Pattern of Use and Dependence on Video Games in Infancy and Adolescence

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Título: Patrón de Uso y Dependencia de Videojuegos en Infancia y Adolescencia.

Resumen: Los videojuegos son una de las fórmulas más atractivas de ocupación del tiempo libre y en la actualidad se trata de unas de las actividades preferidas por niños y adolescentes, tanto por el interés que les suscitan, como por el tiempo que les dedican. Pese a los indudables beneficios que esta actividad comporta, en algunos casos el uso excesivo da paso al abuso y en otros provoca serios problemas personales y familiares. El trabajo que presentamos tiene dos objetivos. Por un lado analizar el patrón de uso de los videojuegos, atendiendo especialmente a las diferencias de género. Por otro, la construcción de un cuestionario de dependencia de los videojuegos, que tenga interés profesional y científico, tomando como referencia los criterios del DSM-IV de los Trastornos por Dependencia de Sustancias y adaptándolos al consumo de videojuegos. La estructura factorial de este cuestionario se adecua al concepto de dependencia, tal y como se entiende en el DSM-IV-TR. Junto a Internet y móvil, la dependencia de videojuegos sería una de las adicciones tecnológicas más características.

Palabras Clave: Adicciones tecnológicas; Dependencia de videojuegos; Test de Dependencia de Videojuegos; Adolescencia; Infancia.

Abstract: Video games are one of the most attractive forms of leisure. Today it is one of the main activities of children and adolescents, because of the interest they have for them and the time the adolescents spend in playing. Despite the undoubted benefits of this activity, in some cases the excessive use leads to abuse and other causes serious personal and family problems.

This paper has two objectives. First, analyze the pattern of use of video games, focusing on gender differences. Second, the development of a questionnaire of video games dependence, according to the criteria of DSM-IV Disorders Substance Abuse and adapting to the use of video games. The factorial structure of this questionnaire is consistent with the concept of dependence, as defined in DSM-IV. Along with Internet and mobile, video game dependency would be one of the most characteristic technological addictions.

Key Words: Technological addictions; Video game dependence; Test of Dependence to Video Games; Adolescence; Infancy.

Introduction

Play is a fascinating and vital part of human intellectual development (Morrissey and Brown, 2009), knowledge construction (Dockett, 1998), emotional development (Rubin, Fein and Vandenberg, 1983) and gender role acquisition (Lindsey and Mize, 2001). Moreover, play is a fundamental leisure activity crucial to establishing interpersonal relationships (Asher and Parker, 1991) and developing social patterns (Parker and Asher, 1987) that encourage key emotional responses (Ravaja, Turpeinen, Saari, Puttonen and Keltikangas, 2008). Research indicates that play extends beyond the personal social sphere and into the realm of cultural phenomena (Huizinga, 1972).

In most cases, play is not engaged in for any material benefit or reward (excluding games of chance or professional gambling), but rather for the interest or pleasure it incites. Available data increasingly show that play is an intrinsically motivated behavior that often produces an optimal experience (Csikszentimihalyi, 1990). Clearly, play fosters experience integration and development of social skills, cultivates higher frustration tolerance and allows actions that would otherwise be impossible in real life to be performed virtually (Chóliz, 2008).

Electronic games were already being played during the mid-twentieth century, a trend which continued into the 1970s with the success of video arcade machines in recreational arcades. However, the true game industry revolution

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came about with the advent of video game consoles (*Atari, Sega*) and the first personal computers (*Spectrum, Commodore 64* and PCs). These systems enabled users to play video games at home as much as desired without the need to pay every time they played. From the early *Atari* and *Magnavox Odyssey* to the current *Wii, Xbox* and *PlayStation 3*, video game consoles have steadily evolved through several generations, offering greater game variety, creativity and performance. Impressive technological developments have led to modern systems that boast capabilities scarcely thought possible just two decades ago. Video games have followed a similar development, presenting increasingly vivid and enthralling fantasy worlds.

