .001$. Using Griffiths' (2010) criterion, 75.2% of MMORPGs players and 72.4% of FPS players had scores suggesting "problematic" use. There were significant but small differences between gamer types: FPS players scored significantly higher than MMORPG players on PVGU and escapism, and scored lower on social interaction (Table 1). MMORPG and FPS players did not differ in their levels of depression, loneliness, social anxiety, or social phobia.

Correlations between measures are shown separately for both gamer types in Table 2. Correlations between all variable pairs were significant except for the depression-social

Table 1 Comparison of MMORPG and FPS players on psychological measures

Variable	FPS		MMORPG		*t* test
	M	SD	M	SD	
Depression	8.39	9.64	7.92	8.84	$t(2,245.23) = 1.21$, *NS*
Loneliness	21.33	6.47	21.21	6.34	$t(2,259) = 0.47$, *NS*
SA: SIAS	4.78	4.76	4.65	4.60	$t(2,259) = 0.68$, *NS*
SA: SPS	3.27	4.73	3.17	4.84	$t(2,259) = 0.48$, *NS*
Social interaction	3.96	1.45	4.17	1.31	$t(2,259) = 3.57$, $p = .001$
Escapism	8.71	2.51	8.49	2.28	$t(2,248.37) = -2.12$, $p = .03$
Video game addiction	47.85	11.83	46.30	10.79	$t(2,247.65) = -3.22$, $p = .001$

SA:SIAS Social Anxiety Social Interaction Anxiety Scale, *SA:SPS* Social Anxiety Social Phobia Scale

Table 2 Correlations between measures used in the mediation analysis

	Depression (DASS)	Social anxiety—SIAS	Social anxiety—SPS	Loneliness (UCLA)	Social interaction (VGUGS)	Escapism (YVGM)	Problem video game playing (PVGU)
Depression (DASS)	–	.41**	.37**	.57**	.06	.39**	.34**
Social anxiety—SIAS	.47**	–	.63**	.55**	.13**	.31**	.35**
Social Anxiety – SPS	.49**	.66**	–	.45**	.18**	.32**	.33**
Loneliness (UCLA)	.64**	.47**	.47**	–	.09**	.35**	.32**
Social interaction (VGUGS)	.14**	.07*	.12**	.17**	–	.58**	.28**
Escapism (YVGM)	.45**	.47**	.33**	.42**	.31**	–	.57**
Problem video game playing (PVGU)	.44**	.41**	.36**	.42**	.33**	.57**	–

Values MMORPGs are shown below the diagonal; values for FPS players are shown above the diagonal

SIAS Social Interaction Anxiety Scale, *SPS* Social Phobia Scale

*$p < .05$ level; **$p < .01$

interaction relationship for the FPS players. The pattern of correlations was almost identical for both gamer types, but correlations were slightly larger for MMORPG players with two exceptions: loneliness-social anxiety and escapism-social interaction. The strongest correlation for both gamer types was between SIAS and SPS, while the weakest was that between loneliness and social interaction.

Mediation Modeling

Parallel multiple mediation analysis was conducted using Hayes' (2013) PROCESS macro. PROCESS does not produce standardized coefficients, so the predictor and mediator variables were standardized prior to analysis so that their relative effects could be more easily interpreted.

FPS Model The model explained around 40% of the variance in problem video gaming for respondents who preferred the FPS genre (Fig. 2, Table 3). All predictors (depression, loneliness, and social anxiety) were correlated with PVGU. Both mediators (escapism and social interaction) were significantly correlated with PVGU. When the effect of the mediators was taken into account, depression and social anxiety but not loneliness had significant direct effects on PVGU. Both depression and loneliness had significant indirect effects on PVGU mediated via escapism, but their effects were not significantly mediated via social interaction. Social anxiety had a significant indirect effect on PVGU via both escapism and social interaction.

