Journal of Behavioral Addictions 6(4), pp. 572–578 (2017)
DOI: 10.1556/2006.6.2017.084

Measures of behavioral function predict duration of video game play: Utilization of the Video Game Functional Assessment – Revised

FRANK D. BUONO[1]*, MARK D. GRIFFITHS[2], MATTHEW E. SPRONG[3], DANIEL P. LLOYD[1], RYAN M. SULLIVAN[1] and THOMAS D. UPTON[4]

[1]Yale School of Medicine, New Haven, CT, USA
[2]Nottingham Trent University, Nottingham, UK
[3]Northern Illinois University, DeKalb, IL, USA
[4]Southern Illinois University, Carbondale, IL, USA

(Received: July 23, 2017; revised manuscript received: October 20, 2017; second revised manuscript received: November 24, 2017; accepted: December 3, 2017)

Background: Internet gaming disorder (IGD) was introduced in the DSM-5 as a way of identifying and diagnosing problematic video game play. However, the use of the diagnosis is constrained, as it shares criteria with other addictive orders (e.g., pathological gambling). *Aims:* Further work is required to better understand IGD. One potential avenue of investigation is IGD's relationship to the primary reinforcing behavioral functions. This study explores the relationship between duration of video game play and the reinforcing behavioral functions that may motivate or maintain video gaming. *Methods:* A total of 499 video game players began the online survey, with complete data from 453 participants (85% white and 28% female), were analyzed. Individuals were placed into five groups based on self-reported hours of video gaming per week, and completed the Video Game Functional Assessment – Revised (VGFA-R). *Results:* The results demonstrated the escape and social attention function were significant in predicting duration of video game play, whereas sensory and tangible were not significant. *Conclusion:* Future implications of the VGFA-R and behaviorally based research are discussed.

Keywords: Internet gaming disorder, functional assessment, VGFA-R, video games

INTRODUCTION

The (latest) fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013) introduced Internet gaming disorder (IGD) as an area worthy of further empirical and clinical study. Further work is needed to standardize the criteria, underlying mechanisms, and diagnosis of problematic video gaming to reach consensus across relevant stakeholders [i.e., clinical, research, and public health and policy (Griffiths et al., 2016)]. The proposed diagnostic criterion proposed in the DSM-5 requires the presence of five of nine symptoms over a 12-month period. These include: (a) preoccupation or obsession with Internet games, (b) withdrawal symptoms when not playing Internet games, (c) an increasing need over time to spend more and more time playing video games (i.e., tolerance), (d) failed attempts to stop or curb Internet gaming, (e) loss of interest in other activities such as hobbies, (f) continued overuse of Internet games even with knowledge of the impact of overuse on their life, (g) lying about extent of Internet game usage, (h) uses Internet games to relieve anxiety or guilt, and (i) has lost or put at risk an opportunity or relationship because of Internet games (APA, 2013). These criteria for diagnosing are arguably limited (Starcevic, 2017; van Rooij & Kardefelt-Winther, 2017), because they share commonalities within pathological gambling (Oggins & Sammis, 2010; Wood, Griffiths, Chappell, & Davies, 2004) and other addictive disorders (Pontes & Griffiths, 2014). Moreover, Kardefelt-Winther et al. (2017) emphasized the difference between the syndrome model of addiction and behavioral addiction. They emphasized need to understand and conceptualize behavioral addiction more specifically so as not to overpathologize everyday activities.

As with other addictive behaviors (e.g., pathological gambling or eating addictions), understanding the reinforcing behavioral functions maintaining the addictive behavior is critical for effective treatment (Hendrickson & Rasmussen, 2013; Petry et al., 2006). Much of this research draws on applied behavior analysis and an emphasis on four predominant reinforcing behavioral functions: social attention, tangible/intangible rewards, escape/avoidance of demands or pain, and sensory stimulation (Cooper, Heron, & Heward, 2007). The reinforcing behavioral functions are assessed by the degree of the behavior emitted due to the presence or absence of the behavioral function (Hanley, Iwata, & McCord, 2003). That is, given the presence or

* Corresponding author: Frank D. Buono, PhD; Department of Psychiatry, Yale School of Medicine, 495 Congress Ave, New Haven 06519, CT, USA; Phone: +1 203 285 2716; Fax: +1 203 781 4681; E-mail: Frank.buono@yale.edu

This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium for non-commercial purposes, provided the original author and source are credited.

absence of a specific reinforcing behavior function, will the individual increase or decrease their play? For example, one player may be more likely to increase their play in the presence of other friends or gamers (social attention), whereas another may be relatively unaffected by other gamers but may increase their game play due to in game rewards (tangible/intangible rewards).