Video games can be classified both according to game-play and game system requirements (Tejeiro and Pelegrina, 2008). Video games offer a variety of undeniable benefits (Griffiths and Meredith, 2008), which range from social and educational to therapeutic, and even cognitive process training in attention, perception and memory (Ferguson, Cruz and Rueda, 2008; Feng, Spence and Pratt, 2007; Rebetez and Betrancourt, 2007). For adolescents, there are several motivations for playing video games (Castellana, Sánchez-Carbonell, Beranuy and Graner, 2006): they allow the player to experience a first-person adventure in which actions are performed in a virtual environment without real life consequences; they rouse an interest in technology, computer science and innovation; they are relaxing, accessible and affordable; they can be played alone or with others, at home or in a cybercafé; they contribute to the player's self-esteem, self-confidence and sportsmanship; and they are emotionally stimulating because of their intensity and fast pace.

Hence, from the modest *Pong* and *Tetris*, to the impressive *Call of Duty* and *Fifa 11*, playing video games is highly

popular among children and teens (Rodríguez, 2002). This observation is not surprising, considering that the structural and functional qualities of video games make playing an intrinsically motivated behavior (Lee and LaRose, 2007) that is independent of any possible benefits this activity may deliver (Chin A Paw, Jacobs, Vaessen, Titze and van Mechelen, 2008). The primary motivational characteristics of video games are that they:

- present players with engaging environments;
- provide feedback about the player's actions in the game, creating an overall interactive experience;
- progress in levels or modes of customizable difficulty, allowing any player to reach their desired skill level once enough experience has been gained through extensive play time;
- elicit feelings of competence through the completion of modes, levels or objectives, which in turn makes play a reinforced and intrinsically motivated behavior, and thus encourages more frequent play;
- generally feature enthralling gameplay elements that, together with a sense of mastery and the ability to engage in play freely, can strengthen the player's sense of self-determination; and
- cause the player to become engrossed in and to dedicate large amounts of time to gameplay, a result of the player's interest in the game and his or her skill level against the game's difficulty (Chóliz, 2011).

Aside from its inherent characteristics, enthusiastic play can have reinforcing effects, further increasing the likelihood of continued play. These effects include the following:

- The player's self-esteem and sense of mastery over the game increase. Success during gameplay fosters the player's self-concept because he or she can demonstrate acquired skills, many of which are socially desirable.
- Some video games, especially strategy and role-playing games, allow the player to become immersed in the game's world, where he or she can share experiences with other players, be part of a group or even form an identity. At times, video games transcend the personal realm and the activity itself, taking on social significance and even fomenting patterns of interpersonal relationships.

However, despite these numerous benefits, video games present a host of problems. In terms of their content, some of the most commercially successful and visually impressive games directed at young audiences are sexist in nature (Burgess, Stermer and Burgess, 2007; Dill and Thill, 2007), while others are rife with aggression that can encourage hostility (Anderson, Gentile and Buckley, 2007; Bartlett, Harris and Bruey, 2008; Deselms and Altman, 2002; Kim, Namkoong and Kim, 2008), desensitization towards violence (Carnagey, Anderson and Bushman, 2007) and even tolerance towards sexual aggression (Dill, Brown and Collins, 2008). Addition-

ally, it is doubtful whether many of these games promote socially positive values (Anderson, Carnagey, Flanagan, Benjamin, Eubanks and Valentine, 2004).

Another problem attributed to video games is that they encourage excessive play patterns, which in some individuals lead to disrupted hygienic or personal health practices, and even estrangement from family members (Patim, 2009). It must be pointed out that, to a great extent, excessive play patterns are exacerbated by many video games' inherent characteristics, some of which are the very same benefits explained above. These benefits include a sense of mastery and self-determination, engaging and imaginative design, player feedback, engagement with other players (in multiplayer games), engrossing gameplay and many others. These motivational characteristics, combined with the effects of excessive play, in some individuals can lead to the development of an overpowering need to play.

An ample body of empirical evidence, both clinical and scientific (Griffiths, 2000), confirms that excessive play can become problematic (Tejeiro and Bersabé, 2002) and in some instances addictive (Griffiths, 2008a). This is especially true for online games, where expansive and endless gameplay allows for a limitless range of actions (Chappell, Eatough, Davies and Griffiths, 2006). Furthermore, excessive video game use frequently hampers other activities that are also important. Once the point is reached when an individual cannot go without playing, when taking a break from play is exceedingly difficult, or when play negatively affects other activities and interpersonal relationship patterns (mainly with parents), the problem is no longer one of excessive use, but borders on dependence. This would be classified as a technological addiction (Echeburúa, Labrador and Becoña, 2009; Griffiths, 1995) in the same manner as Internet addiction (Block, 2008) and mobile phone addiction (Chóliz, 2010). However, the concept of video game addiction, along with other technological addictions, is currently being articulated, and the discussion has generated divergent opinions concerning the concept's authenticity as a diagnostic or clinical criterion (Blaszczynski, 2008; Estallo, 2009; Griffiths, 2000, 2008b; Tejeiro and Bersabé, 2002; Wood, 2007).

