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Trends in Scientific Literature on Addiction to the Internet, Video Games, and Cell Phones from 2006 to 2010

Xavier Carbonell, Elena Guardiola[1], Héctor Fuster, Frederic Gil, Tayana Panova

Department of Psychology, FPCEE Blanquerna, Universitat Ramon Llull, Barcelona, Spain, [1]Department of Experimental and Health Sciences, Universitat Pompeu Fabra, Barcelona, Spain

Correspondence to:
Dr. Xavier Carbonell, FPCEE Blanquerna, Universitat Ramon Llull, Cister 34, 08022 Barcelona, Spain. E-mail: xaviercs@blanquerna.url.edu

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ABSTRACT

Background: The goals of the present work were to retrieve the scientific articles published on addiction to the Internet, video games, and cell phones and to analyze the pattern of publications in this area (who is doing the research, when and where it is taking place, and in which journals it is being published), to determine the research being conducted as well as to document geographical trends in publication over time in three types of technological addictions: Internet, cell phones, and video games.

Methods: Articles indexed in PubMed and PsycINFO between 2006 and 2010 related to the pathological use of Internet, cell phones, and video games were retrieved. Search results were reviewed to eliminate articles that were not relevant or were duplicates.

Results: Three hundred and thirty valid articles were retrieved from PubMed and PsycINFO from 2006 to 2010. Results were compared with those of 1996–2005. The year with the highest number of articles published was 2008 (n = 96). The most productive countries, in terms of number of articles published, were China (n = 67), the United States (n = 56), the United Kingdom (n = 47), and Taiwan (n = 33). The most commonly used language was English (70.3%), followed by Chinese (15.4%). Articles were published in 153 different journals. The journal that published the most articles was Cyberpsychology and Behavior (n = 73), followed by Chinese Journal of Clinical Psychology (n = 27) and International Journal of Mental Health and Addiction (n = 16). Internet was the area most frequently studied, with an increasing interest in other areas such as online video games and cell phones.

Conclusions: The number of publications on technological addictions reached a peak in 2008. The scientific contributions of China, Taiwan, and Korea are overrepresented compared to other scientific fields such as drug addiction. The inclusion of Internet Gaming Disorder in the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition could change the publication trends in the technological addiction area and underline the relevance of this upcoming disorder in dissatisfaction with life in general.

Keywords: Cell phone addiction, Internet addiction, research, scientific publications, video games addiction

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INTRODUCTION

The pathological use of certain Information and Communications Technologies (ICTs), such as the Internet, cell phones, and video games otherwise known as technological addictions,[1] has received considerable media attention and increasing interest in scientific literature in recent years.[2] ICTs are a constantly growing global phenomenon worldwide worldwide. ICTs provide users with many attractive, helpful, and entertaining features. Despite ICTs' many advantages, we should be aware of their possible negative effects on the psychological well-being of its users. During the last two decades, health problems related to Internet,[3,4] mobile phone,[5] and video games addictions[6,7] have shown a big increase. There is a lack of reliable data for estimating the prevalence of these disorders, that apparently are more common in male adolescents and young students.[8-12] The common psychological effects of these addictions are isolation, loss of control, salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse[11,13] that may lead to job loss, economic or academic failure, and family problems.[14] The recent inclusion of the Internet Gaming Disorder (IGD) in section III of the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) as a disorder requiring further empirical inquiry[15] underscores the relevance of this topic. Considering this growing relevance and ICTs' various documented consequences on physical and psychological health, compiling a review of existing literature will allow researchers to better focus future efforts in this field and to create optimal and meaningful work. A previous study[2] that analyzed 179 scientific publications relating to Internet, video games and cell phone addictions between 1991 and 2005 showed that these publications were increasing, especially in the last years of that period; particularly in 2004 and 2005. Results also showed that in that period, the United States and the United Kingdom were the countries that published more articles; some Asian countries also showed a relevant scientific production. According to that study, addiction to Internet was the most studied topic, and the most frequent aspect studied (in more than half of the studies reviewed) was the addictive behavior of both adolescents and university students. As different trends were found when comparing different 5-year periods and when comparing these trends with those of other addictive research areas, it could be very interesting to analyze the evolution of this area for 5 more years, from 2006 to 2010. To help researchers working in this field, such a study could also provide a useful list of journals that usually publish research in this area.