From a behavioral perspective, understanding the specific reinforcing functions for an individual is vital to intervention. The attention function can be described as actively seeking a response from others by drawing attention to one's behavior via positively or negatively maintained behavior (i.e., social attention). Video games provide many opportunities for such positive and negative attention (Beranuy, Carbonell, & Griffiths, 2012; Caplan, Williams, & Yee, 2009; Griffiths, Davies, & Chappell, 2003). For example, positive attention can be reinforced when a video game player is praised by online friends for successfully completing a difficult mission/objective, whereas negative attention can be reinforced when an individual, playing the role of a shooter, insults others after they have killed his character. It should be noted that both positive and negative attention can potentially increase the frequency of play via removal or addition of a stimulus (see Buono, Upton, Griffiths, Sprong, & Bordieri, 2016 for more context on behavior analysis within video game play).

The escape/avoidance function is divided into two related functions. Escape is the termination of the demand made on the individual, whereas avoidance is temporary removal of the demand. For example, many individuals play video games to escape daily stressors, such as boredom, worry, or anxiety related to real-world events (Hussain & Griffiths, 2009; Wan & Chiou, 2006). Video game play also allows the individual to avoid real-world task demands, such as getting into a marital dispute, receiving a low grade on an exam, or being fired from a job. Rather than dealing with the reality of these problems, the individual avoids the consequences of these issues by escaping through game (Griffiths, 2010a).

The tangible function is the desire for an item or commodity. In many video games, players are able to earn in-game items (e.g., improved equipment, cosmetic items, etc.) upon accomplishing certain tasks (King & Delfabbro, 2009; Wan & Chiou, 2006). As more tasks are completed, more in-game items are unlocked. Although not physically tangible, the delivery of in-game items following the performance of specific in-game activity serves a function similar to the acquisition of real-world goods. As the character increases in level, tangible rewards are obtained, such as weapons or spell, which provide a motivation for increased duration of play.

Two aspects of video game play are maintained by sensory functions. First, the lights, sounds, and graphics can be highly stimulating to the engaged user. These sensory stimulation motivations may include graphics that are aesthetically pleasing or professionally produced music that can contribute to continued game play (Hsu, Wen, & Wu, 2009; King & Delfabbro, 2009). Second, players may become so intensely immersed in a video game that it becomes their reality but they become disconnected from other aspects of their environment and life (Griffiths, 2010a).

In treatment for addictive disorders, ascertaining the reinforcing behavior function of the addictive behavior (i.e., Functional Analysis of Behavior) is an integral component of behavioral and cognitive behavioral treatments (Cone, 1997; Külz, 2014). Thus, examination reinforcing behavioral functions of video game play behavior can be an important component of understanding this disorder. In a systematic review of IGD withdrawal symptoms, Kaptsis, King, Delfabbro, and Gradisar (2016) noted that withdrawal does not simply follow duration of play, but those specific requirements of gaming need to be met to prevent withdrawal. Conversely, in relation to the etiology of IGD, examination of reinforcing behavioral functions in relation to duration of play must also be conducted to understand severity and maintenance of IGD. However, two papers (Buono et al., 2016; Sprong, Buono, Bordieri, Mui, & Upton, 2014) have examined the reinforcing behavior functions of video gaming by developing the Video Game Functional Assessment (VGFA) and the revised version (VGFA-R). To the author's knowledge, the VGFA-R is the only assessment developed utilizing the four maintaining functions of behavior (i.e., social attention, escape, tangible, and sensory). Therefore, this study explored the relationship between duration of video game play and the reinforcing behavioral functions that may motivate or maintain play.

METHODS

Participants

Individuals were recruited through two approved methods: (a) via online forums/blogs dedicated to video gaming and (b) flyers distributed throughout Southern Illinois University. Researchers obtained online forum/blog approval from forum/blog administrators prior to posting recruitment information. Approval was obtained by the Southern Illinois University's Human Subjects Committee.