MMORPG Model All predictors were correlated with PVGU and explained around 40% of the variance for respondents who preferred the MMORPG genre (Fig. 3; Table 3). Both mediators (escapism and social interaction) were significantly correlated with PVGU, and after their effects were taken into account, depression and social

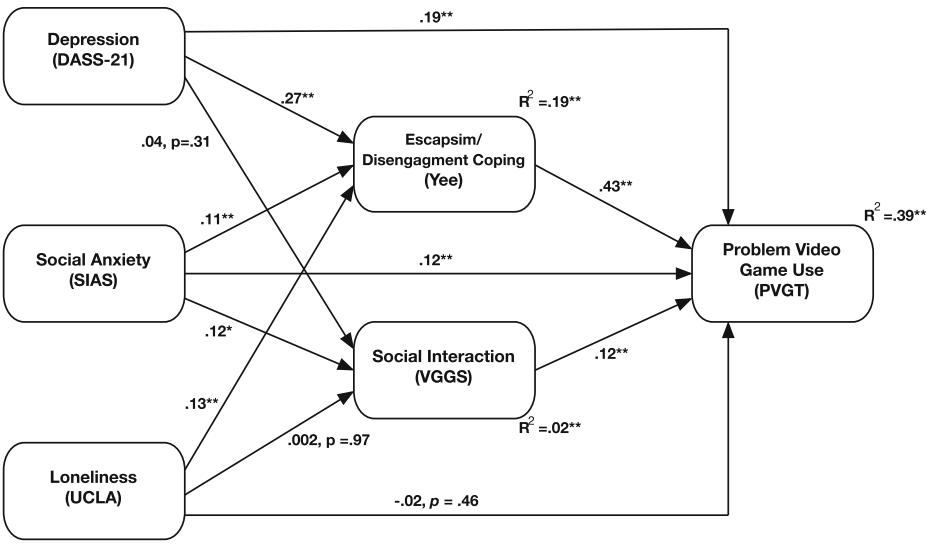

Fig. 2 Mediation model of PVGU for FPS players. *$p < .001$; **$p < .0005$

Table 3 Direct and indirect effect statistics for the mediation models

Predictor	Indirect effect	Effect	SE	LC	UC
FPS $N = 1038$					
Depression	Escapism	0.12	0.02	0.09	0.16
	Social interaction	0.00	0.00	0.001	0.02
	Total indirect effect	0.12	0.02	0.09	0.16
	Direct effect $p < .0005$	0.19	0.03	0.13	0.25
Loneliness	Escapism	0.05	0.18	0.02	0.09
	Social interaction	0.00	0.00	− 0.01	0.01
	Total indirect effect	0.05	0.02	0.02	0.09
	Direct effect $p = .46$	− 0.02	0.03	− 0.08	0.03
Social anxiety	Escapism	0.05	0.01	0.02	0.09
	Social interaction	0.01	0.01	0.005	0.03
	Total indirect effect	0.06	0.02	0.03	0.09
	Direct effect $p < .0005$	0.12	0.03	0.07	0.18
MMORPG $N = 1223$					
Depression	Escapism	0.11	0.01	0.09	0.15
	Social interaction	0.01	0.01	− 0.002	0.02
	Total indirect effect	0.12	0.02	0.09	0.15
	Direct effect $p < .0005$	0.19	0.03	0.13	0.25
Loneliness	Escapism	0.08	0.01	0.05	0.11
	Social interaction	0.03	0.01	0.01	0.05
	Total indirect effect	0.10	0.02	0.07	0.14
	Direct effect $p = .09$	0.05	0.03	− 0.01	0.11
Social anxiety	Escapism	0.02	0.01	− 0.002	0.04
	Social interaction	− 0.01	0.01	− 0.02	0.004
	Total indirect effect	0.01	0.01	− 0.01	0.04
	Direct effect $p < .0005$	0.18	0.03	0.12	0.23

LC lower limit 95% bootstrap confidence interval, *UC* upper limit 95% bootstrap confidence interval

anxiety, but not loneliness, had significant direct effects on PVGU. In contrast to the FPS model, loneliness had significant indirect effects via both mediators, while social anxiety

