

Mobile-phone addiction in adolescence: The Test of Mobile Phone Dependence (TMD)

Chóliz M.

Department of Basic Psychology University of Valencia Avda Blasco Ibáñez, Spain

ABSTRACT

Introduction: The mobile phone is among the technological tools with the greatest presence in the market. During a period of scarcely 10 years, it has gone from being almost non-existent to being the device most used (and desired) by adolescents. Its physical characteristics as well as the psychological processes involved in its use explain both the fascination it elicits and the abuse or dependence it can come to provoke or encourage in adolescents. This study entailed the development and evaluation of a questionnaire designed to evaluate dependence on the mobile phone.

Materials and methods: The items included in this instrument were developed based on criteria contained in the Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition-Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) for dependence disorder. The questionnaires were administered to a total of 2,486 adolescents

aged 12–18 years of age, and factor analyses were then performed.

Results: The questionnaire is characterised by good psychometric properties as well as by the ability to discriminate between sexes and among age groups in an adolescent sample. The factors comprising this instrument are congruent with the concept of dependence as defined in the DSM-IV-TR. The process by which this questionnaire was developed is described, and the final version of the questionnaire is presented.

Conclusion: The Test of Mobile Phone Dependence (TMP) is a questionnaire built taking into account the dependence criteria of DSM-IV-TR. The process by which this questionnaire was developed is described, and the final version of the questionnaire is presented.

Key words: Addiction; mobile dependence; mobile phone; questionnaire; adolescence; sex differences.

Corresponding author:

Department of Basic Psychology
University of Valencia
Avda Blasco Ibáñez, 21
46010-Valencia, Spain
Tel. 0034 96 3864853
Fax. 0034 96 3864822
E-mail: Mariano.Choliz@uv.es (Mariano Chóliz)

Received: 22.04.2012

Accepted: 20.06.2012

Progress in Health Sciences

Vol. 2(1) 2012 pp 33-44.

© Medical University of Białystok, Poland

INTRODUCTION

The mobile phone is among the most prominent kinds of information and communications technology (ICT) and is probably also the one that has shown the most spectacular development during the past few years with regard to technological innovations, social impact, and general use by the majority of the population.

One of the groups in which the increase in mobile-phone use has been the most significant is adolescents, not only because virtually all adolescents have one of these devices but also because the mobile phone acquires much greater relevance in adolescence than it does in other developmental stages (namely youth, adulthood, or older age). The mobile phone has many attributes and characteristics that make it especially attractive to adolescents and that encourage its use among members of this group. Indeed, possession and use of a mobile phone by adolescents has several functions [1]:

- a) Reinforces personal autonomy, especially with regard to parents [2]
- b) Provides identity and prestige in the context of relationships with peers [3], a purpose that is quite evident in the newest or most fashionable models [4]
- c) Offers major technological innovations, tools for which adolescents demonstrate a special inclination and skill
- d) Serves as a source of fun and entertainment
- e) Supports the establishment and maintenance of interpersonal relationships [5] via technological resources, such as those that track "missed calls", which have a clear social and affective function [6].

The fascination that the mobile phone elicits from adolescents, together with its usefulness, means that it becomes a true object of desire for many in this age group. However, despite the fact that it is an extraordinarily useful tool and facilitates the performance of numerous social and personal functions, uncontrolled, inappropriate, or excessive use of mobile phones can give rise to problems in interactions with parents and in other areas. Excessive use of mobile phones, as evidenced by cost and number of calls or messages sent, interferes with other activities in daily life, alters the rules for interpersonal relationships, and can even affect the user's health or well-being, for example by having it on continually, even at night. These behaviours may be understood as reflective of abuse in the sense used by the Diagnostic and Statistical Manual for Mental Disorders-Fourth Edition-Text Revision [7] (DSM-IV-TR; American Psychiatric Association, 2000) in its definition of substance abuse.

One question that must be addressed concerns the term addiction itself, which does not exist as a

diagnostic category in classifications of mental disorders. Both the DSM-IV-TR and the International Classification of Diseases-Tenth Edition [8] (ICD-10; World Health Organization, 1992) include disorders that are commonly understood as addictive in either the section on substance dependence (drug addictions) or that on impulse control disorders (pathological gambling). Other types of addiction are not included in any other sections. A scientific debate about the classification of pathological gambling as an addictive disorder in the new Diagnostic and Statistical Manual-Fifth Edition (DSM-V) is now occurring [9, 10], although many people have defended the position that pathological gambling is an addictive behaviour with characteristics similar to those of the drug addictions for quite some time [11].