The inclusion criteria were (a) being 18 years of age or older, (b) having active video game use in the last 3 weeks (i.e., ≥1 hr), (c) being able to read and comprehend English at a fifth-grade level, and (d) having access to a computer. Active video game play was defined as at least 1 hr of console, computer, mobile device, and/or online play within a 7-day period for at least three consecutive weeks. Exclusion criteria included (a) having no access to the Internet via laptop/desktop computer, (b) submitting of incomplete data (e.g., exiting the survey prior to completion, provided demographics but no answers to outcome measures), (c) scoring 6 or above on the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987), (d) scoring 3 or above on the Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991), and (e) scoring 6 or above on the Michigan Alcohol Screening Test (MAST; Selzer, 1971).

Measures

Three assessments (FTND, MAST, and SOGS) were utilized to exclude individuals with co-occurring disorders that

might have been confounding factors that affected participant's responses. The SOGS (Lesieur & Blume, 1987) is a 20-item self-report assessment based on the DSM-III criteria for pathological gambling. Scores range between 1 and 20, with any score above 5 is considered pathological. The SOGS was shown highly reliable in this study (Cronbach's $\alpha = .97$). The MAST (Selzer, 1971) is a 24-item self-report questionnaire establishing drinking severity within the participant. Scores range between 0 and 50, where 0–3 represents no-issue, 4 represents early or middle problem drinker, and 5 or more represent a problem drinker. The MAST was shown to be reliable in this study (Cronbach's $\alpha = .87$). FTND (Heatherton et al., 1991) is a 6-question self-report assessment that examines how salient cigarettes are to the individual. The scale ranges between 1 and 10, where a score between 1 and 2 indicates low dependence, 3 and 4 as low to moderate dependence, 5–7 a moderate dependence, and 8 or above as high dependence. The FTND was shown to be reliable in this study (Cronbach's $\alpha = .83$).

The VGFA-R (Buono et al., 2016) is a 24-item instrument that assesses self-reported frequency of video gaming on a 7-point Likert scale (1 = never, 2 = almost never, 3 = seldom, 4 = half of the time, 5 = usually, 6 = almost always, and 7 = always) across behavioral functions. Items were developed in four behavioral function domains; social attention, escape/avoidance, tangible/intangible rewards, and sensory stimulation. The assessment was constructed similar to the Motivation Assessment Scale (Durand & Crimmins, 1988), an indirect functional assessment to identify the potential maintaining motivation of the behavior. The overall variance of the VGFA-R was 59.7% and the four functions demonstrated high reliability in an independent sample overall (Cronbach's $\alpha = .93$) (Buono et al., 2016).

Procedure

The survey was developed and hosted via *SurveyMonkey* (www.surveymonkey.com). Participants were provided with a direct link to the survey via a recruitment post within a forum/blog or via a tear-off strip poster. Upon successful link access, participants were asked to read and provide signature for informed consent. Participants were asked to complete a demographics form, which included age, ethnicity, gender, number of hours of video games played weekly, preferred game genre, preferred day of video game play, and asked when was their occurrence of playing video games. Preferred game genre was categorized by game play characteristics and the marketing of the product (e.g., first-person shooter and simulation). Participants were asked to choose between these general game genres or they had the option to choose "other" and describe genre more fully. The number of hours playing video games per week was based on previous research (i.e., Buono et al., 2016; Sprong et al., 2014): Group 1 comprised those who played 1–5 hr/week; Group 2 played between 6 and 11 hr/week; Group 3 played 12–17 hr/week; Group 4 played 18–23 hr/week; and Group 5 played more than 24 hr/week. Upon completing the demographics, participants were asked to self-report active use of alcohol (MAST), cigarettes (FTND), and gambling (SOGS) behavior. Finally, participants were asked to complete the VGFA-R 24-question scale. All questions were either formatted using a drop-down screen for multiple response answers or fixed format. Blank questions prompted an error message for participants to complete the missing question. The average duration of the study was 25 min ($SD = 4.21$).

