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Adapting Young's Internet Addiction Test for Massively Multiplayer Online Role-Playing Game Users: A Factor Analysis

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Abstract

The Internet Addiction Test (IAT), despite its status as the most-used instrument for measuring addictions to Internet activities, has not adequately illuminated the experiences of and potential for addiction in players of massively multiplayer online role-playing games (MMORPGs). Using a factor analysis, this article makes suggestions for improving the IAT's applicability to online gamers. Players of the game *World of Warcraft* (n = 5,313) participated in an online survey that included the 20-question IAT modified for gamers. The results suggest the IAT is useful for massively MMORPGs' users when content-specific modifications to its items are made. Findings indicate a distinct profile for MMORPGs' symptomology, despite differences in experience, gender, or ethnicity. This research demonstrates the importance of robust sampling of specific media user groups and individualized screening for behavioral addictions.

Keywords: Internet addiction, Internet Addiction Test, online gaming addiction, uses and gratifications theory

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Gambling disorder is presently the only diagnosable behavioral addiction included in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association [APA], 2013). However, Internet gaming is listed as a

disorder in need of further study (APA, 2013). In the United States, 42% of citizens play video games for 3 or more hours per week (Entertainment Software Association, 2015). Further, Internet gaming has been linked to domestic violence (“Video Game Dispute,” 2010), college attrition (Tate, 2008), and suicide (CyberSightings, 2003). For these reasons, counselors will likely see clients for Internet gaming concerns in the coming years.

Massively multiplayer online role-playing games (MMORPGs) are defined as games where players assume roles of characters and interact with hundreds of thousands of other players in a virtual world (Anissimov, 2007). While the Internet Addiction Test (IAT; Young, 1999), the most widely used screening tool for problematic Internet use, has been analyzed for factor structure among Internet users, samples have not included robust representations of MMORPG users. For example, Widyanto and McMurrin (2004) administered 86 IAT surveys in the United Kingdom, with only 12 synchronous interactive users. A follow-up study by Widyanto, Griffiths, and Brundsen (2011) surveyed 221 participants, which included only one online gamer. Chang and Law (2008) surveyed 44 Chinese gamers; Khazaal and colleagues (2008) surveyed 20 Italian gamers. Korkeila and colleagues (2009) surveyed 528 gamers in Finland, and Jelenchick Becker and Moreno (2012) surveyed 215 U.S. college student gamers. Until now, a robust sampling of U.S. and international gamers involved in MMORPGs has not been evaluated with the IAT.

Problematic use of MMORPGs is traditionally regarded as a type of Internet addiction (Zhu & Deng, 2006), similar to pathological gambling (Gentile et al., 2011; Young 1998). In a survey of Internet users’ online functions, Griffiths and Szabo (2014) grouped online gaming with gambling. Further, Young’s (1998) IAT includes 20 questions based on pathological gambling criteria (American Psychiatric Association, 2007) to measure “problematic” Internet use. Another conceptualization of Internet usage is based on uses and gratifications theory.

Uses and gratifications theory suggests that certain media fulfill the needs of a particular audience (Katz, Gurevitch, & Haas, 1973). The audience seeks media for an intended purpose, such as entertainment, and may also experience unintended consequences such as viewing a television commercial and making a subsequent purchase. For Internet users, the intended purpose may be entertainment (e.g., interacting with friends and family on social media), but the unintended consequence is decrease of time spent on work or school assignments. Since MMORPG is a distinct type of Internet media, the symptoms experienced by habitual users should also be distinct. MMORPGs contain a social element for gamers in which synchronous or simultaneous communication and interaction is essential. In contrast, asynchronous Internet use is not dependent upon people interacting simultaneously. In social networking, for instance, users may interact with friends online via text, photo upload, posting of videos, or sharing of hyperlinks. In these cases, recipients do not need to be online when senders are. Therefore, not all uses of the Internet attract the same users or have the same outcomes.

New instruments are being validated specifically for online gaming addiction (Király et al., 2014) including the Problematic Online Gaming Questionnaire (Demetrovics et al., 2012) and the Video Game Addiction Test (van Rooij, Schoenmakers, van den Eijnden, Vermulst, & van der Mheen, 2012). However, researchers continue to use the IAT to address symptomology across platforms including

video game addiction (e.g., Chen, 2012; Jelenchick, Becker, & Moreno, 2012). The current study made adjustments to the language of the IAT to evaluate how applicable its questions are to the online gaming platform.

The current study also built upon the work of previous IAT research to consider Young's (1998) IAT for modification for measuring online gaming addiction. One purpose of this study was to survey a robust sample of players from the MMORPG *World of Warcraft* and examine their scores on the modified IAT using factor analysis to inform applicable screening and diagnosis.