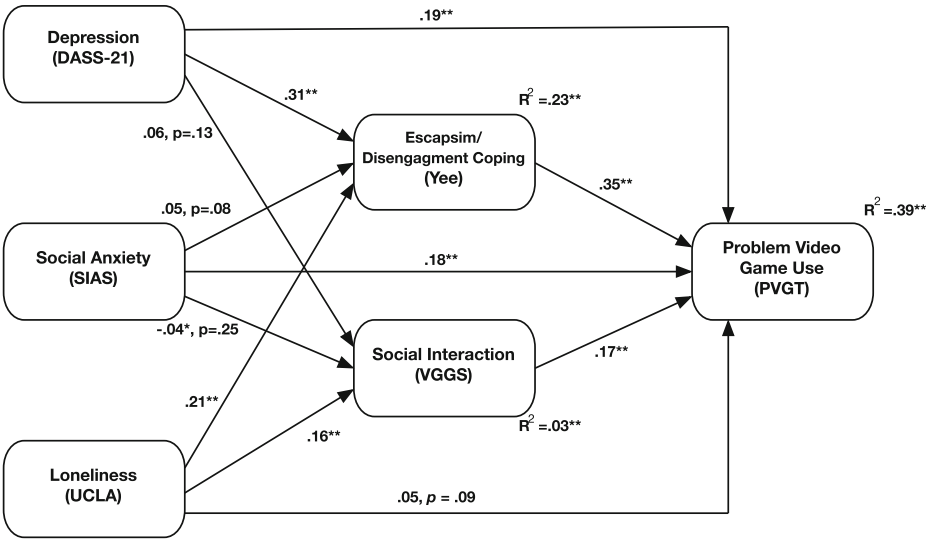

Fig. 3 Mediation model of PVGU for MMORPG players. *$p < .001$; **$p < .0005$

did not have a significant indirect effect via either mediator. Unlike the FPS model, depression had a significant indirect effect via escapism only.

Discussion

The current study investigated whether the stress-coping model of electronic gambling addiction linking stressors to addictive behaviors via maladaptive coping (e.g., Thomas et al. 2011) could be applied to problem video game use (PVGU). We also investigated a more speculative hypothesis that predictors of PVGU differed by gaming genre, as previous researchers have speculated that gameplay mechanics appeal to different types of player, and these would seem to naturally lead to different gameplay motivations that could lead to problematic playing habits. Overall, MMORPG players spent nearly 30% longer playing games in a typical week than FPS players. Despite this, MMORPG players reported slightly lower levels of PVGU than did FPS players. MMORPG and FPS players did not differ on levels of depression, social anxiety, or loneliness. Motives for game playing differed in genre-consistent ways: MMORPG players reported stronger social interaction motives, and FPS players reported stronger escapism motives for game playing. These differences were very small, but significant owing to the large sample. At the group level, coping-related motivations for game playing were very similar for players of both genres, but there were important differences between the genres in terms of the relationships between psychosocial variables, coping motivations, and PVGU.

Consistent with past research, loneliness (e.g., Hussain and Griffiths 2009; Young 2009), depression (e.g., Gentile et al. 2011; Griffiths 2010), and social anxiety (e.g., Lo et al. 2005) were associated with PVGU. As predicted, the effects of these factors were partially mediated by social interaction and escapism motives, and the pattern of mediation differed by game genre. We found that depression-problem gaming and social anxiety-problem gaming relationships were only partially mediated by escapism motives. We also found that although social interaction motives did predict PVGU, the effect was small and social interaction motives were associated only weakly with other model variables. This latter finding is consistent with Thomas et al. (2011), who found that the effect of stress on problem gambling was completely mediated by gambling-to-cope motives, but that socially motivated gambling did not predict problem gambling and thus did not mediate the effects of any predictor. PVGU differs slightly from gambling in that direct effects still existed between mood and PVGU, and we also found an effect for social interaction motivates. However, our sample was much larger than the problem gambling study and this likely accounts for the significance of some low-weight paths in our model. Still, this must be weighed against the fact that around 40% of problem gaming variation could be explained by our model.

For both MMORPG and FPS players, the loneliness-PVGU relationship was completely mediated by motives, although the nature of the mediation differed slightly different by game genre. For MMORPG players, social interaction motives and escapism motives for gaming mediated the effects of loneliness, while for FPS players, only the escapism motive mediated this effect. This result is consistent with the observation that MMORPGs have a stronger social interaction component than do the FPSs. Interestingly, social anxiety predicted PVGU and the effect was partially mediated both by escapism and social interaction. For MMORPG players, social anxiety was only a direct predictor of problem video game playing and it was a stronger

predictor of PVGU than it was for FPS players. Taken together, this pattern suggests that gaming might act as a form of social interaction for socially anxious MMORPG players, but be used as a means of avoiding social interaction by FPS players. This is consistent with observations regarding the relatively more social vs asocial gaming mechanisms in MMORPGs vs FPSs, respectively.

The findings of this study are broadly consistent with similar research on different addictive disorders by Thomas et al. (2011) and Cooper et al. (1995). Namely, egative psychosocial attributes selected on theoretical and empirical grounds predicted PVGU, and that these effects were mediated by motivations for game-playing, specifically escapism. Our method differed slightly from those studies in that we measured more chronic general indicators of distress rather than specific stressful events, and we did not examine the potential protective effects of social support.

Limitations and Future Studies

A potential weakness of this study is the quality of some measures. The online environment is complex, and it is not clear how constructs used in non-online research (e.g., loneliness) translate into the online environment. It is not yet known whether people who are lonely in a more traditional "social contact" sense can compensate through online relationships. The measure of escapism-related gaming motivations has marginal reliability and no validity data available, but no better alternative was available at the time of study.

A more obvious limitation concerns the generalizability of our findings given the sample and sampling technique. The sample was heavily male-dominated. While this fits the stereotype of the intense gamer, market research indicates that women may play games just as much as men. Given this, it might be more appropriate to regard in the present our study as one of male PVGU. Respondents also had to identify as *either* FPS *or* MMORPG players before answering the questionnaire, but many individuals may play both types. However, if anything, this would have made our two models more similar rather than less. Participants were players primarily recruited from a gaming interest website, many of whom reported "problematic" levels of video game playing. It is unclear whether oversampling heavy gamers would inflate or dilute the correlations between variables in our study. At minimum, our results should be interpreted as applying to men with heavy gaming involvement, and generalized to other groups with caution. Future research could investigate other game types, and recruit different player groups (e.g., women, "casual" gamers) to determine if our results generalize.

There may be selection bias arising from the recruitment method and the need for informed consent. The advertisement posted sought participants for "investigating motivations to play video games and their relationship to mood and anxiety." This may have appealed to gamers whose motivation relates to such issues, which could increase correlations between related measures. However, the differential relationships observed within the models for the two game genres argue against this hypothesis, and it is hard to reconcile with selection bias. Furthermore, the majority of participants responded from an Internet forum of active game players who, if anything, might want to downplay links between negative psychological symptoms and video game use. If this presentation bias exists, our findings would *underestimate* the strength of such relationships. Indeed, a number of the written comments on the forums asked whether researchers might be trying to frame gaming in a negative light.

Finally, the study was cross-sectional. Experimental studies and longitudinal studies are needed to properly evidence causality. However, cross-sectional meditational research is useful

in identifying potential causal mechanisms before more labor-intense (and typically smaller) longitudinal and experimental studies are conducted.

Conclusion

This study indicated that psychosocial distress from depression, loneliness, and anxiety about face-to-face interaction was a predictor of PVGU. These effects were found to be mediated by motivations/expectancies regarding video game playing, such as gaming to escape negative states and seeking to fulfill social interaction needs online. This pattern of association parallels established etiologies for addictive disorders and so provides another line of research to understand how technology can contribute to psychosocial problems. Further studies of PVGU utilizing the stress-coping framework for addiction PVGU may be fruitful. Rather than marking technology as particularly insidious or "special" in some way, our findings suggest that addiction-like problems arising from excessive technology use are similar to those that arise from other excessive pursuits. This implies that technology-related problems can be studied and, if necessary, treated using existing methods derived from those frameworks.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all participants for being included in the study.

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