Data analysis

Bivariate comparisons of demographic characteristics of participants across duration of play were conducted using χ^2 tests for categorical variables and analysis of variance for continuous measures. A linear multiple regression was used to evaluate the standardized scores of the degree of reinforcement by functional category (i.e., social attention, escape, sensory, and tangible) to duration of play. The duration of hours played per week was a continuous variable (total hours played). Standardized scores were used (a) because the functional categories were composed of different numbers of items and (b) to examine the relative degree of reinforcement by functional category (Cohen & Wollack, 2006). The study also collected data concerning demographic information and the weekly hours of video games played per week. The dependent variables were categorized to determine if there were any trends that may be useful to explore in future studies with larger samples.

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the Southern Illinois University approved the study. All subjects were informed about the study and all provided informed consent.

RESULTS

A total of 499 video game players began the online survey. Ten individuals did not meet inclusion criteria, three were younger than 18 years, two did not meet the minimum game play of 1 hr/week, and five did not have access to a computer. Of the 489 who met inclusion criteria, 36 were excluded due to inadequately completing the survey, resulting in a final sample of 453 participants. Twenty-eight percent of participants were female ($n = 133$), and the mean age of the participants was 24.6 years ($SD = 2.9$).

Table 1 presents the demographics by weekly hours of video game play. As can be seen in Table 1, the video game duration groups differed by ethnicity, such that Caucasian individuals comprised the majority of participants. Demographic variables were not controlled for in the data analysis, because there were large discrepancies in the different demographic information collected. Types of video game differed among the five groups. However, role-playing games (e.g., MMORPGS, such as *World of Warcraft*) were the most preferred. In addition, individuals playing up to 5 hr weekly were more likely to play a game played via a mobile application or role playing games, whereas those who played more than 24 hr/week were more likely to play role-playing games and first-person shooters.

Table 1. Demographics across the video game groups

	Groups					
Hours per week	1–5	6–11	12–17	18–23	24+	*p* value
n (%)	138 (30%)	119 (26%)	94 (21%)	58 (13%)	44 (10%)	
Gender						.31
Female	55 (40%)	23 (19%)	43 (46%)	7 (12%)	5 (11%)	
Ethnicity						.009
Asian	20 (14%)	5 (4%)	6 (6%)	3 (5%)	4 (9%)	
Black	15 (11%)	2 (2%)	8 (9%)	1 (2%)	1 (2%)	
White	87 (63%)	103 (86%)	55 (59%)	47 (81%)	35 (80%)	
Hispanic	5 (4%)	6 (5%)	5 (5%)	2 (3%)	1 (2%)	
American Indian	8 (6%)	0 (0%)	11 (12%)	5 (9%)	2 (5%)	
Other	3 (2%)	3 (3%)	9 (10%)	0 (0%)	1 (2%)	
Days of week						.05
Monday	1 (1%)	8 (7%)	5 (5%)	2 (3%)	2 (5%)	
Tuesday	21 (15%)	6 (5%)	4 (4%)	4 (7%)	1 (2%)	
Wednesday	19 (14%)	5 (4%)	4 (4%)	2 (3%)	0 (0%)	
Thursday	8 (6%)	6 (5%)	0 (0%)	2 (3%)	1 (2%)	
Friday	11 (8%)	20 (17%)	4 (4%)	9 (16%)	7 (16%)	
Saturday	23 (17%)	58 (49%)	54 (57%)	23 (40%)	25 (57%)	
Sunday	55 (40%)	16 (14%)	23 (24%)	16 (28%)	8 (18%)	
Type of game						<.001
Mobile app	25 (18%)	3 (3%)	0 (0%)	0 (0%)	0 (0%)	
First person	10 (7%)	23 (19%)	22 (23%	21 (36%)	10 (23%)	
Real time	4 (3%)	11 (9%)	16 (17%)	7 (12%)	3 (7%)	
Role playing	72 (52%)	49 (41%)	40 (43%)	18 (31%)	21 (48%)	
Simulation	9 (7%)	8 (7%)	1 (1%)	2 (3%)	1 (2%)	
Sports	7 (5%)	5 (4%)	5 (5%)	2 (3%)	3 (7%)	
Turn-based	1 (1%)	8 (7%)	9 (10%)	5 (9%)	3 (7%)	
Other	10 (7%)	12 (10%)	1 (1%)	3 (5%)	3 (7%)	

Note. *n* = number of individuals.