A second purpose was to identify the demographic traits exhibited by *World of Warcraft* players associated with IAT scores. Finally, the study examined face validity for the IAT by asking participants whether they considered themselves addicted to MMORPGs and sought answers to three research questions:

1. What is the factor structure for the Internet Addiction Test when administered to a sample of massively multiplayer online role-playing game Internet users?
2. What are the relationships of demographic variables (age, race, gender, weekly playing/gaming, and length of experience playing/gaming) to the Internet Addiction Test score?
3. What is the relationship between the Internet Addiction Test score and participants' impressions on whether they are "addicted to massively multiplayer online role-playing games"?

Methods

Participants and Procedure

The population for study was players of the MMORPG *World of Warcraft*. Sample selection was designed to keep the respondent pool as homogeneous as possible by using the most-played MMORPG (Activision Blizzard, 2016). The sampling method of self-selection through online invitations was one of convenience. Gaming forum recruitment posts were also picked up by gaming journalists (Van Allen, 2012).

The nationality of the participants was 60.8% United States ($n = 3456$), 7.2% Canada ($n = 411$), 6.7% United Kingdom ($n = 382$), 3.5% Australia ($n = 202$), 1.5% Netherlands ($n = 88$), and 0.8% Sweden ($n = 50$). Other nations represented had from 1 to 49 participants. Eighty-nine nations were represented. The sample was 87% White or Caucasian ($n = 4620$), 5.4% Hispanic or Latino ($n = 287$), 5.1% Asian ($n = 273$), 1.3% Black ($n = 68$), 0.7% American Indian or Alaska Native ($n = 39$), and 0.5% Native Hawaiian or Other Pacific Islander ($n = 26$). Of the participants, 966 self-identified as female (18%) and 4,347 as male (81.8%). Participants' ages ranged from 18 to 94 years ($M = 29.3$, $SD = 8.6$).

Measures

The instruments included (a) the IAT modified for MMORPG users, (b) demographic (age, race, and gender) and frequency (weekly gaming time and overall experience playing the game) questions, and (c) a self-screening question. All instruments were housed on an Internet survey Web site.

The IAT manual (Young, 2007) uses a 6-point Likert scale, which includes 0 = Not Applicable; 1 = Rarely; 2 = Occasionally; 3 = Frequently; 4 = Often; and 5 = Always. The current study used the scale as a continuum without cut points in order to measure relative severity rather than normed criteria.

The final question on the survey asked participants whether they felt they were addicted to the game. This question was also asked by Petrie and Gunn (1998) and Widyanto, Griffiths, and Brundsen (2011) to evaluate the face validity of the IAT. This research was carried out under the approval of the institutional review board at East Carolina University as exempt research, because identifying data was not collected from participants.

Results

The purpose of this study was to identify a factor structure for the IAT that shows “adequate fit” for data from the United States and from the other countries (Canada, United Kingdom, Australia, Netherlands, and Sweden). Factor analysis can be used to explore if multiple administrations of a survey yield patterns among respondents. These patterns are then used to identify themes that underlie groups of questions and which questions are mathematically and thematically useful measuring what the instrument intends to measure (Streiner & Norman, 2009). The current research explored the effectiveness of the IAT when measuring addiction among Internet gamers.

First, an exploratory factor analysis was conducted on the U.S. data. A three-factor solution was extracted as the most parsimonious. A confirmatory factor analysis was then conducted using the same model and data as the exploratory factor analysis, resulting in a good fit with stable items. Third, a confirmatory factor analysis was run on the sample of multiple countries using the same structure that fit the U.S. data. The confirmatory factor analysis results also fit the data of multiple countries, thereby providing cross-cultural validation for the factor structure.

Confirmatory Factor Analysis of the U.S. Data Structure

An exploratory factor analysis was conducted on the 20 IAT items to identify the most parsimonious factor structure for the U.S. sample and then cross-validated using confirmatory factor analysis with the multinational sample. Because the scree plot was ambiguous in identifying the number of factors to extract, three-, four-, and five-factor solutions were tried. Multiple solutions were extracted and examinations revealed that a three-factor solution best characterized the data. The pattern of factor loadings for this solution was finalized with three IAT items removed: Item 3 (“How often do you prefer the excitement of the Internet to intimacy with your partner?”), Item 4 (“How often do you form new relationships with fellow online users?”), and Item 13 (“How often do you snap, yell, or act annoyed if someone bothers you while you are online?”). Using communality analysis, Items 3 and 13 showed low scores, .24, and .32 respectively, and Item 4 was its own factor and did not predict IAT score. With these exceptions in place, the conclusion that a three-factor oblique solution was the best model for explaining the collected data was made.