That being said, the goal of this study was to analyze the scientific articles on technological addictions over a 5-year period (2006–2010), extending the previous study from 1996 to 2005,[2] to characterize the pattern of publications in this area (who is doing the research, when and where it is taking place, and in which journals it is being published), and to determine the research being conducted as well as to document geographical and time trends in publication over time in three types of technological addictions: Internet, cell phones, and video games.

METHODS

To retrieve the articles dealing with these topics, bibliographic searches were performed in two bibliographical databases: PubMed and PsycINFO. The first one covers biomedical sciences journals and the second one mainly includes psychology publications. These two databases indexed journals well-recognized in the field and allowed for refining of the search to journal articles.

Articles published on addiction to the Internet, video games, and cell phones from 2006 to 2010 and indexed in PubMed and PsycINFO were retrieved. Different search strategies were used in each database database, as was done in a previous study.[2]

PubMed database (http://www.ncbi.nlm.nih.gov/sites/entrez) does not include specific Medical Subject Headings (MeSH) terms for the addictions studied. The search strategy that included MeSH terms most closely related to the study topics was "Search ("Internet" [MeSH] OR "Cellular Phone" [MeSH] OR "Video Games" [MeSH] OR "Computer Systems" [MeSH] OR "Computers" [Mesh]) AND ("Impulse Control Disorders"[Mesh] OR "Obsessive-Compulsive Disorder" [Mesh] OR "Anxiety Disorders" [Mesh] OR "Mood Disorders" [Mesh] OR "Impulsive Behavior" [Mesh] OR "Behavior, Addictive" [MeSH])." Filters: Publication date from January 01, 2006, to December 31, 2010.

Search strategy used in PsycINFO was "(DE = "Telephone Systems" OR DE = "Computer Games" OR DE = "Computers" OR DE = "Electronic Communication" OR DE = "Internet" OR DE= "Technology" OR DE = "Computer Mediated Communication") AND (DE = "Addiction" OR DE= "Internet Addiction") OR (DE = "Internet Addiction" OR DE= "Impulse Control Disorders" OR DE = "Pathological Gambling"). Search options used included: Publication year: 2006-2010; document type: Journal article; and search modes: Boolean/phrase."

Search results were reviewed to exclude from the analysis nonrelevant and duplicated articles. The papers dealing with gambling, pathological gambling, and online sex were rejected. The topic of another important group of articles rejected was the use of video games and the Internet in the treatment or prevention of addictions or other disorders

such as agoraphobia. The following data were recorded for each publication: Year and language of publication, affiliation and country of the first author, journal, and topic (Internet, cell phone or video games addiction). Data were analyzed using descriptive statistical analysis.

RESULTS

The bibliographic search for addictions to Internet, online video games, or cell phones between 2006 and 2010 yielded 245 articles in PsycINFO and 536 in PubMed. The strategy search produced a large number of nonrelevant articles probably due to the lack of a specific descriptor referring to technological addictions.[2] Another possible reason is that our search strategy was very sensitive but unspecific, in an attempt to retrieve all relevant papers, even at the expense of later having to delete those not applicable. Once duplicates and nonrelevant articles were eliminated, 330 valid articles remained.

Publication year

Forty-five articles were published in 2006, 56 in 2007, 96 in 2008, 71 in 2009, and 62 in 2010.

Country of the first author

The most productive countries were, in order of productivity, China (n = 67), the United States (n = 56), the United Kingdom (n = 47), Taiwan (n = 33), Korea (n = 19), Australia (n = 14), Turkey and Germany (n = 11 each), and Spain (n = 10). Authors from Italy and the Netherlands published 8, Canada published 6, France published 4, and Austria, Belgium, Brazil, Czech Republic, Finland, Hong Kong, Japan, Norway, Poland, Serbia, Sweden, Switzerland, and Tunisia published 3 or less articles. The country of the first author was not specified in 13 articles.

Publication language

The most commonly used language was English (n = 232; 70.3%), followed by Chinese (n = 52; 15.4%), German (n = 14; 4.1%), French (n = 10; 2.9%), Korean (n = 6; 1.8%), Spanish (n = 6; 1.8%), Italian (n = 3), and Turkish (n = 2); one document was published in each Portuguese and Dutch.

Journals

The 330 articles retrieved were published in 153 different journals (mean 2.15 articles per journal). Journals that published three or more articles (n = 21) on Internet, cell phones and video games addictions are shown, in alphabetical order, in Table 1. Cyberpsychology and Behavior (n = 73) was the journal that published most articles from 2006 to 2010, followed by Chinese Journal of Clinical Psychology (n = 27), International Journal of Mental Health and Addiction (n = 16), Computers in Human Behavior (n = 11), Chinese Mental Health Journal (n = 10), and CNS Spectrums (n = 10). The remaining 132 journals published one or two articles each.

Table 1: Journals publishing three or more articles on addiction to the Internet, video games, and cell phones, 2006-2010

Journal	Number of articles
Acta Psychologica Sinica	3
Adolescence	4
Annual Review of CyberTherapy and Telemedicine	3
Chinese Journal of Clinical Psychology	27
Chinese Mental Health Journal	10
CNS Spectrums	10
Comprehensive Psychiatry	3
Computers in Human Behavior	11
Cyberpsychology and Behavior/Cyberpsychology, Behavior, and Social Networking	73
International Journal of Mental Health and Addiction	16
Journal of Adolescence	3
Journal of Korean Academy of Nursing	3
Psychiatrische Praxis	5
Psychiatry and Clinical Neurosciences	3
Psychiatry Clinical Neuroscience	3
Psychological Science (China)	4
Psychopathology	3
Revue de l'infirmière	4
Taehan Kanho Hakhoe Chi	3
Zhonghua Liu Xing Bing Xue Za Zhi	4

Topic (type of ICT studied): According to the main topic of the publication, the 336 articles were classified (please note that six articles were assigned to two categories) as addiction to the Internet (the most commonly studied topic; n = 219; 65.2%), addiction to video games (n = 56; 16.7%), addiction to online video games (n = 43; 12.8%), and addiction to cell phones (n = 18; 5.4%).

DISCUSSION

One of the goals of this study was to analyze the scientific articles on technological addictions (Internet, cell phones, and video games) from 2006 to 2010 and to compare the results with those previously published for the period 1996–2005.[2] To be sure that the results could be compared, the same search strategies were used in both studies.

Byun *et al.*,[16] in a meta-synthesis of quantitative research in the period 1996–2006, performed different searches on academic bibliographic databases databases, as well as on Google and Yahoo! Google and Yahoo! The keywords they used were Internet addiction, Internet-addicted, problematic Internet usage, and computer addiction. Other authors,[17] in a meta-synthesis of qualitative research in the same period, used a different analysis strategy and different databases. In addition, the

strategies the authors used to retrieve all empirical reports of Internet addiction over 31 nations were multiple and the authors also contacted with researchers who had published on the topic over the previous decade.[12] Therefore, there is still no consensus in the databases to be analyzed or about which may be the best strategy to retrieve articles.

Coverage of this field in the scientific literature increased from 1996 (n = 4) to a peak in 2008 (n = 99). In 2008, the number of articles about technological addictions was 9 times higher than in 2000 [Figure 1]. From 1996 to 2000, 39 articles were retrieved; 140 from 2001 to 2005 and 245 in 2006–2010, showing the growing interest in this topic. The total amount of articles retrieved by the meta-synthesis of quantitative research (n = 120)[16] and qualitative research (n = 140)[17] is less than the 179 articles retrieved in a similar period (1996–2005)[2] probably because the analysis strategy used and the databases are different.

The most productive countries on the topic were China, the United States, the United Kingdom, Taiwan, and Korea. It is important to underline the contribution of Asian countries in this field. Although the scientific production of these countries has grown in all areas of science, we have not detected an equal representation in other areas. The concern about the use of the Internet and online gaming is clear in China, Korea and Taiwan,[18] and the Middle East.[12] This concern can be matched specifically to a more widespread problem in these geographical areas. The phenomenon of cybercafes or the "farmers" who sell virtual currency for online role-playing games such as World of Warcraft could be examples of this problem. The Internet phenomenon is global, but it can be very specific; consider, for example, the role of social networking in the recent North African revolts and the Spanish "outrage," or the importance of phone and chat in geographical areas where freedom of speech and even public appearances of women are restricted.

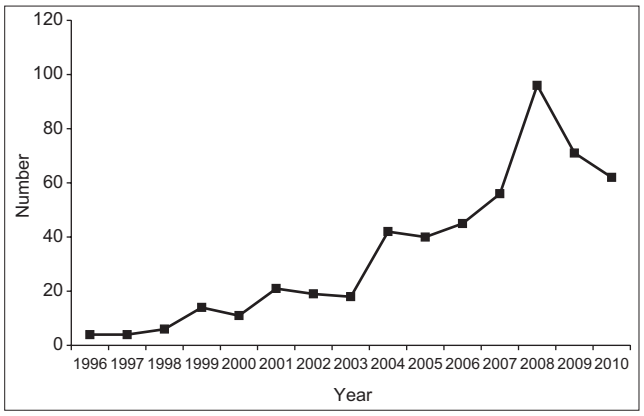

Figure 1: Number of articles published each year on addiction to the Internet, video games, and cell phones (1996–2010)

As Figure 2 shows, the combined production of China, Taiwan, and Korea between 2006 and 2010 is higher than the European Union and almost twice that of the United States and Canada together. Moreover, one must also understand that as technological addictions are a new field of scientific knowledge, authors from emerging countries may find it a promising area in which to publish. Interestingly, Internet addiction prevalence was higher for countries with dissatisfaction with life in general. The authors found that the prevalence of Internet addiction was inversely associated with the quality of life. These data were aligned with both types of indicators: Subjective (i.e., life satisfaction) and objective (i.e., quality of environmental conditions) indicators.[12] Surprisingly, in the regions with the highest Internet accessibility, Internet has a low prevalence. These variations in prevalence rate across world regions pointed out the importance of cultural factors. Most available studies of Internet addiction have been conducted in Asia.[19] Therefore, the cultural influences on perceived control and parental attitudes may be another angle from which to formulate culture-specific health approaches.[20]

In this study, 70.3% of articles were published in English. Other languages, such as Chinese (15.4%), German (4.1%), and French (2.9%), followed at a distance. A similar pattern has also been found in other scientific disciplines, especially in the field of drug addiction. However, in the present study, the percentage of articles in English was lower than in the latter field (drug addiction). It can probably be explained because of the presence in the PsycINFO database of some Chinese journals such as Acta Psychologica Sinica, Chinese Journal of Clinical Psychology, and Chinese Mental Health Journal; as a result, the percentage of articles published in Chinese is higher in the current analysis. The pattern regarding publication language is

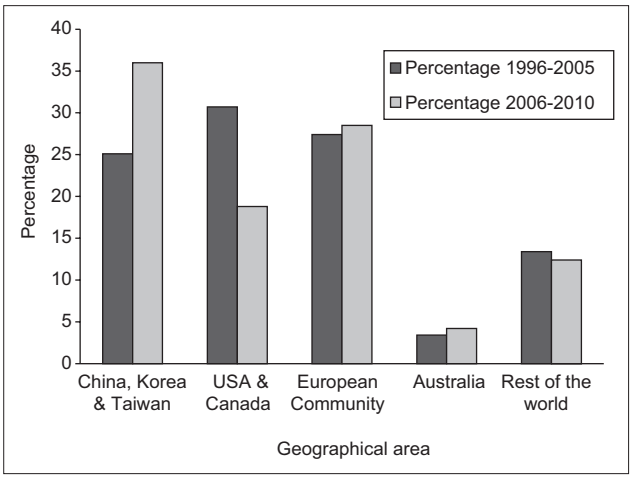

Figure 2: Percentage of articles published on addiction to the Internet, video games, and cell phones in the periods 1996–2005 and 2006–2010 by geographical areas

very similar to that observed for the period 1996–2005, in which the most commonly used language was also English (65.4%), followed by Chinese (12.8%) and the rest (21.8%).

Cyberpsychology, Behavior, and Social Networking, formerly Cyberpsychology and Behavior, was the journal that published most articles from 2006 to 2010 (n = 73), confirming that this journal is a primary source of scientific information for those interested in the pathological use of Internet, cell phones and video games. The new title of this journal may indicate a tendency toward the study of the influence of social networking in different aspects of the person (construction of identity, psychological well-being, leadership, etc.). This trend could explain the decrease in the number of items that can be seen at the end of the period; perhaps researchers are less interested in the potential damage caused by technological addiction and more interested in their influence. This point highlights one limitation of the present study. Since we used the same search strategy in both periods (1996–2005 and 2006–2010), we were not able to identify papers about social networking sites addiction as this is a topic that has emerged in recent years.[21-25] Moreover, the researchers' focus on social networks is more about their influence on adolescent identity,[26] social capital,[27,28] and use motivations.[29] Another point that emerges from the journals publishing is that they belong to a variety of fields underlining the multidisciplinarity of the research on these technological addictions and point out the need for a stronger collaboration between disciplines.

Classifying the articles by type of technology shows that addiction to the Internet was the area most frequently studied. The meta-synthesis on qualitative and quantitative research on this topic supports its classification as a disorder.[16,17] Potentially because, as some researchers postulate, the Internet is a convenient "all access pass" to various activities such as gaming, social network use, and sexual content. The data also showed an increasing interest in other areas such as online video games and cell phones [Table 2]. The concern generated by online gaming is reflected in the DSM-5 (American Psychiatric Association [APA], 2013) with the inclusion of IGD. It is quite clear that the proposed criteria in DSM-5 only apply to Internet gaming and are not appropriate to be used for Internet addiction.[30,31] In DSM-5, IGD is the only technological addiction that is recommended for further attention.[32,33] The APA considered it not pertinent to include other "technological addictions" such such as that to cell phones or social networks. This is likely because, as Petry and O'Brien proposed, the introduction of not well-established conditions that do not cause relevant distress or impairment in DSM-5 could lower the credibility of other psychiatric disorders, thereby undermining the seriousness of psychiatric disorders such as the ones related to social networks.[31] However, this distinction between technologies could be questioned. In fact, despite the clear-cut distinction in DSM-5, some authors propose a model with a generalized Internet addiction (GIA) and specific forms.[14] One suggestion is that future research should aim to define, measure, and investigate this GIA model and its implications on other behavioral addictions. In this area, the proposed search used to evaluate the standards in pathological video-gaming instrumentation was[34] (pathology* OR problem* OR addict* OR compulsive OR dependent*) AND (video OR computer) gam*. The use of this strategy in Academic Search Premier, PubMed, PsycINFO, ScienceDirect, and Web of Science databases between 2000 and 2012 yielded a total of 4120 full-text papers. Interestingly, the number of papers retrieved in PsycINFO (n = 957) was more than 3 times that retrieved in PubMed (n = 235).

Table 2: Comparison of the type of technology studied in articles on addiction to the Internet, video games, and cell phones between the periods 1996-2005 and 2006-2010

	1996-2005 (%)	2006-2010 (%)
Internet	84.2	65.2
Video games	9.8	16.7
Online video games	3.8	12.8
Cell phones	2.2	5.4

CONCLUSIONS

The number of publications on technological addictions reached a peak in 2008. An explanation for the subsequent decrease could be that scientific interest has shifted from addictive properties of the Internet and specific applications, such as online games, to social networks. The scientific contributions of countries such as China, Taiwan, and Korea are overrepresented compared to other scientific fields such as drug addiction, something which could be due either to a higher prevalence of this addictive behavior in these countries and/or to a publication bias. The inclusion of IGD in DSM-5 could change the publication trends in the technological addiction area and underline the relevance of this upcoming disorder in dissatisfaction with life in general. The study of the publication trends and searches used in the next 5-year period (2011–2015) will allow for documenting of the concern in the area of technological addictions.

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Conflicts of interest

There are no conflicts of interest.

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REFERENCES

1. Griffiths MD. Technological addictions. Clin Psychol Forum 1995;76:14-9.
2. Carbonell X, Guardiola E, Beranuy M, Bellés A. A bibliometric analysis of the scientific literature on internet, video games, and cell phone addiction. J Med Libr Assoc 2009;97:102-7.
3. Kuss DJ, Griffiths MD, Karila L, Billieux J. Internet addiction: A systematic review of epidemiological research for the last decade. Curr Pharm Des 2013;1:397-413.
4. Young K. Internet addiction over the decade: A personal look back. World Psychiatry 2010;9:91.
5. Billieux J, Maurage P, Lopez-Fernandez O, Kuss DJ, Griffiths MD. Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. Curr Addict Rep 2015;2:156-62.
6. Fuster H, Chamarro A, Carbonell X, Vallerand RJ. Relationship between passion and motivation for gaming in players of massively multiplayer online role-playing games. Cyberpsychol Behav Soc Netw 2014;17:292-7.
7. Griffiths MD. Videogame addiction: Further thoughts and observations. Int J Ment Health Addict 2008;6:182-5.
8. Beranuy M, Oberst U, Carbonell X, Chamarro A. Problematic internet and mobile phone use and clinical symptoms in college students: The role of emotional intelligence. Comput Human Behav 2009;25:1182-7.
9. Carbonell X, Fuster H, Chamarro A, Oberst U. Addiction to Internet and mobile phone: A review of Spanish empirical studies. Papeles Psicólogo 2012;33:82-9.
10. Mentzoni RA, Brunborg GS, Molde H, Myrseth H, Skouverøe KJ, Hetland J, *et al.* Problematic video game use: Estimated prevalence and associations with mental and physical health. Cyberpsychol Behav Soc Netw 2011;14:591-6.
11. Fu KW, Chan WS, Wong PW, Yip PS. Internet addiction: Prevalence, discriminant validity and correlates among adolescents in Hong Kong. Br J Psychiatry 2010;196:486-92.
12. Cheng C, Li AY. Internet addiction prevalence and quality of (real) life: A meta-analysis of 31 nations across seven world regions. Cyberpsychol Behav Soc Netw 2014;17:755-60.
13. Griffiths MD. A "components" model of addiction within a biopsychosocial framework. J Subst Use 2005;10:191-7.
14. Brand M, Laier C, Young KS. Internet addiction: Coping styles, expectancies, and treatment implications. Front Psychol 2014;5:1256.
15. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Washington: American Psychiatric Association; 2013.
16. Byun S, Ruffini C, Mills JE, Douglas AC, Niang M, Stepchenkova S, *et al.* Internet addiction: Metasynthesis of 1996-2006 quantitative research. Cyberpsychol Behav 2009;12:203-7.
17. Douglas AC, Mills JE, Niang M, Stepchenkova S, Byun S, Ruffini, *et al.* Internet addiction: Meta-synthesis of qualitative research for the decade 1996-2006. Comput Human Behav 2008;24:3027-44.
18. Block JJ. Issues for DSM-V: Internet addiction. Am J Psychiatry 2008;165:306-7.
19. Carli V, Durkee T, Wasserman D, Hadlaczky G, Despalins R, Kramarz E, *et al.* The association between pathological internet use and comorbid psychopathology: A systematic review. Psychopathology 2013;46:1-13.
20. Mak KK, Lai CM, Watanabe H, Kim DI, Bahar N, Ramos M, *et al.* Epidemiology of internet behaviors and addiction among adolescents in six Asian countries. Cyberpsychol Behav Soc Netw 2014;17:720-8.
21. Andreassen CS, Torsheim T, Brunborg GS, Pallesen S. Development of a Facebook addiction scale. Psychol Rep 2012;110:501-17.
22. Echeburúa E, de Corral P. Addiction to new technologies and to online social networking in young people: A new challenge. Adicciones 2010;22:91-5.
23. Kittinger R, Correia CJ, Irons JG. Relationship between Facebook use and problematic internet use among college students. Cyberpsychol Behav Soc Netw 2012;15:324-7.
24. Griffiths MD. Facebook addiction: Concerns, criticism, and recommendations – A response to Andreassen and colleagues. Psychol Rep 2012;110:518-20.
25. Kuss DJ, Griffiths MD. Online social networking and addiction – A review of the psychological literature. Int J Environ Res Public Health 2011;8:3528-52.
26. Renau V, Oberst U, Carbonell X. Construction of identity through online social networks: A look from the social constructionism. Anu Psicol 2013;43:159-70.
27. Ellison NB, Steinfield C, Lampe C. The benefits of Facebook "Friends:" Social capital and college students' use of online social network sites. J Comput Commun 2007;12:1143-68.
28. Boyd DM, Ellison NB. Social network sites: Definition, history, and scholarship. J Comput Commun 2007;13:210-30.
29. Lin KY, Lu HP. Why people use social networking sites: An empirical study integrating network externalities and motivation theory. Comput Human Behav 2011;27:1152-61.
30. Sánchez-Carbonell X, Guardiola E, Bellés A, Beranuy M. European union scientific production on alcohol and drug misuse (1976-2000). Addiction 2005;100:1166-74.
31. Petry NM, O'Brien CP. Internet gaming disorder and the DSM-5. Addiction 2013;108:1186-7.
32. Xavier C. The internet gaming disorder in the DSM-5. Adicciones 2014;26:91-5.
33. King DL, Delfabbro PH. Issues for DSM-5: Video-gaming disorder? Aust N Z J Psychiatry 2013;47:20-2.
34. King DL, Haagsma MC, Delfabbro PH, Gradisar M, Griffiths MD. Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. Clin Psychol Rev 2013;33:331-42.