A multiple regression analysis was used to test if the VGFA-R behavioral functions significantly predicted participants' duration of video game play (total hours played in a week). The results of the regression indicated that four predictors explained 30.7% of the variance [$R^2 = .313$, F (4, 445) = 50.787, $p < .001$)]. No collinearity was found between the four maintaining functions, indicating each function was independent of each other. It was found that the escape function ($\beta = 0.068$, $p < .001$) and social attention function ($\beta = 0.030$, $p < .001$) significantly predicted the amount of hours of video games played per week. The sensory function ($\beta = 0.004$, $p = .730$) and tangible function ($\beta = 0.013$, $p = .141$) did not significantly predict the amount of hours of video games played per week.

DISCUSSION

This is the first study to examine whether reinforcing behavioral functions differ by the amount of weekly video game play using the VGFA-R. The results demonstrated a positive linear relationship between the hours of play and two of the four behavioral functions (social attention and escape) when compared with other functions at higher rates of play. Interestingly, this study is consistent with and extends Sprong et al.'s (2014) initial findings that escape maintained behaviors are predominantly found among individuals who play video games more than 24 hr/week.

Compared with the other behavioral functions, escape maintained behaviors are more often negatively maintained, such as those via the avoidance of responsibilities. From a behavioral theoretical approach to addiction (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996), avoidance behaviors are more likely to lead to negative consequences, which can result in a reinforcement cycle. Frequent avoidance of responsibilities can lead to problems, for which additional avoidance can be even more reinforcing (Mentzoni et al., 2011; Yee, 2007). Therefore, what maintains a video game player's initial motivation for playing a few hours a week would differ from those who play frequently. For example, an individual engaging in a game played via mobile applications (e.g., *Candy Crush*) for less than 5 hr/week is presumably maintained by the tangible function (gaining access to the next level or unlocking a new item) as compared with an individual who engages in over 24 hr/week, who may exhibit escape or combination of functions that maintain their game play.

The social attention condition can be maintained through either positive or negative reinforcement. The current research extends Yee's (2007) work on motivations of play, in particular attention, by indicating that social attention and duration of play have a direct relationship. Moreover, current video games incorporate social attention aspects to retain and provide enticement (Christou, 2014), and by incorporating social attention into a game's design, game developers can increase duration of play. The social attention framework

is counter to escape maintained functions, in which escape maintained behaviors are generally extrinsic to the video game, whereas social attention is directly tied to the video game. Understanding this factor of social attention from a behavioral framework within the context of a video game needs further examination to provide a better understanding of how it might produce meaningful change in players.

Future research should investigate the process of change within maintaining behavioral functions of video game play. The current findings are consistent with research on other addictive behaviors (e.g., pathological gambling) (Weatherly, Miller, Montes, & Rost, 2012; Weatherly, Miller, & Terrell, 2011). Weatherly et al. (2011) found higher incidents of negative contingencies impacting pathological gamblers when evaluating the positive and negative contingencies that reinforce the problem behavior compared with matched controls. Escape maintained behaviors are primarily found within negative contingencies; although the current findings are consistent with a behavioral theoretical perspective, these findings are cross-sectional. Longitudinal studies are needed to better elucidate the development of reinforcement patterns over time and how they pertain to video game play.

The proposed diagnostic criteria in the DSM-5 for IGD (Petry, Rehbein, Ko, & O'Brien, 2015) discuss the impact of reinforcing motivations of online video game play. Of the symptoms listed earlier in the paper, five are consequences of an overreliance on a single reinforce (e.g., loss of interest in other activities, overuse, use to relieve anxiety or guilt, lying about use, and lost opportunity or relationship), while duration of play is indirectly mentioned in the criteria of IGD diagnosis (Criteria 3 and 6; APA, 2013). The amount of video game use, even among individuals with high levels of play problems, needs to be further evaluated. Thus, a limitation of this study was that we did not examine how IGD symptoms were associated with amount of use or behavioral maintaining functions. However, symptom criteria may be viewed as closely related to escape behaviors; other behavior functions could result in the same symptoms. Consequently, a direct evaluation of the relationship between reinforcing functions and diagnostic symptoms, including individuals diagnosed with IGD and those without, is needed.