Trimmed Internet Addiction Test. Due to low communality scores and inconsistent loadings during the exploratory factor analysis, IAT items 3, 4, and 13 were

excluded from the original IAT developed by Young (1998). A three-factor confirmatory factor analysis model was run with the 17 remaining Items (Table 1). This “trimmed” or Table 1

Final Standardized Parameter Estimates and Z Ratio from Cross-Validation of the Trimmed IAT

IAT item (How often...)	Estimate	r ²
1st Salience and Mood Modification		
10. do you block disturbing thoughts about your life with soothing thoughts of gaming?	.62	.39
11. do you find yourself anticipating when you will login to the game again?	.68	.46
12. do you fear that life without the game would be boring, empty, and joyless?	.64	.41
15. do you feel preoccupied with the game when off-line, or fantasize about being online?	.72	.52
19. do you choose to spend more time gaming over going out with others?	.58	.34
20. do you feel depressed, moody, or nervous when you are not gaming, which goes away once you are back in the game?	.67	.44
2nd Tolerance and Withdrawal		
1. do you find that you stay in the game longer than you intended?	.62	.39
2. do you neglect household chores to spend more time gaming?	.67	.45
7. do you login to the game before something else that you need to do?	.74	.55
14. do you lose sleep due to late-night gaming?	.68	.46
16. do you find yourself saying “Just a few more minutes” when gaming?	.65	.42
3rd Conflict and Relapse		
5. do others in your life complain to you about the amount of time you spend gaming?	.59	.35
6. does your work suffer (e.g., postponing things, not meeting deadlines, etc.) because of the amount of time you spend gaming?	.53	.28
8. does your job performance or productivity suffer because of gaming?	.62	.39
9. do you become defensive or secretive when anyone asks you what you do in the game?	.52	.27
17. do you try to cut down the amount of time you spend gaming and fail?	.62	.39
18. do you try to hide how long you’ve been gaming?	.58	.33

final model was found to fit the data moderately well: null model, χ^2 (116, N = 3,456) = 1737.8; tested model, χ^2 (97, N = 3,456) = 253.6, P < .000, TLI = .98, CFI = .98, NFI = .98, RMSEA = .03. Through this procedure, we concluded that the three-factor structure of the trimmed IAT with 17 items provided the best fit. Nonetheless, we applied cross-validation analysis using the multiple countries sample to make a stronger confirmatory model.

Cross-validation of trimmed Internet Addiction Test. The three-factor trimmed IAT model (see Table 1) was analyzed using confirmatory factor analysis based on the multiple countries sample. This model was found to fit the data moderately well:

null model, χ^2 (116, N = 995) = 640.7; tested model, χ^2 (104, N = 995) = 268.8, $P < .000$, TLI = .96, CFI = .97, NFI = .96, RMSEA = .04. Although the modification model would be developed using Lagrange multipliers, the current model maintained a cross-validation of the three-factor structure in the collected data. The exploratory factor analysis and confirmatory factor analysis with cross-validation increased our confidence in the three-factor structure.

Demographic Variables and Internet Addiction Test Scores

Participants' mean number of hours spent gaming weekly was 26.8, with a median of 22 hours and a range of 1 to 147 hours. Their overall experience playing *World of Warcraft* was a mean of 55.89 months (4.66 years), with a median of 57 months and a standard deviation of 26.36 months (4.75 years).

To determine the relationships of demographic variables (age, race, gender, weekly playing/gaming, and length of experience playing/gaming) to IAT score, a general linear procedure was used to address effect size or practical significance and inter-variable effects, using Bonferroni correction. Descriptive terms were used for each effect size relationship, based on recommendations by Cohen (1988): *strong* ($\text{Eta}^2 > 0.25$), *moderate* ($\text{Eta}^2 > 0.09$), *weak* ($\text{Eta}^2 > 0.01$), and negligible associations below 0.01. The general linear procedure identified no differences among genders and/or races/ethnicities and IAT scores. However, weekly hours played ($F = 684$, $p < 0.01$) had a moderate effect size ($\text{Eta}^2 = 0.11$), and there was a weak effect size for age ($\text{Eta}^2 = 0.01$).

Participants' Self Diagnosis and Internet Addiction Test Scores

The study also examined the relationship between IAT score severity and participants' self-identification as 'addicted to MMORPGs.' The mean scores for those who did and did not believe they were addicted were 42.31 and 27.78, respectively ($t = 36.45$, $df = 2060$, $p < 0.01$). Thus, the IAT was moderately successful at predicting whether participants felt addicted to MMORPGs.

Discussion

The IAT is the most-used instrument for identifying Internet addiction, including online gaming. This article contains suggestions for contextualizing the IAT for use among online gamers as Internet users. According to uses and gratifications theory (Katz, 1959), the motivations of media consumers adhere to desired outcomes but there may be both intended and unintended consequences. Gamers seek varied types of game experiences, such as achievement, social interaction, or immersion (Yee, 2006); but in the process of experiencing these desired gratifications, they may also experience negative consequences such as those measured by the IAT. The current study also explored demographics for MMORPG Internet users, their frequency of use, and their relationships to IAT score. It also sought face validity based on users' self-impressions of addiction.

The current factor structure of the IAT differed from earlier studies (Chang & Law, 2008). This study identified three factors: (1) salience and mood modification, (2) tolerance and withdrawal, and (3) conflict and relapse. However, the three-factor solution's IAT item loadings (Factor 1: items 10, 11, 12, 15, 19, 20; Factor 2: Items 1, 2,

7, 14, 16; Factor 3: Items 5, 6, 8, 9, 17, 18) did not match with those of Chang and Law (2008), (Factor 1, Withdrawal and Social Problems: 3, 4, 5, 9, 13, 15, 18, 19, 20; Factor 2, Time Management and Performance: 1, 2, 6, 8, 16, 17; and Factor 3, Reality Substitute: 10, 12, 14). One reason for the mismatch is that items 3, 4, and 13 were removed in this study, changing the interpretations of the remaining items. Online gamers may also experience concepts differently. For instance, the most notable recommendation from the current study toward defining problem Internet use among gamers is to dispense with the notion that online relationships are indicative of impairment. Question 3 (How often do you prefer the excitement of the game to intimacy with partners) and question 4 (How often do you form new relationships with fellow gamers) were removed due to low communality and a non-influential solo factor, respectively. These questions were important when Young (1998) constructed the IAT for couples in which one partner was having an online affair. However, the current study's results normalize gaming as a place of social engagement (Steinkuehler & Williams, 2006) alongside other social venues (home, work) rather than as a predictor of addiction. In light of our results, counselors are advised not to judge the proliferation of online relationships as a necessary symptom of addiction.

When faced with the prospect of screening, diagnosing, and treating for mental health problems involving the Internet, it is necessary to understand the context of the Internet use. Counselors are advised to focus on clients' areas of severity as measured by the IAT. For instance, a user who excessively escapes to the game for relief from everyday stressors may have different underlying problems as compared to a user for whom the game is the most important thing among career, family, and social life. In the case of escapism, gaming may be used for coping, as a resource, or for support. In the case of a game's salience to the detriment of a user's activities of daily living, efforts to limit and/or replace the game activity with other endeavors are advisable. Specifically, counselors can use the items of the IAT to identify the exact domains of a client's life impacted by Internet use, for targeted focus in counseling sessions.

Finally, as online gaming merges with settings like social media (Griffiths, Kuss, & Demetrovics, 2014), education (Boyle et al., 2014), and business (Werbach, 2014), more sophisticated means of measuring impairment across platforms will be necessary; thus the IAT retains relevance. The IAT is a great resource for counselors measuring overlapping technology addictions such as over involvement in social networking, mobile games, and video games.

Limitations of the Study

Limitations of this study include its research design, sampling, and instrumentation. Even though significant correlations were found, these relationships may be better explained by extraneous variables such as underlying sources of impairment, other Internet activities, or games other than *World of Warcraft* not included in the study. Further, the sample is one of convenience and volunteerism. Finally, although other research supports the use of the IAT as a screening tool for problematic Internet use, this study modified the IAT for online gaming language. More research is needed to support the modified IAT for MMORPGs.

Conclusion

Because the IAT remains prevalent in cross-platform addiction research among online users, its utility and modification for online gamers is important. This research isolated gamers as a unique segment of the Internet users and identified a national and an international factor structure using a robust sample of online gamers. This research is also among the largest studies of a problem Internet use instrument (N = 5,313) to date, and to extensively survey MMORPG users as a subgroup of Internet users with an international confirmatory factor structure. This study found that IAT questions concerning relationships do not predict impairment. The factor structure of the IAT differed from earlier studies (Chang & Law, 2008; Widyanto & McMurrin, 2004), which suggests that MMORPG users' motivations are different from those of other people who experience overwhelming involvement in Internet activities. The relevance of these results speaks to counseling strategies in which clinical attention can target life domains that clients indicate as impaired by their IAT results. This specificity offers a precision approach to assessing online gaming and other Internet-based addictions.

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