Problematic Video Game Use Scale: Initial Psychometric Properties With Psychiatrically Hospitalized Adolescents

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ABSTRACT

Objective: Excessive video game use among youth has been a growing concern in the United States and elsewhere. The aims of this study are to establish validity of a video game measure in a large adolescent inpatient sample, identify clinical factors underlying problem video game use, and identify associations with measures of psychopathology.

Method: Three hundred eighty participants admitted to an adolescent inpatient psychiatric unit between November 2007 and March 2009 were administered a battery of self-report measures, including a questionnaire developed for this study that assessed reinforcers and consequences of past-year video game use (ie, Problematic Video Game Use Scale). Factor analysis was used to identify the underlying structure of behaviors associated with problem video game use.

Results: A factor analysis of the Problematic Video Game Use Scale indicated 2 primary factors. One was associated with engaging in problem behaviors that impaired the adolescent's functioning as a result of playing video games and one reflected the reinforcing effects of playing video games. Both factors were associated with measures of psychopathology, although associations were generally stronger for impairment in functioning than for reinforcing effects. Both factors were significantly correlated with self-reported daily video game use ($P < .001$).

Conclusions: Two underlying factors emerged to account for problem video game playing: impairment in functioning and reinforcing effects. Initial evidence of the content validity of the video game measure was established. Findings highlight the importance of assessing video game use among an adolescent population, the factors associated with video game use, and associations with symptoms of psychopathology. Limitations include a common reporter for multiple measures and cross-sectional data that do not allow for causal links to be made.

J Clin Psychiatry 2011;72(12):1611–1615

Submitted: *April 4, 2011; accepted August 24, 2011 (doi:10.4088/JCP.11m07040).*

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Research on video game playing has largely focused on establishing links between violent video game content and adolescent aggression.[1] Recently, there has been a focus on understanding the underlying factors of video game playing, as well as the possibility that excessive video game use may represent a behavioral addiction among adolescents.[2–5] One limitation of this research, however, is that it has focused solely on relatively healthy, community-based samples. The current research considers problem video game playing and its relation to psychological functioning in a sample of adolescents in treatment at a psychiatric inpatient facility.

Problem Video Game Use

Video games are a common source of entertainment for youth. In an early survey of child and adolescent video game use, Phillips and colleagues[6] found that 77% of 11- to 16-year-olds reported playing video games, with nearly a quarter of the sample (24.2%) reporting daily play. More recent estimates of youth video game use range from 60% to 88%.[2] In addition, 90% of 8- to 18-year-olds surveyed have a video game console in their home.[7] On the basis of these statistics, video game use is widespread among adolescents.

The majority of video game research has examined the consequences of video game content, including aggressive thoughts, feelings, and behaviors (for reviews, see Anderson and Bushman,[1] Kaiser Family Foundation,[7] and Anderson[8]). However, more recent research has begun to consider the underlying factors that contribute to video game playing.[7] Given the similarity between the description of problem video game use and pathological gambling, including preoccupation, increasing amounts of time spent on the activity, committing illegal acts, and impairment in social relationships, many studies have adapted pathological gambling diagnostic criteria to measure problem video game use.[2,4,9–11] For example, Fisher[9] was one of the first to develop a measure assessing adolescent video game use that was based on *DSM-IV* criteria for pathological gambling. Griffiths and Hunt[10] evaluated video game dependence among a sample of mid-adolescents in the United Kingdom using an 8-item measure based upon *DSM-III-R* criteria for pathological gambling; 19.9% of these participants were classified as computer-game dependent and an additional 6.8% reported prior use at dependent levels. Similarly, Gentile[2] investigated problematic video game use in a nationally representative sample of US youth (ages 8–18 years) using an 11-item pathological gaming scale based upon *DSM-IV* criteria for pathological gambling. Pathological gaming, defined by endorsing at least 6 of the 11 symptoms, was evident among 8.5% of video game players. In addition, Salguero and Morán[11] investigated problematic video game playing among Spanish adolescents using a 9-item scale based upon *DSM-IV* substance abuse and pathological gambling criteria. Problem video game playing (ie, endorsement of at least 4 criteria) was associated with both adolescents' and parents' perceptions of excessive playing as well as self-reported dependence. Taken together, this literature provides initial support for assessing problematic video game use by adapting pathological gambling criteria.

Less clear are the underlying components of problematic video game use. Previous research has largely considered video game "addiction" as a singular

construct.[2,4,6,10–12] Other research has identified a 2-factor structure underlying video game addiction.[9,13] Specifically, a factor analysis of the measure developed by Fisher[9] identified 1 factor related to playing video games due to the "subjectively overwhelming and ever-present need to play video games" and 1 factor that described negative behaviors as a result of excessive video game playing. Similarly, Chiu et al[13] employed a 9-item measure assessing 2 components: game addiction and game concern.

One limitation of the previous research is the focus on community-based samples. It is unclear how these findings translate to high-risk adolescents (ie, adolescents experiencing clinically significant psychiatric distress) and whether these adolescents demonstrate the same propensity for problem video game use. Exploring problematic video game use and the underlying structure of use in a clinically impaired sample is a central aim of the present study.

Associations With Psychological Functioning

Research has identified negative psychological consequences of problem video game use. Several studies have linked problem video game playing to decreased academic performance[2,6,12,13] and increased aggression.[4,10,12–14] Problem video game playing also has been associated with decreased life satisfaction and perceived social competence[4] and an increased likelihood of being diagnosed with attentional problems.[2] However, the domains of psychological functioning considered in these studies are limited in scope.

Gender Differences

Boys are more likely than girls to endorse regular video game play[4,6,11] and report an increased number of psychological symptoms related to problem gaming.[2,10,13] Some evidence suggests that gender may also influence the psychological correlates of problem video game use. For example, Colwell and Payne[14] found that video game playing frequency was linked to lower self-esteem among boys but not girls. Given these findings, an exploratory aim of this study is to examine whether gender impacts the structure of the problem video game use measure and whether gender impacts the psychological impacts of problem video game use.

Aims

The goals of the current research were to (1) establish validity of a video game measure in a large adolescent inpatient sample, (2) identify clinical factors underlying problem video game use, and (3) identify associations between problem video game use and psychiatric symptoms.

METHOD

Participants

Participants in this study were 380 adolescents (64.7% female) admitted to a child and adolescent psychiatric hospital located in the Northeast who completed an intake battery of self-report measures. They were derived from 699 unique admissions between November 2007 and March 2009. Adolescents who did not complete the intake battery (ie, due to unexpected discharge, refusal to cooperate, very short hospital admission that did not allow time for data collection, readmission to the hospital, active psychosis, or significant cognitive impairment) were excluded. The mean age of the retained participants was 15.14 years (SD = 1.43). The hospital from which the participants were drawn serves all patients regardless of insurance status.

Clinical Points

- Two underlying factors emerged to account for problem video game playing: impairment in functioning factor and reinforcing effects factor.
- These findings highlight the importance of assessing video game use among an adolescent population, the factors associated with video game use, and the relation of video game use to symptoms of psychopathology.

Procedures

Self-report rating scales were administered by trained mental health staff as part of the standard hospital intake. Participants were assessed within 1 week of admission, typically within the first 3 days. Forty-four participants (11.6%) were readmitted following a discharge from the unit while data for this study were being collected. Only data from these adolescents' first admissions were used in analyses. The hospital institutional review board approved the use of these data for research purposes.

Measures

Problematic Video Game Use Scale. The Problematic Video Game Use Scale was developed for this study. A copy of this measure is included in eAppendix 1 (available at PSYCHIATRIST.COM). The scale was modeled on the measure developed by Fisher,[9] which is based on the *DSM-IV-TR* criteria for pathological gambling. Playing video games replaced gambling in the criteria in the current measure. Participants who endorsed playing video games were asked to respond to 11 items about their video game use and the reasons for their use on a 5-point scale ranging from 1 ("not at all") to 5 ("almost all the time"). One additional item (item 12) assesses average amount of daily video game use using a forced-choice response scale ("less than 1 hour," "1–3 hours," "4–7 hours," "7+ hours").

Reynolds Adolescent Depression Scale-Second Edition.[15] The Reynolds Adolescent Depression Scale-Second Edition is a 30-item self-report measure of depressive symptoms for adolescents ages 13–18 years. This widely used measure has shown adequate internal consistency ($\alpha = .92$) and test-retest reliability ($r = 0.80$).[15] Items are rated on a 4-point scale from "almost never" to "most of the time." Item scores are summed to create a total score. Higher total scores indicate greater depressive symptoms.

Multidimensional Anxiety Scale for Children-Short Version.[16] The Multidimensional Anxiety Scale for Children-

Short Version is a 10-item screening measure assessing symptoms of anxiety, harm avoidance, social anxiety, and separation/panic. Items are rated on a 4-point scale ranging from "never true about me" to "often true about me." Items are summed to create a total score, with higher scores indicating greater anxiety symptoms. The Multidimensional Anxiety Scale for Children-Short Version has adequate internal consistency (α = .87) and test-retest reliability (r = 0.83).[16]

Suicide Probability Scale.[17] The Suicide Probability Scale is a 36-item measure assessing hopelessness, suicidal ideation, negative self-evaluation, hostility, and overall suicidality. Items are rated on a 4-point scale ranging from "none or little of the time" to "most or all of the time," with higher scores indicating greater suicidality. The Suicide Probability Scale produces a total score and 4 subscale scores (ie, hopelessness, suicide ideation, negative self-evaluation, hostility). The total score was used in the present research. The measure has adequate internal consistency (total score, α = .93; subscale α values were .62–.89), split-half reliability (r = 0.93), and test-retest reliability (r = 0.92).[17]

Hopelessness Scale for Children.[18] The Hopelessness Scale for Children is a 17-item modification of the Beck Hopelessness Scale. Items on the Hopelessness Scale for Children are rated either true or false. Total scores range from 0 to 17. Higher scores indicate greater hopelessness. The Hopelessness Scale for Children has demonstrated good internal consistency (α = .97), test-retest reliability (r = 0.52), and adequate construct validity with child and adolescent psychiatric inpatients.[18,19]

State/Trait Anger Expression Inventory-2.[20] The State/Trait Anger Expression Inventory-2 is a 44-item measure that contains 5 main scales (ie, state anger, trait anger, angry temperament, angry reaction, anger control) and 2 subscales (ie, anger in, anger out). Items are rated on a 4-point scale. Higher scores indicate greater intensity/frequency of anger experienced or expressed. This inventory has adequate psychometric properties and has been validated with both community and clinical populations.[20]

Trauma Symptom Checklist for Children.[21] The Trauma Symptom Checklist for Children is a 55-item measure assessing symptoms associated with trauma exposure. Items are rated on a 4-point scale, with higher scores indicating greater symptom severity. The Trauma Symptom Checklist for Children yields 6 clinical scales (ie, anxiety, depression, anger, posttraumatic stress, dissociation [with 2 subscales: overt and fantasy], and sexual concerns [with 2 subscales: preoccupations and distress]) and 2 validity scales (ie, underreporting, hyperreporting). The checklist has shown adequate internal consistency (subscale α values were .82–.89) and construct and convergent validity.[21]

RESULTS

Video Game Use

Two hundred forty-four participants (64.2%) endorsed playing video games on a gaming console, on a computer, and/or in an arcade. The mean age at which participants started playing video games was 7.62 years (SD = 3.09). There was no significant difference in video game use by age: 72.7% of 12-year-olds (n = 8), 68% of 13-year-olds (n = 34), 57.4% of 14-year-olds (n = 35), 75.3% of 15-year-olds (n = 70), 61.9% of 16-year-olds (n = 52), 55.4% of 17-year-olds (n = 41), and 80% of 18-year-olds (n = 4) endorsed video game use (χ^2_5 = 10.11, P = .12).

Male participants were more likely to endorse video game use than female participants (χ^2_1 = 38.22, P < .001). A total of 114 of the 134 male participants (85.1%) reported playing video games, starting at a mean age of 7.01 years (SD = 2.58). Among female participants, 130 of 246 (53.3%) reported playing video games starting at a mean age of 8.16 years (SD = 3.39).

Exploratory Factor Analysis

The 11 items on the Problematic Video Game Use Scale demonstrated good internal consistency (α = .83). A principal components factor analysis followed by varimax rotation was used to explore the underlying structure of responses to these items. Eigenvalues greater than 1 were used to identify factors. Factor loadings equal to and above 0.40 were considered indicative of items belonging to a specific factor.

Two factors were identified that accounted for 51.04% of the total variance. The specific item loadings on these 2 factors are displayed in Table 1. The first factor accounted for 26.38% of the shared variance and had high loadings for 6 items that were associated with impairment as a result of video game playing (ie, missing school, demonstrating withdrawal, lying to family and friends, stealing, having arguments with others, and needing to be bailed out as a result of video game playing). This was termed *impairment in functioning* factor. Cronbach α for these 6 items was 0.78, indicating adequate internal consistency.

The second factor had high loadings for 5 items that were associated with the adolescent experiencing reinforcing effects from playing video games (ie, obsessive thoughts, feeling the rush of beating the game, escaping his or her current problems, perseverative thoughts, and playing video games with other people). This factor, *reinforcing effects*, accounted for 24.66% of the shared variance. Cronbach α for these 5 items was 0.74, indicating adequate internal consistency.

Previous research has used associations between time spent playing games and a measure assessing problem video game playing as evidence of validity for the measure.[4] To assess content validity of these scales, factor scores for impairment in functioning and for reinforcing effects were correlated with self-reported daily video game use (item 12; see eAppendix 1). Both factors were significantly related to self-reported daily video game use (r values = 0.32 and 0.53, respectively; P values < .001). These findings, in conjunction with the previously described factor-analysis results, provide initial evidence for the content validity of the Problematic Video Game Use Scale.

Two t tests were performed to examine gender differences in factor scores. Scores for the impairment in functioning factor did not differ significantly by gender (t_{244} = 0.91, P = .37).

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For the reinforcing effects factor, male participants had significantly higher scores compared to female participants ($t_{244} = 4.78$, $P < .001$).

Problematic Video Game Use and Psychological Functioning

To examine concurrent validity of the Problematic Video Game Use Scale, analyses investigated associations between impairment in functioning and reinforcing effects with the self-report symptoms of psychological functioning. For these analyses, the means of the items in the impairment in functioning and reinforcing effects factors were used as subscale scores.

Table 1. Factor Loadings From the Principal Components Analysis Followed by Varimax Rotation of the Problematic Video Game Use Scale[a]

Symptom	Factor 1, Impairment in Functioning	Factor 2, Reinforcing Effects
Variance, %	26.38	24.66
(2) Due to video game playing I have missed schoolwork or school	**0.44**	0.39
(4) I become irritable or restless when attempting to cut down or stop playing video games	**0.62**	0.37
(7) I lie to family and friends to hide how much time I play video games	**0.63**	0.26
(8) I have stolen money or stolen from home or elsewhere to pay for video game playing or have more time playing video games	**0.80**	0.00
(9) Due to video game playing I have had arguments with family or close friends	**0.71**	0.38
(10) I needed someone else to give me money I owed due to video game playing ("bailout")	**0.70**	0.02
(1) When I am not playing video games, I keep thinking about them (remembering the games, planning the next game, etc)	0.30	**0.68**
(3) I play more and more games to feel the rush of beating the game	0.27	**0.76**
(5) I use video games as a way of escaping my problems and difficult feelings	0.24	**0.66**
(6) When I lose at a video game or I have not obtained the desired results, I need to play again to get a higher score or achieve my target	0.25	**0.71**
(11) I play video games with other people	–0.12	**0.47**

[a]Only rotated factors are shown. Loadings greater than 0.40 are shown in boldface. Parenthetical numbers correspond to the original item number on the Problematic Video Game Use Scale.

Both the impairment in functioning and the reinforcing effects factors were significantly correlated with multiple measures assessing for psychopathology (Table 2). The impairment in functioning factor was positively related to increased symptoms of depression (on the Trauma Symptom Checklist for Children), suicidal ideation, hopelessness, and most aspects of trauma reactions. The reinforcing effects factor was similarly related to several indices of trauma reactions.

Exploratory analyses also examined whether associations between the reinforcing effects factor and indices of psychological functioning differed by gender, given the gender differences previously identified. Of the 20 tests conducted, none were significant.

Table 2. Correlations Between Scores for Impairment in Functioning and Reinforcing Effects With Self-Reported Indices of Psychological Functioning[a]

Measure	Impairment in Functioning	Reinforcing Effects
Reynolds Adolescent Depression Scale-Second Edition	0.21	0.14
Multidimensional Anxiety Scale for Children-Short Version	0.15	0.18
Suicide Probability Scale total score	0.25***	0.22
Hopelessness Scale for Children	0.27***	0.12
State/Trait Anger Expression Inventory-2		
State anger	0.16	0.06
Trait anger	0.22	0.16
Trauma Symptom Checklist for Children		
Anxiety	0.28***	0.17
Depression	0.29***	0.21
Anger	0.22	0.16
Posttraumatic stress disorder	0.22	0.26***
Dissociation	0.29***	0.28***
Dissociation-overt	0.24***	0.23***
Dissociation-fantasy	0.32***	0.30***

[a]In order to correct for multiple comparisons, only α levels at $P < .001$ are reported as significant.
***$P < .001$.

DISCUSSION

This is one of the first studies to examine the underlying factors of video game playing among an adolescent inpatient psychiatric sample and to relate these factors to symptoms of psychopathology. Video game use is widespread among this study's participants, which is consistent with previous studies.[2] Male participants also began playing video games on average 1 year earlier than female participants. Two underlying factors emerged to account for problem video game playing: impairment in functioning and reinforcing effects. That is, adolescents in this study who played video games reported impairment in multiple areas of functioning related to their video game use, including missing school, lying to others, stealing, and increased arguments with others. Adolescents also reported reinforcing effects related to playing video games, including feeling a "rush" when beating a game and using video game playing to escape current problems. These factors are consistent with those identified by Fisher.[9]

Initial evidence for content validity for the Problematic Video Game Use Scale was established in this study, as measures of adolescent-reported symptoms of psychopathology were related to the 2 factors on the Problematic Video Game Use Scale. Both factors were associated with increased symptoms of psychopathology, although these associations were limited to trauma reactions for the reinforcing effects factor. The impairment in functioning factor was most strongly associated with suicidality, hopelessness, anxiety, depression, and dissociation. These findings are consistent with previous studies; however, prior findings are mixed as to the causality of this association.[22,23] While outside the scope of the present study, it is likely the case that reciprocal relations exists.

The reinforcing effects factor was related to symptoms of posttraumatic stress disorder and dissociation. While no previous studies directly examined video game playing and

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dissociative symptoms, an association between dissociative symptoms and problem gambling among adolescents has been established.[22,24] As the present study used criteria for pathological gambling to define problem video game playing, this association is important to consider. It has been postulated that an adolescent's overinvolvement with video games may serve as a form of dissociation, or means of coping, with life stressors.[25] Further studies are needed to explore the relation between problem video game use and dissociative symptoms.

These findings are tempered by several limitations. One limitation is that all of the measures were based on adolescent self-reports. Only 1 reporter of information may have led to artificially high associations between the measures. Adolescents may not be accurate in their self-assessments or may not have felt comfortable expressing their self-perceptions in a candid manner upon hospital admission. A second limitation was that content validity analysis of the video game measure was limited to the clinical measures administered upon hospital admission. These measures focused on impairment from psychiatric symptoms and may not be generalizable. Finally, a third limitation was that the associations were determined through correlational analyses, which do not permit understanding of causation.

Despite these limitations, these study findings generate several directions for future research, including further developing and refining valid assessment instruments for measuring video game use and for examining the relation of this use to symptoms of psychopathology in inpatient, residential, and community adolescent samples. Future studies should use a longitudinal study design to better understand the causal relationships between video game use and measures of psychopathology over time. These studies may also consider how these findings may relate to use of other technologies such as the Internet[26,27] and mobile devices.[28]

CONCLUSION

The results identify 2 factors that account for problem video game use among adolescents. Initial validity was established for a 2-factor measure used to assess video game use among adolescents. The findings highlight the importance of understanding an adolescent's motives for playing video games and how these motives might relate to his/her symptomatology.

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Potential conflicts of interest: The authors have no potential conflicts of interest and no financial or other relationship to report relevant to the subject of this article.
Funding/support: Bradley Hospital and the Department of Psychiatry and Human Behavior, Warren Alpert Medical School of Brown University, Providence, Rhode Island.
Previous presentation: Part of this work was presented in a poster format at the 55th Annual Meeting of the American Academy of Child and Adolescent Psychiatry; October 29, 2008; Chicago, Illinois.

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eAppendix 1 is available at PSYCHIATRIST.COM

eAppendix 1. Problematic Video Game Use Scale

Name (First): _____ (Last): _____ Sex: _____ Today's Date ___/___/_____

This questionnaire asks about video game usage among teenagers. Thank you for taking the time to fill out this questionnaire.

Do you play video games? (on a gaming console and/or computer, at an arcade, etc.) **YES** **NO**

If yes, please answer the remaining questionnaire.
Please check the box that is true about you and write in your answers where indicated.

At what age did you start playing video games? _____ years old

In the past year…	**Not at All**	**Little of the Time**	**Sometimes**	**Lots of the Time**	**Almost All the Time**
1. When I am not playing video games, I keep thinking about them (remembering the games, planning the next game).					
2. Due to video game playing I have missed schoolwork or school.					
3. I play more and more games to feel the rush of beating the game.					
4. I become irritable or restless when attempting to cut down or stop playing video games.					
5. I use videogames as a way of escaping my problems and difficult feelings.					
6. When I lose at a video game or I have not obtained the desired results, I need to play again to get a higher score or achieve my target.					
7. I lie to family and friends to hide how much time I play video games.					
8. I have stolen money or stolen from home or elsewhere to pay for video game playing or have more time playing video games.					
9. Due to videogame playing I have had arguments with family or close friends.					
10. I needed someone else to give me money I owed due to video game playing ("bailout").					
11. I play videogames with other people.					

12. How much time ON AVERAGE do you spend playing videogames each day?
LESS THAN HOUR 1 – 3 HOURS 4 –7 HOURS 7 + HOURS

13. Please list your five favorite games and list if they are computer, console (Xbox, ps3, wii), arcade, Internet or cell phone games.

OF THIS YEAR		**LIFETIME**	
Name of the Game	Gaming System	Name of the Game	Gaming System
1. _____	_____	1. _____	_____
2. _____	_____	2. _____	_____
3. _____	_____	3. _____	_____
4. _____	_____	4. _____	_____
5. _____	_____	5. _____	_____

doi:10.4088/JCP.11m07040