There were some additional limitations of the current research. First, a majority of participants were recruited through online forums and blogs. Several scholars discuss the disadvantages of recruiting video game players online (Griffiths, 2010b; Griffiths, Lewis, Ortiz de Gortari, & Kuss, 2015; King, Delfabbro, & Griffiths, 2009). There are four specific issues when it comes to recruiting online: (a) threat responses, (b) dishonesty, (c) lack of awareness, and (d) incentive. All these issues were addressed using pro-active strategies outlined by King et al. (2009). These challenges were addressed by including a precautionary message during orientation alerting potential participants to the credibility of the research study by displaying the university's logo and the lead author's signature page. In addition, participants were placed in a lottery draw to win one of four $50 gift cards. Second, the exact number of hours of self-reported game use per week was not assessed, because participants selected the category of hours of use that was most appropriate to their gaming usage. A continuous measure would have provided greater statistical flexibility to evaluate linear and non-linear relationships with the outcome. However, we chose the measure to be consistent with other recent studies of the amount of video game play (e.g., Buono, et al., 2016; Sprong et al., 2014; Van Rooij & Prause, 2014) as self-reported hours of video game use tends to be under reported, possibly due to a perceived stigma of the implications of frequent use. Third, in our attempt to control for this study, we only excluded for cigarette usage, pathological gambling, and alcohol usage. It should be noted that none of the participants self-reported any usage on these measures above the threshold for exclusion. IGD is a complex disorder and understanding other co-occurring diseases or disorders needs to be evaluated in greater detail. Finally, more research needs evaluate if the maintaining motivations (i.e., social attention, escape, tangible, and sensory) are interdependent or independent of themselves. The present research found these functions as independent, which reinforces previous research by Sprong et al. (2014). In examining therapeutic treatments for IGD, firmly establishing a function's potential independence is of critical importance to assess for a given treatment's efficacy.

Although IGD was not directly assessed, the present results have clinical implications. The VGFA-R provides a comprehensive assessment that can be used for functional analysis of behavior, a common initial step in behavioral and cognitive-behavioral treatments of addiction. By understanding the factors motivating the individual to continue game play, therapists can work with patients to determine methods to reduce problematic game use or to establish if current patterns of play are of clinical or behaviorally significant. The findings of this study suggest that treatment would likely need to address escape/avoidance and social attention behavior provided by high levels of game use, targeting alternative reinforcing behaviors to replace the functions that the video game play provides, or address the need or desire for avoidance directly.

Funding sources: None.

Authors' contribution: FB: study concept and design, interpretation of data, and manuscript construction; MG: study supervision and manuscript construction; MS: study concept and statistical analysis; DL: interpretation of data and manuscript construction; RS: manuscript editing; TU: study supervision, mentoring, and manuscript construction.

Conflict of interest: The authors declare no conflict of interest.

Acknowledgement: Portions of this research will be presented at the 150th annual scientific meeting of the American Psychological Association, Washington, DC.

REFERENCES

American Psychiatric Association [APA]. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Association.

Beranuy, M., Carbonell, X., & Griffiths, M. D. (2012). A qualitative analysis of online gaming addicts in treatment. *International Journal of Mental Health and Addiction, 11*(2), 149–161. doi:10.1007/s11469-012-9405-2

Buono, F. D., Upton, T. D., Griffiths, M. D., Sprong, M. E., & Bordieri, J. (2016). Demonstrating the validity of the Video Game Functional Assessment – Revised (VGFA-R). *Computers in Human Behavior, 54,* 501–510. doi:10.1016/j.chb.2015.08.037

Caplan, S., Williams, D., & Yee, N. (2009). Problematic Internet use and psychosocial well-being among MMO players. *Computers in Human Behavior, 25*(6), 1312–1319. doi:10.1016/j.chb.2009.06.006

Christou, G. (2014). The interplay between immersion and appeal in video games. *Computers in Human Behavior, 32,* 92–100. doi:10.1016/j.chb.2013.11.018

Cohen, A. S., & Wollack, J. A. (2006). Test administration, security, scoring, and reporting. In R. L. Brennan (Ed.), *Educational assessment* (4th ed., pp. 355–386). Westport, CT: Praeger.

Cone, J. D. (1997). Issues in functional analysis in behavioral assessment. *Behaviour Research and Therapy, 35*(3), 259–275. doi:10.1016/S0005-7967(96)00101-5

Cooper, J. O., Heron, T. E., & Heward, W. (2007). *Applied behavior analysis* (2nd ed.). Columbus, OH: Merrill-Prentice Hall.

Durand, V., & Crimmins, D. (1988). Identifying the variable maintaining self-injurious behaviors. *Journal of Autism and Developmental Disorders, 18*(1), 99–117. doi:10.1007/BF02211821

Griffiths, M. D. (2010a). The role of context in online gaming excess and addiction: Some case study evidence. *International Journal of Mental Health and Addiction, 8*(1), 119–125. doi:10.1007/s11469-009-9229-x.

Griffiths, M. D. (2010b). The use of online methodologies in data collection for gambling and gaming addictions. *International Journal of Mental Health and Addiction, 8*(1), 8–20. doi:10.1007/s11469-009-9209-1

Griffiths, M. D., Davies, M. N., & Chappell, D. (2003). Breaking the stereotype: The case of online gaming. *CyberPsychology & Behavior, 6*(1), 81–91. doi:10.1089/109493103321167992

Griffiths, M. D., Lewis, A., Ortiz de Gortari, A. B., & Kuss, D. J. (2015). Online forums and blogs: A new and innovative methodology for data collection. *Studia Psychologica, 15*(2), 101–122. doi:10.21697/sp.2015.14.2.07

Griffiths, M. D., van Rooij, A. J., Kardefelt-Winther, D., Starcevic, V., Kiraly, O., Pallesen, S., Dreier, M., Carras, M., Prause, N., King, D. L., Aboujaoude, E., Kuss, D. J., Pontes, H. M., Lopez Fernandez, O., Nagygyorgy, K., Achab, S., Billieux, J., Quandt, T., Carbonell, X., Ferguson, C. J., Hoff, R. A., Derevensky, J., Haagsma, M. C., Delfabbro, P., Coulson, M., Hussain, Z., & Demetrovics, Z. (2016). Working towards an international consensus on criteria for assessing Internet gaming disorder: A critical commentary on Petry et al. (2014). *Addiction, 111*(1), 167–175. doi:10.1111/add.13057

Hanley, G. P., Iwata, B. A., & McCord, B. E. (2003). Functional analysis of problem behavior: A review. *Journal of Applied Behavior Analysis, 36*(2), 147–185. doi:10.1901/jaba.2003.36-147

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology, 64*(6), 1152–1168. doi:10.1037/0022-006X.64.6.1152

Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K.-O. (1991). The Fagerstrom Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. *Addiction, 86*(9), 1119–1127. doi:10.1111/j.1360-0443.1991.tb01879.x

Hendrickson, K. L., & Rasmussen, E. B. (2013). Effects of mindful eating training on delay and probability discounting for food and money in obese and healthy-weight individuals. *Behavior Research and Therapy, 51*(7), 399–409. doi:10.1016/j.brat.2013.04.002

Hsu, S. H., Wen, M.-H., & Wu, M.-C. (2009). Exploring user experiences as predictors of MMORPG addiction. *Computers & Education, 53*(3), 990–999. doi:10.1016/j.compedu.2009.05.016

Hussain, Z., & Griffiths, M. D. (2009). The attitudes, feelings, and experiences of online gamers: A qualitative analysis. *CyberPsychology & Behavior, 12*(6), 747–753. doi:10.1089/cpb.2009.0059

Kaptsis, D., King, D. L., Delfabbro, P. H., & Gradisar, M. (2016). Withdrawal symptoms in Internet gaming disorder: A systematic review. *Clinical Psychology Review, 43,* 58–66. doi:10.1016/j.cpr.2015.11.006

Kardefelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Maurage, P, Carras, M., Edman, J., Blaszczynski, A., Khazaal, Y., Billieux, J., & Billieux, J. (2017). How we can conceptualize behavioural addiction without pathologizing common behavior. *Addiction, 112*(10), 1709–1715. doi:10.1111/add.13763

King, D. L., & Delfabbro, P. (2009). Understanding and assisting excessive players of video games: A community psychology perspective. *Australian Community Psychologist, 21*(1), 62–74.

King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2009). The psychological study of video game players: Methodological challenges and practical advice. *International Journal of Mental Health and Addiction, 7*(4), 555–562. doi:10.1007/s11469-009-9198-0

Külz, A. K. (2014). Die funktionsanalyse in der verhaltenstherapie [The functional analysis in behavioral therapy]. *Verhaltenstherapie, 24*(3), 211–220. doi:10.1159/000365649

Lesieur, H. R., & Blume, S. B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144*(9), 1184–1188. doi:10.1176/ajp.144.9.1184.

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouveroe, K. J., Hetland, J., & Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior and Social Networking, 14*(10), 591–596. doi:10.1089/cyber.2010.0260

Oggins, J., & Sammis, J. (2010). Notions of video game addiction and their relation to self-reported addiction among players of World of Warcraft. *International Journal of Mental Health and Addiction, 10*(2), 210–230. doi:10.1007/s11469-010-9309-y

Petry, N. M., Ammerman, Y., Bohl, J., Doersch, A., Gay, H., Kadden, R., Molina, C., & Steinberg, K. (2006). Cognitive-behavioral therapy for pathological gamblers. *Journal of Consulting and Clinical Psychology, 74*(3), 555–567. doi:10.1037/0022-006X.74.3.555

Petry, N. M, Rehbein, F., Ko, C. H., & O'Brien, C. P. (2015). Internet gaming disorder in the DSM-5. *Current Psychiatry Reports, 17*(9), 72. doi:10.1007/s11920-015-0610-0

Pontes, H. M., & Griffiths, M. D. (2014). Assessment of Internet gaming disorder in clinical research: Past and present perspectives. *Clinical Research and Regulatory Affairs, 31*(2–4), 35–48. doi:10.3109/10601333.2014.962748

Selzer, M. L. (1971). The Michigan Alcoholism Screening Test: The quest for a new diagnostic instrument. *American Journal of Psychiatry, 127*(12), 1653–1658. doi:10.1176/ajp.127.12.1653

Sprong, M. E., Buono, F. D., Bordieri, J., Mui, N., & Upton, T. D. (2014). Establishing the behavioral function of video game use: Development of the video game functional assessment. *Journal of Addictive Behaviors, Therapy & Rehabilitation, 3*(4), 1–6. doi:10.4172/2324-9005.1000130

Starcevic, V. (2017). Internet gaming disorder: Inadequate diagnostic criteria wrapped in a constraining conceptual model. *Journal of Behavioral Addictions, 6*(2), 110–113. doi:10.1556/2006.6.2017.012

van Rooij, A. J., & Kardefelt-Winther, D. (2017). Lost in the chaos: Flawed literature should not generate new disorder. *Journal of Behavioral Addictions, 6*(2), 128–132. doi:10.1556/2006.6.2017.015

van Rooij, A. J., & Prause, N. (2014). A critical reivew of "Internet addiction" criteria with suggestions for the future. *Journal of Behavioral Addiction, 3*(4), 203–213. doi:10.1556/JBA.3.2014.4.1

Wan, C. S., & Chiou, W. B. (2006). Why are adolescents addicted to online gaming? An interview study in Taiwan. *CyberPsychology & Behavior, 9*(6), 762–766. doi:10.1089/cpb.2006.9.762

Weatherly, J. N., Miller, J. C., Montes, K. S., & Rost, C. (2012). Assessing the reliability of the gambling functional assessment: Revised. *Journal of Gambling Studies, 28*(2), 217–223. doi:10.1007/s10899-011-9275-8

Weatherly, J. N., Miller, J. C., & Terrell, H. K. (2011). Testing the construct validity of the gambling functional assessment – Revised. *Behavior Modification, 35*(6), 553–569. doi:10.1177/0145445511416635

Wood, R. T. A., Griffiths, M. D., Chappell, D., & Davies, M. N. O. (2004). The structural characteristics of video games: A psycho-structural analysis. *CyberPsychology & Behavior, 7*(1), 1–10. doi:10.1089/109493104322820057

Yee, N. (2007). Motivations for play in online games. *CyberPsychology & Behavior, 9*(6), 772–775. doi:10.1089/cpb.2006.9.772