At this point, a few lines must be dedicated to explaining that what many researchers consider to be technological addictions are not acknowledged as addictions in the DSM-IV or the ICD-10. The clearest example pertaining to video game addiction occurred in 2007, when the APA declared that it would not deliberate the issue of recognizing video game addiction as a mental disorder at that time. Gambling addiction is not currently defined as an addiction either, but instead as pathological gambling, classified under the category of impulse-control disorders (along with trichotillomania, pyromania and onychophagia). In fact, the diagnostic category "addictive disorders" does not even exist; the closest category would be substance dependence disorders. Nevertheless, specialists conjecture that pathological gambling may be included as an addictive disorder in the future DSM-V (APA, 2011).

The criteria for disorder classification in the DSM-IV are descriptive. In order for a disorder to be diagnosed, certain significant criteria must be met over a period of time, often independently of their originating causes. Within this context the notion of a behavioral addiction is understood as a dependence on a certain behavior or action. This dependence cannot be explained by any biological or biochemical activity, but is instead psychological (motivational, affective, conditioned, etc.), which indicates that psychological processes are germane to the manifestation of the dependence. Therefore, the key similarity between drug dependence and behavioral addiction is the forming of a pathological relationship of dependence (with a substance or with a behavior, respectively). Other characteristics of drug dependence, such as physical deterioration, physical withdrawal symptoms, and the causative agent involved, are quite obviously different from those of behavioral addictions. It should also be noted that these characteristics are distinct even between drug dependencies, and in any case are not criteria that are used to define the dependence described here.

So, if the same criteria used to diagnose substance dependence are assumed, but substance use is substituted with video game play, video game dependence would be characterized according to the criteria exhibited in Figure 1 below.

This study was performed in collaboration with the Foundation for Drug Dependence Study, Prevention and Aid [*Fundación para el Estudio, Prevención y Asistencia a las Drogodependencias*, FEPAD], a subsidiary of the Department of Health of Valencia [*Consellería de Salud de la Generalitat Valenciana*], and in an effort to meet the demand for aid by treatment and prevention centers. The principal objectives of this study are to understand patterns of video game use in children and adolescents, analyzing significant factors such as frequency of use and time spent during each play, and to develop a questionnaire that evaluates video game dependence using DSM-IV diagnostic criteria for substance dependence, and has the potential to be used both as a clinical instrument by mental health professionals and as a research tool by scientists.

CRITERIA FOR VIDEO GAME DEPENDENCE
- **Tolerance**: There is a progressive need to play more games or for longer durations. Former play patterns are no longer sufficient
- **Withdrawal**: Interrupted or prolonged cessation of play causes emotional distress.
- Games are played **longer** than originally intended.
- Player wishes to quit playing, but **cannot.**
- Player **spends excessive amounts of time** on video game-related activities, which starts to interfere with daily activities.
- Other activities are **abandoned** in order to play more.
- Although player knows it is harmful, **play is continued**.

Figure 1. Diagnostic criteria for video game dependence.

Method

Participants

The sample consisted of 621 children and adolescents (327 boys and 294 girls) between ages 10 and 16 and who were enrolled in 12 schools and institutions (one private school, three charter schools and eight public high schools) in the province of Valencia, Spain. The students were randomly selected from educational institution rosters of the Department of Education, and were sent formal invitations to the study. There was a 90% acceptance rate. The testing procedure was approved by the corresponding school committee as part of the educational curriculum, and written consent was obtained from the parents of the participants.

Materials

A self-report study was devised that examined both use patterns and potential problems that arise from video game overuse or dependence. The self-report study questionnaires were administered to students during regular classroom hours by mental health professionals specializing in technological addictions and who were trained for this task. These qualified professionals belong to various community prevention centers from the Department of Health of Valencia's health network, and are holders of a Graduate and University Professional Specialization Degree: "Game Addiction and Other Behavioral Addictions" (*Diploma de Postgrado y de Especialización Profesional Universitaria: "Adicción al Juego y otras Adicciones Comportamentales"*) from the University of Valencia. In order to create the Video Game Dependence Test (TDV), 55 items were developed that conformed to DSM-IV-TR criteria for dependence disorders, with each criterion represented by at least seven items. An inter-rater reliability test reduced the questionnaire to 32 items, and this version was used in the study. Subjective perception of dependence was measured using a scale of 0 to 100, which is similar to studies that measure mobile phone addiction.

Results

Video game use patterns

Type of video game. Although responses varied considerably (a total of 275 different games were determined), the majority of children and adolescents play a few specific games that are very popular among these groups. The most popular of these games are *The Sims* and the various games in the *Mario Bros.* series. Table 1 shows the video games played most frequently by the adolescents surveyed.

Table 1: Most-Played Video Games: Number of Players and Sample Proportion (in Parentheses).

	Girls	Boys	Total
Mario Bros[1]	135 (*.46*)	50 (*.15*)	185 (*.30*)
Sims[1]	100 (*.35*)	15 (*.05*)	115 (*.21*)
Fifa[2]	8 (*.03*)	72 (*.22*)	80 (*.13*)
Pro-Evolution Soccer[2]	8 (*.03*)	70 (*.21*)	78 (*.13*)
GTA[2]	4 (*.01*)	55 (*.17*)	59 (*.11*)
Animal Crossing[1]	48 (*.16*)	4 (*.01*)	52 (*.08*)
Wii Sports	19 (*.06*)	19 (*.06*)	38 (*.06*)
Call of Dutty[2]	1 (*.00*)	31 (*.10*)	32 (*.05*)
Fútbol[2]	4 (*.01*)	20 (*.06*)	24 (*.04*)
Brain Training[1]	21 (*.07*)	2 (*.01*)	23 (*.04*)
Nintendogs[1]	20 (*.07*)	1 (*.00*)	21 (*.03*)
Need for Speed[2]	3 (*.01*)	17 (*.05*)	20 (*.03*)

[1] Played mostly by girls (p<.01); [2] Played mostly by boys (*p*<.01).

Frequency of play and time spent playing games. The following tables display frequency of play, and are categorized by gender and age. Participants 12 and under were classified as children, while those 13 and older were classified as adolescents. Whether the participants were studying at the primary or secondary education level was a variable that could impact the development and manifestation of the behaviors analyzed in this study. Therefore, to control the effect of grade level on the results, data were selected so that all children ages 10 to 12 were enrolled at the primary level and all adolescents ages 13 and older were enrolled at the secondary level.

Results by age showed that adolescents between the ages of 12 and 16 played more days per week than children ages 10 and 11, $F = 3.95$, $p < .05$, and spent more time per day playing console games, $F = 29.46$, $p < .001$. Additionally, Mann-Whitney U test results showed that the proportion of adolescents who played online games was greater than that of children, $z = 5.05$, $p < .001$.

There were statistically significant differences between genders. Boys played more frequently, $F(1,609) = 76.14$, $p < .001$, and for longer spans of time, $F(1,609) = 58.32$, $p < .001$, than girls. Mann-Whitney U results for the proportion of participants who reported playing online games did not show statistically significant differences by gender, meaning that there was no difference between how many boys played online games as compared to girls. However, if only those who reported playing online games are taken into account, boys played more times per week than did girls, $F(1,609) = 42.83$; $p < .01$, which compares to the results for console games.

Table 2: Patterns of Video Game Use (Mean and Standard Deviation) by Gender.

	Girls	Boys	Total
Play frequency	1.71	3.18	2.49
(days/week)	(*1.84*)	(*2.27*)	(*2.20*)
Playing time	51.23	71.86	65.76
(minutes/day)	(*37.94*)	(*49.17*)	(*46.28*)
Online play frequency	1.72	2.75	2.32
(days/week)	(*1.93*)	(*2.45*)	(*2.30*)
Online playing time	60.45	72.06	67.36
(minutes/day)	(*44.49*)	(*46.97*)	(*46.20*)

Table 3: Patterns of Video Game Use (Mean and Standard Deviation) by Age.

	10-11años	12-16 años
Play frequency (days/week)	2.32 (*2.02*)	2.72 (*2.46*)
Playing time (minutes/day)	56.58 (*41.05*)	78.84 (*50.87*)
Online play frequency (days/week)	1.78 (*2.05*)	2.44 (*2.29*)
Online playing time (minutes/day)	56.54 (*38.42*)	70.74 (*45.82*)

Type of gaming platform. In relation to the type of gaming platforms used, girls used handheld systems more than boys, $F(1,609) = 7.02$, $p < .01$, while boys used consoles more than girls, $F(1,609) = 58.43$, $p < .001$. No differences between genders were found for PC use. Results by age showed that children used handheld systems more frequently, $F = 43,24$, $p < 0,001$, while adolescents preferred PCs, $F = 5.64$, $p < .01$. No differences were found for console use.

Table 4: Type of Gaming Platform Used.

	Girls	Boys	ages 10-11	ages 12-16
Handheld	.66	.56	.73	.45
Console	.46	.74	.64	.60
PC	.60	.54	.52	.62

Academic performance. Academic performance was measured based on whether the participant had passed all of his or her classes or had failed any class. 63.8% of the participants reported that they passed all of their classes, while 36.2% reported that they failed at least one. Table 4 shows the weekly gameplay of participants categorized by those who passed all classes and those who failed at least one. The difference between these two groups is statistically significant, $F(1,610) = 7.27$, $p < .01$. No differences by gender were noted. Differences by age were not analyzed since the difference of being enrolled in primary or secondary levels could have a large effect on this variable.

Table 5: Play Frequency as a Function of Classes Passed.

	days/week	Standard Deviation
All classes passed	2.31	2.07
At least one class failed	2.81	2.39

However, Table 6 gives a more detailed look at the relationship between play frequency and academic performance, showing the proportion of students who passed all classes as a function of days they played video games. Statistically significant differences were only found between the group that played every day of the week and those who did not, $F(1,611) = 7.78$, $p < .01$.

Table 6: Academic Performance as a Function of Play Frequency.

	All classes passed
Rarely	.65
1 or 2 days/week	.70
3 or 4 days/week	.62
5 or 6 days/week	.61
Every day	.49

Game Dependence Test

The Video Game Dependence Test (TDV) was devised by creating 55 items that conformed to DSM-IV-TR criteria for dependence disorders, with the aim that each criterion be reflected in at least 7 items. Next, an inter-rater reliability test reduced the Test to the 32 item version that was administered for this study. After the required factor analyses were performed, the questionnaire was reduced to 25 items, with a higher internal consistency reliability (Cronbach α =.94). The corrected homogeneity index for each item was at least .5, meaning that each item had a correlation greater than or equal to .5 with the rest of the Test, which indicated that all of the items measured the same hypothetical construct: video game dependence. The factor extraction method employed was the principal component analysis, and a Promax rotation was performed with a Kappa value = 4. This rotation method was used because a correlation between factors was assumed, as the hypothetical construct dimensions (video game dependence) are not independent of one another.

Four factors were extracted from the factor analysis. The first of factor accounted for 40.43% of the variance, and consisted of final questionnaire items 3, 4, 6, 7, 10, 11, 13, 14, 21 and 25. Based on the content of these items, the first factor was labeled *Withdrawal* because it reflected both the distress felt by individuals when they could not play video games and their playing of video games to deal with psychological problems. The second factor, labeled *Overuse and Tolerance*, accounted for 5.49% of the variance and consisted of 5 items (1, 5, 8, 9 and 12), which reflected excessive play that increased progressively over time. The third factor, labeled *Problems caused by video games*, accounted for 4.19% of the variance and consisted of items 16, 17, 19 and 23. Lastly, the fourth factor, labeled *Lack of control*, accounted for 4.00% of the variance and consisted of items 2, 15, 18, 20, 22 and 24, and reflected the difficulty individuals have in ceasing play, even though it may not be appropriate or practical to play at a given moment or in a certain situation. Table 7 shows the factor loading and communalities of each questionnaire item.

Table 7: Video Game Dependence Test Factor Loading and Communalities

	Item	Factor I	Factor II	Factor III	Factor IV	Comun.
11.-	If a game does not work, I quickly look for another to continue playing	.733				.540
3.-	I am very distressed when I want to play and the console or video game does not work	.730				.576
10.-	I am obsessed with leveling up, being the best, etc. in video games	.730				.548
7.-	I become irritated when a video game does not work right due to a console or PC malfunction	.707				.528
21.-	I lose track of time while playing video games	.706				.503
25.-	I start playing video games when faced with a problem to take my mind off it	.704				.554
13.-	I find it hard to stop once I start playing, even when my friends or parents call me away, or when I have to go somewhere	.680				.490
6.-	I start to feel empty and helpless if I go a long time without playing	.679				.561
4.-	Every time video games cross my mind I feel the need to play them	.678				.584
14.-	I use video games as an escape when I feel bad	.611				.455
1.-	I play video games much longer than I did when I started		.742			.600
9.-	I spend less time doing other things because video games take up so much of my time		.728			.581
5.-	I spend a lot of spare time on video games, even when not playing (reading magazines, talking with friends, drawing game characters, etc.)		.676			.500
12.-	I feel like I play video games too much		.675			.473
8.-	Playing as long as I used to when I first started is not enough anymore		.636			.476
19.-	I have gone to bed later or slept less because of staying up playing video games			.774		.643
17.-	I have argued with my parents, relatives or friends because I spend a lot of time playing my game console or PC			.721		.539

16.-	I have played more than three straight hours in the past	.715	.572
23.-	I have lied to my family or to others about how much time I spend playing	.715	.520
15.-	The first thing I do when I get up on the weekends is play video games		.716	.558
2.-	I try to borrow a friend's or relative's PC or game console if mine does not work		.708	.515
20.-	As soon as I have time, even a moment, I start playing video games		.698	.519
18.-	I start playing video games when I get bored		.684	.604
22.-	The first thing I do when I get home from school is play video games		.631	.575
24.-	I think about video games (how to level up, beat a level or puzzle, etc.) even when I'm doing other work (in class, with friends, while studying, etc.)		.624	.517

TDV scores by gender and age are displayed in the following tables.

Table 8: Video Game Dependence Test Scores (Mean and Standard Deviation) by Gender.

	Girls	Boys	Total
Factor I	7.26 (*7.85*)	12.01 (*9.60*)	9.75 (*9.12*)
Factor II	3.72 (*4.22*)	6.14 (*4.65*)	5.00 (*4.61*)
Factor III	1.94 (*2.85*)	3.51 (*3.69*)	2.76 (3.*40*)
Factor IV	4.16 (*4.47*)	5.78 (*4.74*)	4.99 (*4.67*)
Total	17.00 (*17.31*)	27.39 (*20.05*)	22.33 (19.*45*)

Boys scored higher than girls for all factors of the Video Game Dependence Test: $F(1,564) = 41.04$, $p < .001$ for Factor I; $F(1,594) = 43.52$, $p < .001$ for Factor II; $F(1,590) = 32.96$, $p < .001$ for Factor III; $F(1,577) = 17.86$, $p < .001$ for Factor IV and $F(1,514) = 39.71$, $p < .001$ for the questionnaire total.

Results by age showed that adolescents scored higher for Factor III: Problems caused by video games, $F(1,500) = 13.58$, $p < .001$. For all other factors and the questionnaire total, there were no statistically significant differences.

Table 9: Video Game Dependence Test Scores (Mean and Standard Deviation) by Age.

	Children (ages 10-11)	Adolescents (ages 12-16)
Factor I	10.27 (*9.27*)	9.08 (*8.84*)
Factor II	5.46 (*4.65*)	4.69 (*4.80*)
Factor III	2.33 (3.*03*)	3.45 (*3.78*)
Factor IV	5.02 (*4.72*)	5.02 (*4.72*)
Total	22.02 (*17.31*)	19.48 (*20.05*)

Lastly, Table 10 shows the correlations between the Test factors and principal use metrics (weekly frequency of gameplay and length of play sessions for video games and online games). All results showed positive correlations that were statistically significant.

Table 10: Correlations between Use Metrics and Video Game Dependence Test.

	Factor I	Factor II	Factor III	Factor IV	Total
Weekly frequency of gameplay	.55**	.52**	.49 **	.55**	.62**
Length of play session	.50**	.46**	.58**	.50**	.58**
Weekly frequency of online gameplay	.39**	.32**	.40**	.41**	.48**
Length of online session	.26**	.18*	.37**	.25**	.28**

* Significant correlation $p < .05$
** Significant correlation $p < .001$

Discussion

The main objectives of this study were to examine patterns of video game use and the resulting differences between genders and age groups, and to develop an instrument for studying potential video game dependence in children and adolescents.

Results by gender showed differences between boys and girls, both in use patterns (boys played more often and longer than did girls) and type of game: boys mostly played sports and racing games, and preferred shooter games and games with graphic violence, whereas girls tended to play games that are characteristically socio-affective and educational, in addition to arcade action games. These results correspond with traditional gender stereotypes and earlier surveys administered in Spain (Rodríguez, 2002), and are consistent with scientific studies of video game dependence (Bickham, Vandewater, Huston, Lee, Caplovitz y Wright, 2003; Ogletree and Drake, 2007; Olson, Kutner, Warner, Almerigi, Baer, Nicholi II and Beresin, 2007). The results of this study are also consistent with studies that analyzed use patterns of other technologies, such as mobile phones (Chóliz, Villanueva and Chóliz, 2009). Despite girls using mobiles phones more than boys, the results showed that boys used the video game capabilities of mobile phones much more than did girls.

Results by age showed that children ages 10 to 12 preferred handheld systems, followed by console games and lastly PC games. These results stand in direct contrast to those for adolescents (especially 16-year-olds), who preferred playing video games on a PC, most likely because mass PC use among this age group for access to Internet and social networks is already common. This area of study is of crucial importance, since the most harmful video games in terms of encouraging obsessive play are online multiplayer games, some of which can be played on social networks. Progression from handheld use to PC use is commensurate with increasing age. Despite their numerous functions, personal computers are still widely used to play online games, a fact which contributes to video games being the preferred leisure activity among adolescents.

The Video Game Dependence Test (TDV) was developed to be administered to populations of children and adolescents in the framework of prevention programs. The Test's basic tenet is that the emergence of an addiction does not depend soley upon a toxic substance as its cause, but rather that an individual's behavior can lead to dependence, which is the core component of addiction (Del Miglio, Couyoumdjian and Patrizi, 2005; Griffiths, 2008b; Lemmens, Valkenburg and Peter, 2009). Accepting that dependence may arise from psychological processes originating from specific activities rather than from substances does not mean that said dependence is trivial or will never develop (Echeburúa, 1999; González, Merino and Cano, 2009; Valleur and Matysiak, 2005). A very clear example is that of adolescents and video games (Griffiths, 2008b; Shao, Jie-Zhi and Der-Hsiang, 2004; Smyth, 2007). The DSM-IV recognizes the existence of a dependency once a certain set of criteria are fulfilled. These same criteria were considered while devising the questionnaire through an inter-rater reliability test, factor analysis and internal validity test. The Test's psychometric properties make it a useful instrument in clinical practice and scientific investigation. The Test incorporates four factors that make up the principal characteristics of dependence: Withdrawal, Tolerance, Problems caused by excessive use, and Lack of control. Of these factors, Withdrawal (defined as the distress arising from not being able to play video games, and using games as a means of coping with adverse emotional states) accounts for the greater part

of the variance, which is clinically important for how addiction is understood. All of the factors correlate positively with video game use, and have shown differences between genders, indicating that problems arise more frequently with boys than with girls. Thus, boys scored higher than girls in results for use patterns and on the dependence questionnaire. These results make the questionnaire potentially useful in the analysis of dependence with a specific focus on gender differences.

Clearly, this study suffers from limitations that could be overcome in future investigations. One consideration to be kept in mind is the need to carry out longitudinal studies over at least an academic year, and which take vacation times into account so as to avoid interference from the academic schedule with study results. However, the academic schedule can specifically influence the amount of time spent playing video games, and perhaps to a lesser extent the psychological processes involved in video game addiction. This limitation makes it all the more necessary to carry out studies that correlate different psychological processes using the dependence questionnaire. The principal objective should be to gain a better understanding of a problem that in recent years has had a noticeable social and clinical impact.

Another matter to be taken into account is that the dependence questionnaire was designed to be used in primary prevention programs during childhood and adolescence (Chóliz, 2011). This questionnaire seeks to evaluate dependence criteria in the general population, and has not been validated with a clinical sample or with other questionnaires that specifically examine problematic video game use (Tejeiro and Bersabé, 2003). This is an important area of investigation that must be explored to prevent more serious cases from arising, such as those being treated currently in the Department of Psychology's research lab in the University of Valencia. In these cases, individuals can play up to entire days at a time, failing academic courses, losing employment and professional opportunities and, ultimately, disrupting both personal adjustment and family and social relationships. In such cases, the issue is much larger in scope than problematic video game use. More experimental studies are needed in order to understand and address the problem through effective prevention and intervention.

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