The main types of technological addictions [12] currently being considered for inclusion in DSM-V are those involving videogames, the Internet, and mobile phones, all of which are main tools used by adolescents for communication or entertainment.

Recently, research on addiction to the Internet and videogames has increased considerably. This increase has included studies of the addictions themselves [13 - 16], their comorbidity with other psychological disorders [17, 18], and the development of psychometric instruments for their evaluation [19, 20, 21]. However, research on the use and abuse of mobile phones remains limited. Studies on appropriate psychometric instruments are also scarce. Of the extant measures, the Mobile Phone Dependence Questionnaire (MPDQ) [22], the Scale of Problem Mobile Phone Use [23], and the Scale of Self-perception of Text-message Dependence [24] are particularly prominent.

Several studies examining the pattern of mobile-phone use in adolescents have reported significant relationships between several of the main parameters of mobile-phone use and problems derived from the abuse of mobile phones; they have also reported indicators of mobile-phone dependence in terms of DSM-IV-TR criteria [25]. The following symptoms constitute several of the most characteristic criteria of dependence:

- a) Excessive use, manifested in both a high economic cost and in numerous calls and messages.
- b) Problems, especially with parents, associated with excessive use of mobile phones
- c) Interference with other school or personal activities
- d) A gradual increase in use to obtain the same level of satisfaction as well as the need to replace functioning devices with new models
- e) The need to call or send messages when time has elapsed without using the mobile phone

and emotional alterations when the use of the phone is impeded.

The results obtained in this exploratory study demonstrate the need for a questionnaire with the appropriate psychometric requirements that can be used to evaluate mobile-phone dependence according to the DSM-IV-TR criteria for dependence.

The main objective of this study was to develop a questionnaire to evaluate mobile-phone dependence in adolescents based on the DSM-IV-TR criteria for dependence and similar to the approaches used to evaluate other behavioural addictions such as addiction to gambling (NORC DSM-IV Screen for Gambling Problems) [26] or to the Internet [20].

MATERIALS AND METHODS

Participants

The sample consisted of 2,833 adolescents between 12 and 18 years of age. The research project was financed by the Educational Administration, and the participation of students was approved by the appropriate committee. Several high schools were randomly selected and invited to participate in the study. The study was conducted at 16 schools and high schools. Surveys were given to all the classes at each degree with the exception of one school, in which participating classes were randomly selected due to the large number of students. The research consisted of three phases.

An initial pilot study was conducted with a sample of 542 students. The results of this study were used to develop the penultimate instrument, which consisted of 46 items, a reduction from the 101 contained in the initial version.

The main study, conducted among 1,944 adolescents (51.4% girls and 48.6% boys), resulted in the development of the final questionnaire.

A third study was conducted with 347 adolescents (51.6% girls and 48.2% boys) to evaluate the construct validity of the questionnaire by correlating it with the Mobile Phone Dependence Questionnaire (MPDQ) [22].

Procedure

Data were collected via surveys simultaneously completed by students in their classrooms. Researchers and previously trained teachers provided a series of instructions about how to respond to the questions. They also emphasised the need for honesty when filling out the survey and guaranteed the confidentiality of the responses.

Instruments

All students completed surveys consisting of various sections, the most prominent of which focussed on the following:

a. Sociodemographic and academic characteristics, such as sex, age, current grade in school, grades repeated, number of brothers and sisters and weekly allowance received.

b. Basic parameters of mobile-phone use, including number of calls, messages, and missed calls per day; average amount of time spent using mobile phones per day (messages and calls); monthly cost of mobile-phone use; ways of financing this cost; form of payment (prepaid card or contract); hours of the day and place of greatest use and availability of the phone.

c. Test of Mobile-phone Dependence (TMD). These items were constructed according to the criteria contained in DSM-IV-TR for dependence disorder. The initial 101-item questionnaire was reduced to 46 items after the pilot study. The first 18 items were answered on a Likert-type scale ranging from 0 (never) to 4 (frequently). The 28 remaining items asked respondents to use a Likert-type scale ranging from 0 (completely disagree) to 4 (completely agree) to respond to a set of statements. Six inverse items were included to control for the acquiescence effect.

Statistical analysis

All the data were analysed using the SPSS 15 statistical program for Windows. Various reliability analyses and an exploratory factor analysis were performed. Principal-components analysis was used to extract the factors, and promax rotation with Kaiser normalisation and a value of 4 for kappa was applied [27]. Basic and central-tendency descriptive statistics (Pearson bivariate correlations, t-tests, analyses of variance (ANOVAs), post hoc tests (Student–Newman–Keuls, S-N-K), and minimum significant differences (MSD)) were also calculated.

RESULTS

The main objective of this study is to develop a questionnaire for the diagnosis of mobile addiction. The more significant results are the following

Factor Structure of the Questionnaire

The final questionnaire consisted of 22 items and had high internal consistency (Cronbach's $\alpha = .94$). The corrected homogeneity index for each of the items was greater than .5; that is, the correlation between each of the items and the rest of the scale was equal to or greater than .5, indicating that all of the items measure the same construct, namely dependence on the mobile phone.

Factor analysis was used to analyse the structure of the questionnaire, principal-

components analysis was used to extract the factors, and promax normalisation with a kappa value of 4 was used to perform the rotation. This rotation technique was used because it is assumed that the factors were correlated with one another, as the dimensions that constitute the construct (mobile-phone dependence) are not independent of one another.

The Bartlett sphericity contrast (χ^2 (231) = 10,257,452; $P < .001$) allowed rejection of the null hypothesis that the variables used in the analysis were not correlated in the population of the sample. This allows consider the correlation matrix suitable for factorisation. Furthermore, the Kaiser–Meyer–Olkin measure of sample adequacy ($KMO = .95$) also indicated that the correlation matrix was adequate for the analysis. Three factors were extracted from the factor analysis. The first factor explained 42.69% of the variance and was

composed of items 8, 11, 13, 14, 15, 16, 20, 21, and 22 of the final questionnaire.

Based on the content of these items, the first factor was called abstinence, as it refers both to the discomfort felt when unable to use mobile phones and to the use of these phones to alleviate psychological problems. The second factor explained 10.38% of the variance. It was composed of six items (1, 2, 3, 4, 7, and 10) that refer to the difficulty of stopping mobile-phone use despite efforts to do so and to related problems. The second factor was labelled lack of control and problems derived from use. Finally, the third factor explained 5.64% of the variance and was composed of items 5, 6, 9, 12, 17, 18, and 19, which refer to increasing use and interference with other important activities. This factor was labelled tolerance and interference with other activities. Table 1 shows the rotated factor matrix. Items with saturation levels lower than .30 were excluded from the factors.

Table 1. Rotated factor matrix.

Items	Component		
	I Abstinence	II Lack Control/Problems	III Tolerance/Interference
Item1	-.011	.902	-.046
Item2	.079	.701	-.013
Item3	-.040	.928	-.074
Item4	.215	.430	.248
Item5	-.029	.066	.772
Item6	.192	.205	.422
Item7	-.064	.686	.224
Item8	.522	.056	.054
Item9	.340	.046	.387
Item13	.831	-.033	-.083
Item14	.747	-.018	.011
Item15	.941	-.061	-.180
Item10	-.060	.993	-.101
Item11	.666	.049	.113
Item12	-.070	-.035	.844
Item16	.787	.045	-.143
Item17	-.113	-.144	.995
Item18	.256	-.021	.511
Item19	-.028	.060	.733
Item20	.763	-.036	.018
Item21	.595	-.012	.123
Item22	.577	-.040	.235

The structural matrix, or factor structure, were extracted, which reflects the correlation of each item with the oblique factor. This includes both the direct effects of the factor on the item (as in the oblique pattern) and the indirect effects of other factors through their correlations with a given factor (see Table 1). Both the factor structure and the structural matrix (see Tables 1 and 2) show that item 9 had saturations in both the first and third factors and was correlated with both factors.

However, because the factor loading and the correlation were stronger for the third factor, item 9 were included in the third factor. It is worth mentioning that the same results were obtained with the Kaiser oblimin rotation method, with a value of δ equal to 0, which is the case when factors are more oblique.

Table 2. Structural matrix.

Items	Component		
	I Abstinence	II Lack Control/Problems	III Tolerance/Interference
Item1	.390	.869	.493
Item2	.405	.731	.461
Item3	.355	.864	.461
Item4	.579	.683	.646
Item5	.496	.519	.794
Item6	.559	.551	.668
Item7	.406	.791	.598
Item8	.583	.338	.421
Item9	.609	.442	.632
Item10	.348	.903	.460
Item11	.762	.436	.569
Item12	.452	.442	.778
Item13	.763	.313	.429
Item14	.746	.345	.478
Item15	.797	.279	.385
Item16	.717	.334	.387
Item17	.454	.404	.836
Item18	.573	.410	.662
Item19	.469	.489	.751
Item20	.758	.340	.485
Item21	.667	.346	.496
Item22	.708	.377	.579

Table 3 shows the correlations among the three factors extracted from the questionnaire. This Table

shows that these three factors are indeed related in a direct and statistically significant way.

Table 3. Correlations among factors.

	Factor I Abstinence	Factor II Lack Control/Problems	Factor III Tolerance/Interference
Factor I Abstinence	1	-	-
Factor II Lack Control/Problems	.450**	1	-
Factor III Tolerance/Interference	.676**	.557**	1

** The correlation is significant at the level of .01 (two tailed).

Results according to sex and age

With regard to the sex and age of the participants in the study, girls had a higher degree of dependence on mobile phones than did boys (see Table 4). Likewise, girls had higher scores than boys on each of the factors of the questionnaire. That is, compared with their male counterparts, adolescent girls had higher levels of tolerance and experienced more interference with other activities, were more likely to use mobile phones to avoid uncomfortable mood states, were more likely to feel

bad if they could not use mobile phones, and had greater economic and family problems as a result of the cost associated with mobile phones. These results are congruent with those for several of the main parameters of mobile-phone use and show that adolescent girls rely more heavily on mobile phones (send more SMSs and spend more time and money) than do boys. Furthermore, they also have more problems with their parents due to their use of the mobile phone.

Table 4. Differences according to sex.

	Boys	Girls	F	p
Factor I Abstinence	8.78	13.11	-9.49	.001
Factor II Lack Control/Problems	4	6.28	-8.61	.001
Factor III Tolerance/Interference	9.78	12.85	-7.86	.001
Global	19.22	27.65	-9.27	.001

The data also revealed differences among the mean scores of the three age groups (12–14, 15–16, and 17–18) (see Table 5). However, according to post hoc tests (S-N-K and MSD), only the differences between those 12–14 years of age and those 15–16 or 17–18 years of age were statistically significant; no statistically significant differences on the TMD or on factors I and II were found between participants 15–16 and those 17–18 years of age.

Statistically significant differences were found among the scores obtained by three age groups on factor III. In general, scores on the questionnaire increased as age increased, especially among those 15 or older. These results are internally consistent in that participants 15–16 years of age also had the most favourable attitudes towards mobile phones and devoted more time and resources to using these devices. They also reported more problems with parents due to excessive use.

Table 5. Differences according to age.

		12-14 years	15-16 year	17-18 years	F	P
Factor I Abstinence	Factor I	10.61	11.88	10.65	4.21	.015
Factor II Lack Control/Problems	Factor II	4.62	5.75	5.19	7.80	.001
Factor III Tolerance/Interference	Factor III	9.72	12.32	13.18	30.63	.001
Global	Global	21.08	25.89	25.04	11.87	.001

Furthermore, the interaction between age and sex had no effect on the mean scores obtained on the questionnaire ($F_{2,1633} = .64, p = n.s.$) or on any of its factors (factor I: $F_{2,1337} = .025, p = n.s.$; factor II: $F_{2,1630} = 2.20, p = n.s.$; and factor III: $F_{2,1346} = 2.30; p = n.s.$). The corresponding scales were further developed based on these results (see Appendix 2).

Table 6 shows the associations between the TMD and each of its factors with several basic parameters of mobile-phone use, especially those

referring to how much this device is used to communicate. The results show a direct and statistically significant relationship among degree of dependence; lack of impulse control; use of mobile phones to avoid unpleasant mood states; problems derived from use of mobile phones; abuse of mobile phones; number of daily calls, messages, missed calls or “beeps”; and amount of time per day devoted to calls and messages.

Table 6. Correlations between the TMD and patterns of mobile-phone use.

		Calls daily	Messages daily	Missed calls	Time daily
Factor I Abstinence	Factor I	.244**	.344**	.335**	.378**
Factor II Lack Control/Problems	Factor II	.265**	.251**	.283**	.360**
Factor III Tolerance/Interference	Factor III	.317**	.438**	.458**	.467**
Global	Global	.259**	.247**	.298**	.388**

** The correlation is significant at the level of .01 (two tailed).

Finally, Table 7 shows the correlations between the TMD and the MPDQ (Toda et al., 2006) in terms of global scores and scores on each of the three factors of the TMD. In all cases, the

correlations were high and statistically significant. The last variable (subjective dependence) was analysed based on values per item ranging from 0 to 10.

Table 7. Correlations between TMD and MPDQ.

	Factor I Abstinence	Factor II Lack Control/ Problems	Factor III Tolerance/ Interference	Global	MPDQ	Subjective dependence
Factor I Abstinence	1	-	-	-	-	-
Factor II Lack Control/Problems	.569**	1	-	-	-	-
Factor III Tolerance/Interference	.768**	.601**	1	-	-	-
Global	.932**	.765**	.909**	1	-	-
MPDQ	.824**	.575**	.800**	.857**	1	-
Subjective dependence	.620**	.422**	.636**	.654**	.670**	1

** The correlation is significant at the level of .01 (two tailed).

DISCUSSION

Roman law used the term “addiction” to refer to submission to an owner or lord; that is, it referred to a relationship of dependence and a limitation on personal freedom. This is one of the most important characteristics of any addictive process, regardless of whether it involves drugs or the latest non-toxic activities. The technological addictions [12] represent the most recent type of addiction not involving. Despite the obvious fact that the individual consequences of technological addictions are not as serious as those associated with drug dependence, these addictions should not be viewed as less important.

Technological addictions in general and mobile-phone dependence in particular are especially important for several reasons. Firstly, despite the fact that the technologies involved are extremely useful and necessary (even beneficial) for our society, they are also characterised by factors that render them susceptible to abuse, leading to addiction. Secondly, unlike the case with other addictions, especially drugs, no social consensus exists with regard to the risk for abuse presented by these technologies. Thirdly, the population that is most susceptible to abusing or depending on these technologies consists of adolescents. Teenagers are not only more vulnerable to addiction processes because of cortical development [28] but they are also more likely to find the technologies under examination to be fascinating and to develop skills for their use that is superior to those of adults [1]. This special vulnerability to addiction, together with the accessibility of these technologies and their excessive use, render the adolescent population especially susceptible to this type of “modern-day” addiction.

A recent study [25] showed that a segment of the adolescent population used the mobile phone excessively. Some of these individuals showed clear signs of abuse, and some met the main DSM-IV criteria for dependence. Thus, it was considered important and even necessary to develop a psychometric instrument that would evaluate mobile-phone dependence in adolescents, especially given that this problem is increasing.

A 101-item questionnaire that reflected the seven criteria for dependence contained in the DSM-IV-TR was developed. An initial pilot study with 542 students enabled to reduce the initial instrument to 46 items, and this measure was completed by 1,944 adolescents between the ages of 12 and 18 years.

The final instrument was composed of 22 items and had good psychometric indicators. The factor structure of the questionnaire included three factors

that represented the main characteristics of dependence according to the DSM-IV-TR; this justified the usefulness of the TMD as a diagnostic instrument and as a support in the treatment of mobile-phone addiction. This instrument measures the main dependence criteria, and the results are coherent with those obtained by other questionnaires that measure various sorts of technological addictions such as those involving the Internet [19 - 21], and mobile phones [22 - 24]. All these questionnaires are inspired by the addiction literature. They assume that mobile phone addiction has some problems, such as tolerance, withdrawals, craving, difficulty to control the impulse, escape from other problems, or negative consequences upon daily life (at familiar, academic, professional or social levels) [29 - 31].

In respect of this questionnaire, the first factor, abstinence, explained the highest percentage of the variance and addresses what is probably the main criterion in the definition of addiction. The items within this factor measure the degree of discomfort produced by being deprived of mobile phones as well as the use of these phones to resolve affective problems that may or may not be related to mobile-phone abuse. That is, addictive behaviour is negatively reinforced, as it is in any dependence, whether to drugs or any other substance or phenomenon. Thus, the behaviour is produced to relieve discomfort rather than to achieve pleasure. Being unable to perform or finding it difficult to perform the behaviour in question produces discomfort that is resolved by engaging in the behaviour again. The second factor, lack of control and problems derived from use, includes two basic characteristics of addiction. On the one hand, it includes difficulty controlling the behaviour once the environmental conditions that favour its expression are in place. Difficulty controlling impulses is common to all kinds of drug dependence, and pathological gambling is currently included in this category. On the other hand, one of the characteristics common to all addictions is that the repetition of the behaviour has undesirable consequences. Yet, despite these consequences, the behaviour continues to be performed, probably due to the difficulty of controlling it. Conceptually, it is significant that both of these quite relevant criteria belonged to the same factor in our questionnaire; that is, two elements that conceptually have elements in common also appeared as methodologically correlated. The third factor, tolerance and interference with other activities, also included two basic aspects of addiction that, again, appear to be correlated and have common conceptual underpinnings. One aspect is tolerance or progressively greater use to obtain the desired

effects. Tolerance also appears in any dependence and is due not only to chemical variables. Conditioned tolerance, which is produced in the presence of situational cues, is fundamental to explaining the addictive process of even drug dependence [32]. Obviously, when consumption increases to excessively high levels or to levels that impair functioning, addictions come to interfere with other activities that are incompatible with the high use because less time is available for these activities when excessive time is spent on the activity involved in the dependence. That both criteria appeared in the same factor makes conceptual sense, and this methodological corroboration confirms the validity of this factor. Additionally, the TMD showed strong and statistically significant correlations with the MPDQ [22].

This questionnaire was also shown to be sensitive to sex and age differences among adolescents, which makes it especially relevant as a diagnostic instrument. Thus, global TMD scores and scores for each of the factors were higher in girls. This result is congruent with data showing that girls use mobile phones more than do boys and that girls are more likely to engage in mobile-phone abuse and to experience problems with their parents due to excessive use. With regard to age, the questionnaire was sensitive to differences between those 12–14 years of age and those 15–16 or 17–18 years of age. Although mobile-phone use begins during the first phases of adolescence, or even before puberty, the most severe consequences of abuse occur in those 15–16 years of age, especially with respect to increased use (tolerance and problems derived from excessive use).

This study has several limitations that should be noted. Although data on concurrent validity were presented in relation to the main parameters of the use of mobile phones, additional analyses are necessary to examine associations between the scale and mental health conditions (for example depression, anxiety) and other indicators of psychosocial dysfunction. But the main problem is related, precisely, with the impressive growth of technological functions and applications of the mobile. The use of Internet by the mobile, or the development of applications as WhatsApp, not only modifies the pattern of use of the mobile, but are some crucial variables which can also induce the abuse, or the dependence of the mobile phone. This is particularly relevant for teenagers, because the adolescents' dependence on mobile phone is a problem that is not only new, but also on the rise. It is necessary to continue to study the conditions that foster this dependence, to develop prevention and treatment programs, and to make available assessment and diagnostic instruments that enable effective intervention.

CONCLUSIONS

The results obtained in previous exploratory studies showed that the mobile phone is one of the technological tools more used by adolescents. Some of the teenagers show the main symptoms which characterized the dependence disorders, such as: excessive use, problems with parents, difficulty in controlling the use, interference with other activities, emotional discomfort when they cannot use the mobile phone.

This paper shows an instrument built in order to evaluate the dependence of mobile in adolescents taking into account the DSM-IV-TR criteria for dependence disorders, a problem that is not only new but also on the rise. It is necessary to continue to study the conditions that foster this dependence, to develop prevention and treatment programs, and to make available assessment and diagnostic instruments that enable effective intervention. We believe (and hope) that this instrument can be useful for researchers and therapists working with mobile-phone dependence.

This study has several limitations that should be noted. Although data on concurrent validity were presented in relation to the main parameters of the use of mobile phones, additional analyses are necessary to examine associations between the scale and mental health conditions (for example, example depression, anxiety) and other indicators of psychosocial dysfunction. However, the main problem is related, precisely, with the impressive growth of technological functions and applications of the mobile. The use of the Internet by the mobile, or the development of applications as WhatsApp, not only modifies the pattern of use of the mobile, but are some crucial variables, which can also induce the abuse, or the dependence of the mobile phone. This is particularly relevant for teenagers, because the adolescents' dependence on mobile phone is a problem that is not only new, but also on the rise. It is necessary to continue to study the conditions that foster this dependence, to develop prevention and treatment programs, and to make available assessment and diagnostic instruments that enable effective intervention.

Conflicts of interest

I declare that I have no conflict of interest.

REFERENCES

1. Chóliz M. Mobile phone addiction in Adolescence: Evaluation and prevention of mobile addiction in teenagers. Saarbrücken: Lambert Academic Publishing; 2010. 65p.

2. Oksman V, Turtiainen J. Mobile Communication as a Social Stage. The Meanings of Mobile Communication among Teenagers in Finland. *N Med Soc/* 2004; 6(3):319-39.
3. