

Research Article

Pathological Video-Game Use Among Youth Ages 8 to 18

A National Study

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ABSTRACT—*Researchers have studied whether some youth are “addicted” to video games, but previous studies have been based on regional convenience samples. Using a national sample, this study gathered information about video-gaming habits and parental involvement in gaming, to determine the percentage of youth who meet clinical-style criteria for pathological gaming. A Harris poll surveyed a randomly selected sample of 1,178 American youth ages 8 to 18. About 8% of video-game players in this sample exhibited pathological patterns of play. Several indicators documented convergent and divergent validity of the results: Pathological gamers spent twice as much time playing as nonpathological gamers and received poorer grades in school; pathological gaming also showed comorbidity with attention problems. Pathological status significantly predicted poorer school performance even after controlling for sex, age, and weekly amount of video-game play. These results confirm that pathological gaming can be measured reliably, that the construct demonstrates validity, and that it is not simply isomorphic with a high amount of play.*

Many parents (and the occasional professional) have remarked that they were worried about their children being “addicted” to video games. Is this simply hyperbole, meaning only “my child plays a lot, and I don’t understand why?” A true addiction, even a behavioral addiction, has to mean much more than that someone does something a lot. According to psychiatric and psychological experts, it has to damage multiple levels of functioning, such as family, social, school, occupational, and psychological functioning. Clinicians and social workers in

multiple countries have received requests for treatment of video-game addiction. In response, researchers have conducted several studies and determined that the idea cannot be dismissed. When criteria similar to those used in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM; e.g., criteria similar to those used to define pathological gambling) were applied to video gamers, a substantial number appeared to exhibit damaged functioning on multiple levels. It was impossible, however, to tell how representative of gamers these studies were. The purpose of the present study was to survey a national panel of American children ages 8 to 18 to determine their video-gaming habits, their parents’ involvement in gaming, and the percentage of youth that appear to meet DSM-style criteria for pathological gaming.

The past 15 years have seen a revolution in the use of digital technologies, with processing power, access to digital technologies, and children’s use of such technologies increasing dramatically. The amount of time children and adolescents spend with video games has been increasing steadily (Anderson, Gentile, & Buckley, 2007). Changes in technologies bring the potential for changes in users’ thoughts, feelings, and behaviors (Kipnis, 1997). Several researchers have been concerned about the potential for some people to demonstrate pathological patterns of behavior using computer, Internet, and video-game technologies (Chiu, 2004; Fisher, 1994; Griffiths, 2000; Griffiths & Hunt, 1998; Johansson & Götestam, 2004; Nichols & Nicki, 2004; Tejeiro Salguero & Bersabé Morán, 2002; Yee, 2001, 2002; Young, 1997). Although there have been many studies of computer, video-game, and Internet “addiction,” all have relied on fairly small convenience samples. There have been no studies of the prevalence of pathological video-game use at the national level.

Although there is still considerable debate about how to define addictions (Shaffer, Hall, & Vander Bilt, 2000; Shaffer & Kidman, 2003; Shaffer et al., 2004), most researchers studying pathological computer or video-game use have developed defi-

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nitions similar to the DSM criteria for pathological gambling. This approach appears to be a valid starting point because pathological video-game use and pathological gambling are both assumed to be behavioral addictions (Tejeiro Salguero & Bersabé Morán, 2002). Both gambling and video games are forms of games. As such, they are initially played as a form of entertainment, because they are stimulating and produce positive (and sometimes negative) emotions. People gamble or play video games for many reasons, including to relax, to experience competence and autonomy, and to escape from daily concerns (Griffiths, 2003; Ryan, Rigby, & Przybylski, 2006). Gambling or gaming may produce a “flow” state, in which the player is focused, may lose a sense of place or time, has a sense of control, and finds the activity intrinsically rewarding (Csikszentmihalyi, 1990). The activity is not pathological at first. But gambling becomes pathological for some people when it begins to produce serious negative life consequences.

The list of pathological-gambling criteria in the fourth edition of the DSM (DSM-IV) demonstrates that any single symptom is not pathological. Having zero to four of the symptoms is considered to be within the normal range, and a person’s gambling is considered pathological only after it has resulted in problems in several areas of his or her life. Using this clinical approach to defining pathological video gaming appears appropriate for initial investigations, as it provides a somewhat clean distinction between being highly engaged in a behavior and doing it in such a way as to incur damage to several areas of one’s life. Although there is little research on where the dividing line is, being highly engaged in a behavior appears to be both theoretically and empirically distinct from being addicted (Charlton, 2002).

Although case studies of pathological video-game use were documented as early as 1983, scientific studies first began to be reported in the mid-1990s (Fisher, 1994; Griffiths & Dancaster, 1995; Griffiths & Hunt, 1998). Most of the published studies of supposed computer, Internet, and video-game addiction have focused on either the reliability of various definitions of pathological use or the construct validity of pathological use. For example, Tejeiro Salguero and Bersabé Morán (2002) created a nine-item questionnaire assessing video-game use, basing their questionnaire on DSM criteria for pathological gambling and substance abuse. They reported reasonable reliability and factor structure for this questionnaire, as well as some evidence of its construct validity (i.e., scores indicating pathological play correlated with amount of video-game playing, self-perceptions of playing too much, and a measure of psychological dependence on different types of drugs).

The present study assessed video-game use with an 11-item scale based on the DSM-IV criteria for pathological gambling. The study followed DSM diagnostic criteria for other disorders in considering gaming to be pathological if the gamer exhibited at least half (6) of the symptoms. Although the symptoms were similar to DSM-IV criteria for pathological gambling, they also share core characteristics with other definitions of addictions,

such as Brown’s core facets of addiction (Brown, 1991): *salience* (the activity dominates the person’s life, either cognitively or behaviorally), *euphoria or relief* (the activity provides a “high” or the relief of unpleasant feelings), *tolerance* (over time, a greater amount of activity is needed to achieve the same “high”), *withdrawal symptoms* (the person experiences unpleasant physical effects or negative emotions when unable to engage in the activity), *conflict* (the activity leads to conflict with other people, work, obligations, or the self), and *relapse and reinstatement* (the person continues the activity despite attempts to abstain from it).

There is still no agreement as to whether pathological gaming is a discrete problem, and the purpose of this study was not to resolve that debate, but rather to provide some new relevant data and to explore approaches to defining pathological gaming. This is the first study to use a large-scale, nationally representative sample of youth to study the reliability of measures of pathological video gaming, the validity of this construct, and the prevalence of pathological video gaming. In addition, this sample allows us to provide national data about trends in video-game use, parental monitoring of gaming, and children’s playing of Mature-rated games.

METHOD

Participants

A national sample of 1,178 U.S. residents, ages 8 through 18, was surveyed by Harris Polls. This sample was a stratified random sample of Harris Interactive’s on-line panel and was recruited through password-protected e-mail invitations to participate in a 20-min omnibus survey. The sample size yielded results accurate to $\pm 3\%$ with a 95% confidence interval. The sample included 588 males and 590 females, and approximately 100 participants of each age from 8 through 18 (minimum $n = 98$, for 8-year-olds; maximum $n = 119$, for 16-year-olds).

All regions of the country were represented in this study, as the sample included 253 participants in the East, 369 in the South, 289 in the Midwest, and 267 in the West. The ethnic-racial makeup was 66% White, 17% Black or African American, 3% Asian or Pacific Islander, 1% Native American, 7% mixed, and 2% other (4% declined to answer). Sixteen percent reported being of Hispanic origin. Instruments and participants were treated in accordance with the code and standards of the Council of American Survey Research Organizations and the code of the National Council of Public Polls.

Procedure

Interviews were conducted by Harris Interactive, using a self-administered on-line questionnaire via Harris’s proprietary, Web-assisted interviewing software. The software permits on-line data entry by the respondents. Interviews averaged 20 min

in length and were conducted between January 17 and January 23, 2007.

Measures

The survey included several scales, including the previously mentioned 11-item pathological-gaming scale based on the DSM-IV criteria for pathological gambling. Because there is no clear standard for how to measure pathological gaming or how to score symptom checklists of pathological gaming, participants were allowed to respond “yes,” “no,” or “sometimes” to each symptom.

In addition, the survey included several items assessing children’s video-game habits (adapted from the General Media Habits Questionnaire and the Adult Involvement in Media Scale; Anderson et al., 2007; Gentile, Lynch, Linder, & Walsh, 2004). These items measured weekly amount of video-game play, knowledge of game ratings, household rules for media use, school performance, attention difficulties, involvement in physical fights, and physical health.

Data Weighting

Data were weighted to reflect the distribution of key demographic variables (age, gender, race-ethnicity, highest level of education, parents’ education, urbanicity, and region) in the general population of 8- to 18-year-olds in the United States. The weights were calculated based on the 2006 Current Population Survey (U.S. Census Bureau, 2006). All reported results incorporate this weighting.

RESULTS

Video-Game Use

The results of the survey indicate that most (88%) American youth between ages 8 and 18 play video games at least occasionally. The average (median) reported frequency of playing was three or four times a week (Table 1), with boys playing more frequently than girls, $t(1176) = 16.9, p < .001, d = 0.98$. The average amount of playing time was 13.2 hr per week ($SD = 13.1$). However, there was a sizable difference between boys’ average playing time ($M = 16.4$ hr/week, $SD = 14.1$) and girls’ average playing time ($M = 9.2$ hr/week, $SD = 10.2$), $t(1034) = 9.2, p < .001, d = 0.57$.

Given trends for television usage, one might expect video-game usage to increase across elementary school, peak at about middle school, and drop off across high school (Huston et al., 1992). The pattern of video-game usage across ages is similar, but not identical to, the typical pattern with television. The frequency of video-game play appeared to be relatively steady from ages 8 to 13, and to decrease thereafter (see Fig. 1). The linear and quadratic changes were both statistically significant, $F(1, 1166) = 79.0, p < .001$, and $F(1, 1166) = 11.4, p < .001$, respectively. The amount of video-game play appeared to increase at middle-school age (12–14), but did not drop consistently for all older ages (see Fig. 2). However, the differences in amount of play between ages were not statistically significant (although when ages were combined into three groups, they were marginally significant). Therefore, although adolescents play video games less frequently as they grow older, they appear to increase their playing time per session.

TABLE 1
Respondents’ Frequency of Playing Video Games and Means of Obtaining Mature-Rated Video Games

| Measure | Overall | Sex | | Age range | | |
|--|---------|------|-------|-----------|-------|-------|
| | | Boys | Girls | 8–11 | 12–14 | 15–18 |
| Frequency of video-game play | | | | | | |
| At least once a day | 23 | 33 | 12 | 26 | 26 | 17 |
| 5 or 6 times a week | 13 | 20 | 6 | 16 | 14 | 11 |
| 3 or 4 times a week | 16 | 17 | 14 | 17 | 19 | 12 |
| Once or twice a week | 16 | 15 | 18 | 16 | 16 | 16 |
| A couple of times a month | 9 | 6 | 11 | 10 | 7 | 8 |
| About once a month | 4 | 3 | 6 | 4 | 5 | 4 |
| Less than once a month | 7 | 3 | 12 | 5 | 4 | 13 |
| Never | 12 | 3 | 21 | 6 | 9 | 19 |
| Obtained a mature-rated video game . . . | | | | | | |
| As a gift | 26 | 35 | 16 | 16 | 31 | 34 |
| With own money, and parents knew about it | 22 | 33 | 9 | 7 | 23 | 37 |
| With parents’ money, and parents knew about it | 13 | 18 | 6 | 7 | 16 | 17 |
| With own money, and parents did not know about it | 4 | 7 | 1 | 2 | 2 | 9 |
| With parents’ money, and parents did not know about it | 1 | 2 | 0 | 1 | 0 | 2 |
| Percentage who own a mature-rated game | 39 | 54 | 20 | 22 | 41 | 56 |

Note. All numbers in the table are percentages.

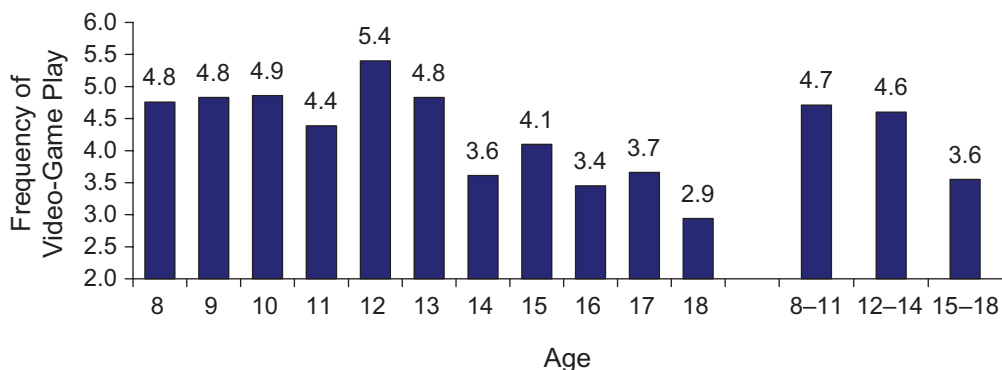


Fig. 1. Frequency of video-game play by age. The response scale was verbally anchored as follows: 0 = never, 1 = less than once a month, 2 = about once a month, 3 = a couple of times a month, 4 = once or twice a week, 5 = 3 or 4 times a week, 6 = 5 or 6 times a week, and 7 = at least once a day.

Overall, only about half the homes represented in the survey had rules about video games. Forty-four percent of respondents said there were rules about when they were allowed to play video games, 46% reported having rules about how long they were allowed to play, and 56% said they had rules about the kinds of games they were allowed to play. Because several studies have demonstrated both short- and long-term negative effects of playing violent video games, the survey asked the youth how they had gotten M-rated (“Mature”) video games, if they had (see Table 1). A large percentage of the youth owned M-rated games: 22% of 8- to 11-year-olds, 41% of 12- to 14-year-olds, and 56% of 15- to 18-year-olds (39% of 15- and 16-year-olds). Boys were more than twice as likely as girls to have obtained M-rated games, whether as a gift or through a purchase using their own or their parents’ money; 7% of boys admitted that they had pur-

chased such a game with their own money without their parents’ knowledge.

Prevalence of Symptoms of Pathological Video-Game Use

As Table 2 shows, most of the symptoms of pathological video-game use were demonstrated by only a small percentage of youth gamers. Some symptoms were more typical than others, however. Skipping household chores to play video games was the disruption most often reported (33% of the youth responded “yes,” and an additional 21% responded “sometimes”). At least one fifth of respondents said that they had played to escape from problems (25% responded “yes”), that they had skipped their homework to play (23%), that video games had high cognitive salience for them (21%), and that they had done poorly

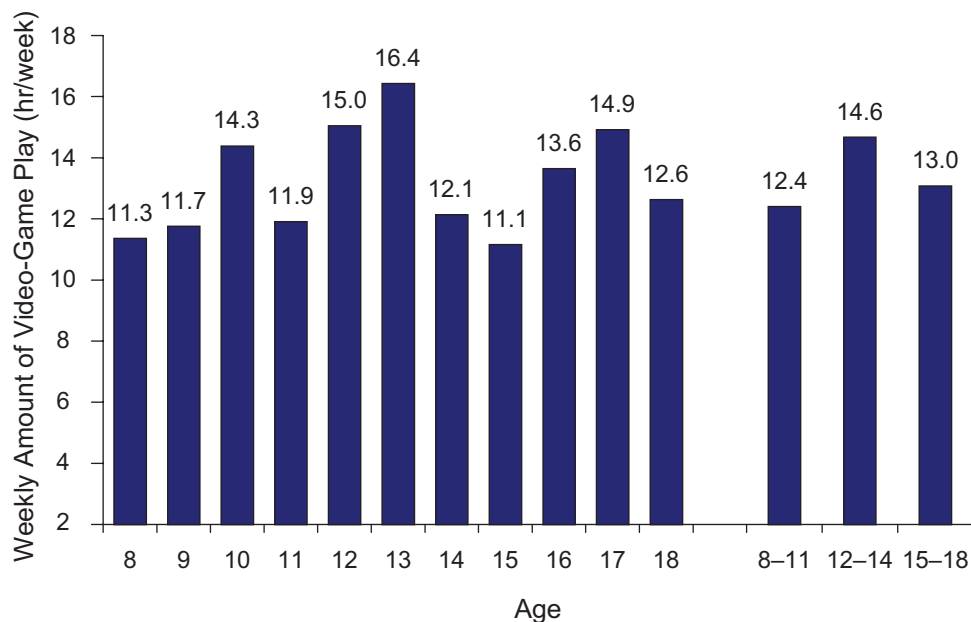


Fig. 2. Average weekly amount of video-game play by age.

TABLE 2
Percentage of the Sample Reporting Each Symptom of Pathological Video-Game Use

| Symptom | Total sample | | “Yes” responses only | |
|---|--------------|-------------|----------------------|-------|
| | “Yes” | “Sometimes” | Boys | Girls |
| Over time, have you been spending much more time thinking about playing video games, learning about video-game playing, or planning the next opportunity to play? | 21 | 19 | 29 | 11*** |
| Do you need to spend more and more time and/or money on video games in order to feel the same amount of excitement? | 8 | 9 | 12 | 3*** |
| Have you tried to play video games less often or for shorter periods of time, but are unsuccessful? | 2 | 22 | 2 | 3 |
| Do you become restless or irritable when attempting to cut down or stop playing video games? | 2 | 6 | 2 | 1 |
| Have you played video games as a way of escaping from problems or bad feelings? | 25 | 20 | 29 | 19*** |
| Have you ever lied to family or friends about how much you play video games? | 14 | 10 | 17 | 10*** |
| Have you ever stolen a video game from a store or a friend, or have you ever stolen money in order to buy a video game? | 2 | 2 | 3 | 1* |
| Do you sometimes skip household chores in order to spend more time playing video games? | 33 | 21 | 40 | 24*** |
| Do you sometimes skip doing homework in order to spend more time playing video games? | 23 | 19 | 29 | 15*** |
| Have you ever done poorly on a school assignment or test because you spent too much time playing video games? | 20 | 12 | 26 | 11*** |
| Have you ever needed friends or family to give you extra money because you spent too much money on video-game equipment, software, or game/Internet fees? | 9 | 6 | 13 | 4*** |

Note. For each symptom, chi-square tests were used to compare prevalence among boys and girls. Overall, the number of symptoms reported was significantly different ($p < .001$) between boys ($M = 2.8$) and girls ($M = 1.3$). Also, the prevalence of pathological gaming (i.e., displaying at least 6 of the 11 symptoms) was significantly different ($p < .001$) between boys (12%) and girls (3%).

* $p < .05$. *** $p < .001$.

on schoolwork or a test because of playing (20%). If “sometimes” is counted as a “yes,” then 7 of the 11 symptoms were endorsed by at least 20% of youth. The other potentially problematic symptoms were endorsed by far fewer youth gamers, with the least likely symptom being stealing video games or stealing money to buy games (2% “yes” and an additional 2% “sometimes”). Boys were more likely than girls to report each of the symptoms, with the exception that more girls than boys reported trying to reduce their video-game play (Table 2).

Prevalence of Pathological Video-Game Use

As noted, an individual was considered to be a pathological gamer if he or she exhibited at least 6 of the 11 criteria on the symptom checklist. However, it was unclear whether a “sometimes” response should be considered equivalent to a “yes” response, equivalent to a “no” response, or something in between. Therefore, three versions of checklist scores were calculated. Version A considered “sometimes” to be equivalent to a “yes.” This approach yielded reasonable reliability, and the highest prevalence of pathological gaming ($\alpha = .77$; 19.8% of gamers). Version B was the most conservative approach, considering “sometimes” to be equivalent to a “no.” This approach also yielded reasonable reliability, and the lowest prevalence of

pathological gaming ($\alpha = .74$; 7.9% of gamers). Version C considered “sometimes” to be equivalent to half of a “yes” (yes = 1, sometimes = .5, no = 0). This approach yielded the highest reliability and a prevalence very close to that of Version B ($\alpha = .78$; 8.5% of gamers). Version C was adopted as the “best” approach, as it was conservative in assessing prevalence while still allowing participants who “sometimes” experienced symptoms to be considered. It should be noted, however, that the construct validity analyses reported here yielded almost identical results when the other two versions were used.

Boys exhibited a greater number of symptoms ($M = 2.8$, $SD = 2.2$) than girls ($M = 1.3$, $SD = 1.7$), $t(1175) = 12.5$, $p < .001$, $d = 0.73$, $p_{rep} = .99$. Note that the average number of symptoms reported was not high for either group. However, the percentage of respondents exhibiting at least six of the symptoms was very different for boys and girls; 11.9% of boys and 2.9% of girls were classified as pathological by this criterion, $\chi^2(1, N = 1,178) = 34.2$, $p < .001$, $p_{rep} = .99$.

The relations between the number of reported symptoms and the primary continuous dependent variables were tested for linearity by visual examination of scatter plots and by regression analyses. In general, the quadratic terms were small, but significant because of the large sample size. The relations tended to appear linear from zero up to about six symptoms, with the slope changing at about that point. This finding pro-

TABLE 3
Comparisons of Pathological and Nonpathological Gamers: Continuous Variables

| Variable | Nonpathological gamers | | Pathological gamers | | <i>d</i> | 95% CI | <i>p</i> _{rep} |
|---|------------------------|-----------|---------------------|-----------|----------|----------------|-------------------------|
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | | | |
| Mean number of years playing video games | 5.5 | 3.2 | 6.6** | 3.2 | 0.34 | (0.12, 0.56) | .98 |
| Mean frequency of playing video games (0 = <i>never</i> , 7 = <i>at least once a day</i>) | 4.0 | 2.3 | 6.3*** | 1.1 | 1.28 | (1.16, 1.40) | .99 |
| Mean weekly amount of video-game play (hours) | 11.8 | 12.6 | 24.6*** | 16.0 | 0.88 | (0.62, 1.15) | .99 |
| Mean number of video-game rating symbols known | 3.4 | 2.3 | 4.2** | 2.1 | 0.36 | (0.16, 0.56) | .98 |
| Mean grades usually received | 6.1 | 1.5 | 4.8*** | 1.9 | -0.76 | (-1.03, -0.49) | .99 |
| Frequency of trouble paying attention to classes at school (1 = <i>never</i> , 5 = <i>always</i>) | 2.5 | 0.9 | 3.0*** | 0.9 | -0.55 | (-0.78, -0.33) | .99 |
| Overall health (1 = <i>not at all healthy</i> , 4 = <i>extremely healthy</i>) | 3.1 | 0.7 | 3.0 | 0.6 | -0.15 | (-0.34, 0.04) | .95 |
| Frequency of hand or finger pain (1 = <i>never</i> , 6 = <i>almost every day</i>) | 2.7 | 1.2 | 3.0* | 1.3 | 0.24 | (0.01, 0.47) | .94 |
| Frequency of wrist pain (1 = <i>never</i> , 6 = <i>almost every day</i>) | 2.7 | 1.2 | 3.1** | 1.4 | 0.31 | (0.06, 0.56) | .98 |
| Frequency of neck pain (1 = <i>never</i> , 6 = <i>almost every day</i>) | 2.9 | 1.4 | 3.2 | 1.4 | 0.21 | (0.00, 0.43) | .91 |
| Frequency of blurred vision (1 = <i>never</i> , 6 = <i>almost every day</i>) | 2.7 | 1.3 | 2.9 | 1.3 | 0.15 | (-0.06, 0.56) | .82 |
| Frequency of headaches (1 = <i>never</i> , 6 = <i>almost every day</i>) | 4.1 | 1.5 | 4.5 | 1.5 | 0.27 | (0.05, 0.48) | .81 |
| Mean age | 13.1 | 3.0 | 13.3 | 2.7 | 0.07 | (-0.13, 0.27) | .66 |
| Frequency of using the Internet to do homework (1 = <i>never</i> , 5 = <i>almost always</i>) | 3.0 | 1.0 | 3.1 | 1.1 | 0.10 | (-0.14, 0.33) | .67 |
| Respondents' self-ratings of how much they are affected by violence in the games they play, compared with other students of the same age (1 = <i>a lot less</i> , 5 = <i>a lot more</i>) | 1.7 | 1.0 | 1.9 | 1.1 | 0.19 | (-0.05, 0.43) | .93 |

Note. Significance of the difference between pathological and nonpathological gamers was determined by *t* test. Confidence intervals (CIs) for the *d* values were calculated following the method of Bonett (2008), which has been demonstrated to work properly with unequal sample sizes and unequal variances.

p* < .05. *p* < .01. ****p* < .001.

vided additional justification for the use of six symptoms as a cutoff.

Construct Validity of Pathological Video-Game Use

Although questionnaire space was limited, several items were included to measure the construct validity of pathological gaming. Theoretically, pathological gamers, compared with other gamers, should spend more time playing, play more frequently, know more about games, have more health-related problems that could be associated with game use, and get worse grades in school; they should also be more likely to feel “addicted” to games, to have friends they think are “addicted” to games, and to have video-game systems in the bedroom. Demonstrating such associations would indicate convergent validity, and failing to demonstrate them would be evidence of a lack of construct validity. Similarly, some items on the survey provided the opportunity to demonstrate divergent validity. As theory currently stands, there is no reason to assume that pathological gaming would be related to the type of school a child attends, having a TV in the bedroom (given the generally high prevalence), using the Internet to help with homework, or a child’s age or race. Some of these variables may be found to be relevant as more studies are conducted, but there is currently no theoretical reason to assume they would be.

Tables 3 and 4 show how pathological gamers and nonpathological gamers compared on a number of dimensions. Pathological gamers had been playing for more years, played more frequently and for more time, knew more of the video-game rating symbols, received worse grades in school, were more likely to report having trouble paying attention in school, were more than twice as likely to have been diagnosed with an attention-deficit disorder, had more health problems that were likely to have been exacerbated by long hours of playing video games (e.g., hand pain and wrist pain), and were more likely to report having felt “addicted” to games and having friends they thought were “addicted” to games. Pathological gamers were also significantly more likely to have been involved in physical fights in the past year. Also, as predicted, pathological gamers were more likely to have a video-game system in their bedrooms.

The tests of divergent validity showed that, as predicted, pathological use of video games was not systematically related to age, frequency of using the Internet to do homework, having a TV in the bedroom, or type of school attended. Equal percentages (within 1%) of pathological and nonpathological gamers attended private or parochial schools, attended public schools, or were home-schooled. Approximately equal percentages of pathological and nonpathological gamers come from each race, $\chi^2(6, N = 1,036) = 6.0$, n.s.

TABLE 4
Comparisons of Pathological and Nonpathological Gamers: Dichotomous Variables

| Variable | Nonpathological gamers (%) | Pathological gamers (%) | Odds ratio | 95% CI | p_{rep} |
|---|----------------------------|-------------------------|------------|---------------|-----------|
| Has been diagnosed with an attention problem (e.g., attention-deficit disorder or attention-deficit/hyperactivity disorder) | 11.0 | 25.3*** | 2.77 | (1.66, 4.65) | .99 |
| Has felt “addicted” to video games | 21.1 | 65.4*** | 7.00 | (4.34, 11.28) | .99 |
| Has friends who are “addicted” to video games | 56.8 | 77.2*** | 2.67 | (1.56, 4.67) | .99 |
| Has been in a physical fight in the past year | 12.3 | 24.1** | 2.28 | (1.36, 3.82) | .99 |
| Has a video-game system in the bedroom | 40.8 | 64.4*** | 2.69 | (1.71, 4.22) | .99 |
| Has a TV in the bedroom | 62.4 | 69.0 | 1.36 | (0.86, 2.18) | .81 |

Note. Significance of the difference between pathological and nonpathological gamers was determined by chi-square test. ** $p < .01$. *** $p < .001$.

These tests provide some evidence of convergent and divergent construct validity for pathological video-game use, when defined as damaging functioning in several areas (e.g., school, social, family, and psychological functioning). The amount of time spent playing is not a criterion for pathological video-game use, just as how much one drinks is not a criterion for alcohol dependence. However, because the amount of time spent playing video games is a consistent negative predictor of school performance (Anderson et al., 2007; Gentile et al., 2004), and because pathological gamers spend twice as much time playing games each week as nonpathological gamers do (Table 3), it would be stronger evidence for pathological gaming if the classification were a significant predictor of school performance after controlling for amount of time spent playing video games. This possibility was tested with an analysis of covariance. Even after controlling for sex, age, and weekly amount of video-game playing, pathological status was a significant predictor of school performance, $F(1, 1003) = 27.7, p < .001, \eta^2 = .027, p_{rep} = .99$.¹

DISCUSSION

In a national sample of youth ages 8 to 18, 8.5% of video-game players exhibited pathological patterns of play as defined by exhibiting at least 6 out of 11 symptoms of damage to family, social, school, or psychological functioning. Although this percentage may at first appear to be high, it is very similar to the prevalence demonstrated in many other studies of pathological video-game use in this age group, including studies in other nations (e.g., the prevalence rate of 9.9% among Spanish adolescents, reported by Tejeiro Salguero & Bersabé Morán, 2002). This definition showed reasonable reliability and construct validity. Its convergent validity was demonstrated by the findings that pathological gamers (compared with nonpathological

gamers) spent twice as much time playing games (24 hr/week), were more likely to have video-game systems in their bedrooms, reported having more trouble paying attention at school, received poorer grades in school, had more health problems, and were more likely to feel “addicted.” Divergent validity was demonstrated by the findings that pathological gamers were not more likely to have televisions in their bedrooms or to use the Internet for homework; moreover, pathological status was not related significantly to age, race, or type of school attended. Pathological use (or addiction) must mean more than “do it a lot.” As predicted, pathological status was a significant predictor of poorer school performance even after controlling for sex, age, and weekly amount of video-game play. This is the first study of pathological computer, Internet, or video-game use to conduct such a strong test, and the results demonstrate that pathological use is not simply isomorphic with excessive play or high engagement with video games.

One could hypothesize that the third-person effect (the belief that one is less affected by media than other people are) might be stronger among pathological gamers than among nonpathological gamers because they should have a stronger positive feeling about video games. The third-person effect was demonstrated in this study (76% of gamers believed themselves to be less affected by video-game violence than other students their age, whereas only 4% believed themselves to be more affected), but pathological status was not significantly related to it.

The finding that pathological gamers were twice as likely as nonpathological gamers to have been diagnosed with an attention problem, such as attention-deficit disorder or attention-deficit/hyperactivity disorder, helps to demonstrate the current limits of knowledge about pathological gaming. One could interpret this finding as a predictable type of comorbidity, given that many addictions are comorbid with other problems and that Internet “addiction” has previously been found to be correlated with attention problems (Yoo et al., 2004). Still, it is not clear whether (a) pathological play is entirely distinct from other pathologies, (b) pathological play is a contributing factor to the development of other problems, or (c) the other problems contribute to pathological play.

¹For a stronger test of construct validity, pathological status was recalculated dropping the two school-related items (skipping homework, doing poorly on an assignment or test; five of nine items were required for pathological status), and the analysis of covariance was conducted again. After controlling for sex, age, and weekly amount of video-game playing, pathological status (defined without school-related symptoms) was again a significant predictor of school performance, $F(1, 1019) = 5.83, p < .05, \eta^2 = .006, p_{rep} = .96$.

The primary limitation of this study is its correlational nature. It does not provide evidence for the possible causal relations among the variables studied. It is certainly possible that pathological gaming causes poor school performance, and so forth, but it is equally likely that children who have trouble at school seek to play games to experience feelings of mastery, or that attention problems cause both poor school performance and an attraction to games. Furthermore, the data on pathological gaming should be considered to be exploratory, as no standard definition of pathological gaming exists, and further research may determine that there are better ways to define it. A related limitation is the nature of the response scale; for example, it is unclear whether all youth would interpret the difference between “yes” and “sometimes” the same way. However, the fact that the relations between pathological status and the other variables were similar regardless of how we defined “sometimes” suggests that this limitation may not be a major problem. Nonetheless, in a clinical setting, this approach would serve only as a screen for a detailed clinical interview in which the actual severity of the problems could be assessed. Furthermore, if these questions were to be used in a clinical setting, they should be time bounded the same way that substance-use items are (e.g., “In the past year, how much have you . . .?”).

This study is also limited because it included only youth who had access to the Internet. However, as of 2005, 87% of youth ages 12 through 17 were users of the Internet (Hitlin & Rainie, 2005). Although this group as a whole may be more likely than others to play video games (because they have computer access), comparisons were made only among game players.

This study’s primary strength is that it is nationally representative within 3%. Nonetheless, it yields far more questions than answers. We do not know who is most at risk for developing pathological patterns of play, what the time course of developing pathological patterns is, how long the problems persist, what percentage of pathological gamers need help, what types of help might be most effective, or even whether pathological video-game use is a distinct problem or part of a broader spectrum of disorders. The present study was designed to demonstrate whether pathological gaming is an issue that merits further attention. With almost 1 out of 10 youth gamers demonstrating real-world problems because of their gaming, we can conclude that it is.

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Erratum

Douglas Gentile, "Pathological Video-Game Use Among Youth Ages 8 to 18: A National Study," *Psychological Science*, Volume 20, Number 5, pp. 594–602.

In this article, I made an error in claiming that the study was nationally representative within $\pm 3\%$. Because of the type of sample that was used, it is impossible to put a confidence interval around the 8.5% prevalence rate of pathological gaming reported. The sample was from a panel recruited through multiple means, and the data were weighted by age, gender, race-ethnicity, highest level of education, parents' education, urbanicity, and region in order to make the data generalizable to the total population. I incorrectly assumed that a confidence interval could be calculated similarly to how it is calculated for a random probability sample (such as the sample obtained in a random-digit telephone survey). However, it is not possible to calculate the exact confidence interval for our data because the theoretical sampling frame is not determined, although some studies suggest that the confidence interval would be similar to (and perhaps better than) the confidence intervals obtained with random probability samples (Taylor, 2007).

Nevertheless, the main conclusion of the study still stands: By plausible clinical standards, a nontrivial percentage of youth exhibit signs of addictive behavior with regard to video games. That is, the study provides evidence for the convergent and divergent validity of pathological video-game use, and demonstrates that 8.5% of the youth who play games would be classified as pathological gamers according to a definition similar to that for pathological gambling. Furthermore, the prevalence of pathological gaming found in this study is similar to that found in other studies using similar definitions of pathological gaming. Even if future studies using different approaches to definition or sampling find that the percentage is lower, this would not detract from the central point that pathological video-game use is a problem that is large enough to warrant concern and further study.

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