Pergamon

Addictive Behaviors, Vol. 19, No. 5, pp. 545–553, 1994

0306-4603/94 $6.00 + .00

0306-4603(94)00025-5

IDENTIFYING VIDEO GAME ADDICTION IN CHILDREN AND ADOLESCENTS

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Abstract — There is a current trend of thought among some scholars of gambling that arcade video game playing in some adolescents may develop into a behavior which resembles a gambling addiction. A scale, developed to identify arcade video game addiction in adolescents, was administered to 467 secondary school children in a coastal town in the UK. Initial psychometric tests show that the scale has acceptable internal consistency reliability and factorial validity, and is significantly related to alternative means of assessing excessive video game play. The implications of the study findings are discussed together with its limitations and suggestions for future research.

Coin-operated video game machines have become a familiar sight in cafes, sports centres, bars, cinema foyers, arcades and elsewhere in the U.S. and throughout Europe (Bowman & Rotter, 1983; Fisher, 1991; Surrey, 1982). Video games provide a number of themes, but the most popular provide a participatory role for the player in an action-packed scenario. The player is usually the "good guy" who is required to make a daring and heroic stand against the "bad guys" who range from alien life forms to street fighters. Whatever their theme, video games typically transport the player to a fantasy world created by thrilling graphic imagery and awesome electronic sound effects. The aptitude of players is reflected in the number of points scored. Lists of the initials and corresponding scores of top players are frequently exhibited on the digital display of the machine to encourage competition (Graham, 1988).

Existing research suggest that video games are a mixed blessing. Some writers have highlighted the educational potential of video games (e.g., Loftus & Loftus, 1983; Silvern, 1986). Others have expressed concern that the violent themes of many games encourage an aggressive response in impressionable young minds (e.g., Koop, 1982; Zimbardo, 1982). Yet others, like this author, have focussed on the hypothesis that arcade video games are addictive for some children (e.g., Anderson & Ford, 1986; Soper & Miller, 1983).

In the U.S., Egli and Meyers (1984) found that 13% of the 151 adolescents they interviewed were "heavy users" of video games. The "heavy users" sacrificed the buying of food, clothes, and cinema visits, as well as sporting activities, in order to play video machines. McClure and Mears (1984) found that in a sample of 336 high school students 26% used part or all of their lunch money to finance video game playing. Klein (1984) and Keepers (1990) both reported that the foremost preoccupation of the children they counselled with behavioral problems was video game playing.

The author would like to thank the Economic and Social Research Council for funding the design stage of this work through a research studentship grant. The author would also like to thank Henry Lesieur, Paul Kline, and Iain Brown for their comments on an earlier draft of this paper.

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In the UK, the official governmental line is that "there is little if any likelihood of becoming dependent upon video machines" (Graham, 1988, p. 29). However, 41% of their adolescent respondents (n = 402) reported spending half or more of their weekly income on arcade video games and 28% (n = 485) played arcade video games once a week or more. Other researchers in the UK have associated arcade video machine playing with borrowing (Lee, 1989; Blackpool & Fylde Youth and Community Service (BFYCS), 1990); spending school dinner money (Lee, 1989), and the selling of possessions to fund play (Huxley & Carroll, 1992). BFYCS (1990) also reported that 7% of the respondents who played arcade video machines (n = 2,233) stole from their family to fund their play and that 5% stole from sources outside of their family. Huff and Collinson (1987) reported a number of their "criminal" video players as "having problems associated with their playing in the past, in the present and also foresaw more in the future" (p. 407). They also had more relationship problems, took more time off work, and neglected food to a greater extent than "non-criminal" players.

While none of these studies demonstrates empirically the concept of arcade video game addiction, the concerns which they express warrant further, more specific, research. Soper and Miller (1983), Brown and Robertson (1990), and Griffiths (1991) claim not only that the phenomenon of addiction to video games exists, but that it mirrors other behavioral addictions. Griffiths (1991), for example, argues that arcade video game playing may be viewed as a "non-financial" form of gambling and may similarly develop into a non-substance addiction.

Pursuing a similar theme, Brown and Robertson (1990) attempted to measure addiction to video gaming in a sample of 45 Scottish schoolchildren, using selected items from the Twenty Questions used by Gamblers Anonymous to determine the presence of "compulsive" gambling. They found a high positive and significant correlation between addiction to arcade video game playing thus defined and the proportion of available money spent playing. The authors speculated that a sizeable percentage of the general population may have "a significant addiction to video gaming."

As a preliminary attempt to address the issue of arcade video game addiction, the present study describes the development and initial psychometric properties of a scale developed to identify the phenomenon in adolescents — the main user group. The scale is adapted from DSM-IV a set of criteria shown to discriminate pathological gambling effectively in adults (Lesieur & Rosenthal, 1991). The adapted scale is presented as DSM-IV-JV (J = Juvenile; V = arcade video game). The term "pathological" play is used below to denote addiction, in order to conform to existing descriptions using such measures.

METHOD

Measures of pathological behavior

Like DSM-IV, DSM-IV-JV comprises nine dimensions of addiction: (1) progression and preoccupation, (2) tolerance, (3) withdrawal and loss of control, (4) escape, (5) chasing, (6) lies and deception, (7) illegal acts, (8) family/schooling disruption, and (9) financial bail-out. A score of four or more of these criteria indicates pathological arcade video game playing. The DSM-IV (Lesieur, Rosenthal, & Custer, 1990) and DSM-IV-JV criteria are shown below, with the changes which comprise DSM-IV-JV italicized.

DSM-IV	DSM-IV-JV
Maladaptive behavior as indicated by at least **four** of the following:	Maladaptive behavior as indicated by at least **four** of the following:
1. as gambling progressed, became more and more preoccupied with reliving past gambling experiences, studying a system, planning the next venture, or thinking of ways to get money,	1. as *video game playing* progressed, became more and more preoccupied with reliving past playing experiences, studying *video game playing, planning the next opportunity to play, or thinking of ways to get money to play,*
2. needed to gamble with more and more money in order to achieve the desired excitement,	2. needed to *spend* more and more money in order to achieve the desired excitement,
3. became restless or irritable when attempting to cut down or stop gambling,	3. became restless or irritable when attempting to cut down or stop *video game playing,*
4. gambled as a way of escaping from problems or intolerable feeling states,	4. *played video game machines* as a way of escaping from problems or intolerable feeling states,
5. after losing money gambling, would often return another day in order to get even ("chasing" one's losses),	5. *after spending money on video game machines,* would often return another day in order to get *a higher score* ("*score chasing*"),
6. lied to family, employer, or therapist to protect and conceal the extent of involvement with gambling,	6. lied to family, or friends to protect and conceal the extent of involvement with *video game machines,*
7. committed illegal acts, such as forgery, fraud, theft, or embezzlement, in order to finance gambling,	7. committed *illegal/unsocial acts, such as misuse of school dinner/fare money, and theft from the home or elsewhere in order to finance video game playing,*
8. jeopardized, or lost a significant relationship, marriage, education, job, or career because of gambling,	8. *fell out with family or close friends and jeopardized education because of video game playing,*
9. needed another individual to provide money to relieve a desperate financial situation produced by gambling (a "bailout").	9. needed another individual to provide money to relieve a desperate financial situation produced by *video game playing* (a "bailout").

Criteria numbers 5, 7, and 8 of DSM-IV-JV differ most from the adult gambling scale. Criterion number 5 of DSM-IV-JV reflects the fact that gambling games are ostensibly played to accumulate as much money as possible, whereas arcade video game machines are played to accumulate as many points as possible (for ethnographic insights into the underlying orientations of young fruit machine players, see Fisher, 1993a). Illegal acts in criterion 7 of DSM-IV are adapted in DSM-IV-JV to include the most likely sources of illegitimate cash for children under the age of 16 years. Criterion number 8 is similarly adapted to reflect the enduring, noncontractual nature of family relationships for most children and omit references to job or career.

Sample

A questionnaire survey was carried out in 1990 in a small coastal town (population 6,000) in the south west of England where the main industries are tourism and fishing. Three amusement arcades containing low-stake gambling machines and video games provide an important leisure facility for holidaymakers during the summer season. These arcades have been adopted by the local youth as a year-round

leisure venue for meeting up with friends, as well as playing the machines (see Fisher, in press). The town is served by one state secondary school which provides education for all the local children aged between 11 and 16 years, except for a small number of children who attend fee-paying schools away from home.

The aim was to obtain a near-universal sample of children in this age group, residing in the study location. The final sample consisted of 467 out of the 493 children who attended the secondary school on the day of the survey. Seven questionnaires were incomplete or incoherent, leaving a final sample of 460. Fifty-two percent of the children were female and 48% were male. The modal age was 14 years. Sixty-three percent of the children were Protestant, 4% were Catholic and, with the exception of one Jehovah's Witness, the remainder were agnostic or atheist. Thirty-three percent of the children were from class background AB (professional/managerial), 12% from C1 (skilled non-manual), 41% from C2 (skilled manual), and 14% from DE (partly skilled/unskilled) — based on the 1980 Classification of Occupations (Office of Population Censuses and Surveys, 1980).

Procedure

The questionnaire included two research instruments: DSM-IV-J, to address the issue of adolescent fruit machine gambling (Fisher, 1992; Fisher, 1993b); and DSM-IV-JV, to address the present concern of adolescent video game playing. The questionnaire also contained questions on a wide range of behaviors related to amusement machine use. The questionnaire was anonymous and was administered simultaneously to all classes by 32 adults unknown to the children. The classrooms had been rearranged the previous evening to provide examination conditions. The administrators checked the childrens' understanding of the terms "anonymous" and "confidential" and stressed their importance for the study.

RESULTS

Sixty-six percent of the children ($n = 303$) had played video machines in an arcade in the past year. Twenty-one percent played regularly (defined as at least once a week). Males were significantly more likely to play regularly than females — 29% of the males compared with 13% of the females (Yates' corrected $\chi^2 = 17.81$, $df = 1$, $p < .001$). Six percent ($n = 28$) scored 4 or more items on the index and were defined "pathological players." The remaining 60% who played but scored less than 4 items on the index ($n = 275$) were defined "social players" and became the control group for some of the psychometric tests. Gender differences in the group defined as pathological gamblers were not significant.

Mean scores on the DSM-IV-JV

The mean score of the boys ($M = 1.09$) was higher than that of the girls ($M = 0.57$), $t = 3.96$, $p < .001$. As expected, mean scores were also significantly higher for the regular players ($M = 2.06$) than for the nonregular players ($M = 0.49$), $t = 7.72$, $p < .001$.

Item analysis

Given the greater participation of boys than girls in arcade video game playing and the higher mean score on the DSM-IV-JV for boys, scores of each item on the scale were analysed by gender both as a function of the total sample and of regular play. The details are shown in Table 1.

Table 1. Item analysis by all respondents, gender and regular players

	Gender			Regular players			Nonregular players		
DSM-IV-JV item no.	Total %	Boys %	Girls %	Boys %	Girls %	Total %	Boys %	Girls %	Total %
1	15.0	20.4	10.0	38.5	41.9	39.6	12.8	5.3	8.5
2	9.8	11.3	8.4	23.1	25.8	24.0	6.4	5.8	6.0
3	6.3	9.9	2.9	15.4	9.7	13.5	7.7	1.9	4.4
4	7.8	9.9	5.8	15.4	19.4	16.7	7.7	3.8	5.5
5	12.6	16.7	8.8	35.4	29.0	33.3	9.0	5.8	7.1
6	8.5	12.7	4.6	23.1	16.1	20.8	8.3	2.9	5.2
7	14.1	18.5	10.0	40.0	32.3	37.5	9.6	6.7	8.0
8	5.4	7.2	3.8	12.3	19.4	14.6	5.1	1.4	3.0
9	1.3	1.8	0.8	4.6	3.2	4.2	0.6	0.5	0.5

Endorsement of DSM-IV-JV items varied from 1.3% (seeking help with a serious money worry caused by arcade video game play, to 15% (stealing or using school fare/dinner money to fund play); the mode was 8.5%. A smaller percentage of females than males endorsed each item on the scale and these differences were significant in items 1, 3, 5, 6, and 7 ($p < .01$). Regular players were significantly more likely to endorse each of the items than nonregular players ($p < .0001$ for all items except for item 3 [$p < .005$] and item 9 [$p < .05$]). It is interesting that there were no significant differences in the endorsement of scale items between male and female regular players. This result and the lack of significant gender bias in the group defined as "pathological players" suggest that, while the overall participation of males is higher than females, the dynamics of committed playing are similar for both sexes.

Internal consistency reliability and factorial validity

Internal consistency reliability for the scale (coefficient alpha) was acceptable for a scale of this size at .71. The scale was represented primarily by one factor (eigenvalue = 2.7, accounting for 30.4% of the variance). Only one other factor with an eigenvalue over 1.00 was identified (eigenvalue = 1.02, accounting for 11.4 percent of the variance). The first factor showed a string of positive correlations with the need to play video games to escape from problems or intolerable feeling states; preoccupation with playing; planning the next opportunity to play; thinking of ways to get money to play again; habitual returning to play video machines to gain a higher score; and stealing to fund play. Thus factor 1 is directly concerned with the experience of playing arcade video games and might be interpreted as measuring something like a subjectively experienced overwhelming and ever-present need to play. The second factor was positively correlated with restlessness or irritability when trying to cut down or stop playing; lying to family or friends to conceal the extent of playing; and jeopardising close relationships or education because of playing. This factor seems to describe negative behaviors or feeling states consequent on excessive play, but outside of the playing experience itself. Thus an arcade video game "addiction" may be characterised by a subjectively experienced, overwhelming need to play, together with negative behaviors or feeling states consequent on this need which spill over into everyday social experience. The details are shown in Table 2.

Table 2. DSM-IV-JV: Principal components factor analysis

DSM-IV-JV item no.	Factor 1 loadings (eigenvalue = 2.73)	Factor 2 loadings (eigenvalue = 1.03)
1	.55	.39
2	.42	.40
3	.00	.74
4	.58	.08
5	.73	−.02
6	.18	.71
7	.63	.19
8	.20	.59
9	.38	.14

Note. Internal consistency reliability (coefficient alpha) = .71.

Construct validity — Alternative measures of excessive play

The highly significant mean score difference on the DSM-IV-JV between regular and nonregular players provides some construct validity evidence for the scale. Additional analyses comparing the "pathological" video game players with the "social" players on alternative measures of problem playing provided additional evidence as follows:

Frequency and duration of play. The pathological players played video games significantly more frequently than the social players — 75% played at least once a week compared with only 28% of the social players. Twenty-five percent of the pathological players played between 3 and 6 times a week, and 21% played every day. This compares with just 4% and 2%, respectively, of the social players (Yates' corrected $\chi^2 = 41.65$, $df = 4$, $p < .0001$). The pathological players also spent more time on a typical visit to an arcade than the social players — the modal duration of time spent was less than half an hour for social players compared with between two and three hours for pathological players.

Weekly expenditure on video machines. The pathological players tended to spend more money per week on video games than the social players. The modal weekly expenditure for pathological players was between £5 and £10 per week compared with under £1 for social players (£1 ≈ $1.6). Nearly 30% of the pathological players spent between £5 and £10 per week on video machines, and 11% spent between £10 and £20. This compares with just 4% and 2%, respectively, of the social players (Yates' corrected $\chi^2 = 28.15$, $df = 4$, $p < .0001$).

Borrowing money and selling possessions to play. Borrowing money to play video machines was a common occurrence — 54% of the children had done so in the past year. However, nearly twice as many (82%) of the pathological players had borrowed to play as social players (42%). They also borrowed more often — 29% had borrowed more than 3 times in the past year compared with just 2% of the social players (Yates' corrected $\chi^2 = 43.03$, $df = 2$, $p < .0001$). Pathological players were also significantly more likely to have sold their possessions to fund video game playing — 21% had done so compared with only 1% of the social players (Yates' corrected $\chi^2 = 19.65$, $df = 2$, $p < .0001$).

Self perception of playing to excess. The children were also asked if they had a subjective awareness of excessive video game play. (Subjective awareness of excessive play is a prerequisite to most adult gambling addiction programmes.) Only 9% of the "social" players reported that they were "worried that they played video games too much," compared with 40% of the pathological players (Yates' corrected $\chi^2 = 19.4$, $df = 1$, $p < .0001$).

DISCUSSION

This study presents DSM-IV-JV, a preliminary scale for the identification of arcade video game addiction in adolescents. The scale's internal consistency reliability (coefficient alpha) is acceptable for a scale of nine items at .71. A principal component factor analysis revealed that the scale is represented by two factors. These suggest that an arcade video game "addiction" may be characterised by a subjectively experienced, overwhelming need to play arcade video games, together with negative behaviors or feeling states consequent on this need which spill over into everyday social experience. Construct validity is supported by the relationship between pathological video game playing, as defined by the scale, with alternative measures of problem play. These include supernormal frequency and duration of play, supernormal expenditure, borrowing and selling possessions to play, and self-awareness of a problem.

Caution must be exercised in generalizing the findings of this study to adolescents in other areas. The study location was chosen for its plentiful supply of arcade video games. Research into gambling behavior among the youth highlights the importance of supply in affecting prevalence rates for problem gambling in different jurisdictions (Fisher, 1993b). It is likely that prevalence rates for problem arcade video game playing are similarly affected.

Table 1 shows that criterion number 5, "score chasing," attracted more positive responses than expected. The wording of the related survey question clearly requires revising and repiloting. In addition, "bail out" is a weak indicator for video machine dependency in children. There are several likely reasons for this: a video game addiction is likely to be cheaper to sustain than a gambling machine addiction (practice improves performance so that games last longer); children do not bear the economic responsibility of adults for essential bills, so that "desperate financial situations" rarely arise; and the high positive response to item 7 (illegal acts) suggest that financially embarrassed children obtain money from less regular sources. (Fifty percent of the pathological players stole from the family home to fund play.) Substitution of item 9, "bail out," by regular play (once a week or more), and subjective perception of a problem, raises the internal consistency reliability of the scale (coefficient alpha) to .74.

The initial psychometric properties of the scale are encouraging and provide a sound basis for further refinement. A clinical trial on the screen which incorporates the lessons learned from this study and includes the independent ratings of treatment professionals is currently under way.

Since scale components were based upon the DSM-IV criteria, which are used to identify pathological gambling in adults, this study supports the hypothesis that, in some adolescents, arcade video game playing is a behavior which resembles pathological gambling. The present trend in gambling slot machine design is towards increased interactivity and the integration of gambling features with video game

scenarios. These machines may prove to be particularly attractive to a generation of children and young adults raised on arcade video games. Given the common dimensions of play, further research is needed into the possible relationship between arcade video game playing in adolescents and slot machine gambling.

The most popular arcade video games are now reproduced for children to play on home computers. Logic suggests that if arcade video games are addictive for some children, then the same games played on a home computer will be similarly addictive (see Brown & Robertson, 1993). Further research is required to examine the social and psychological impact of the widespread use of both arcade video machines and home computer games among children.

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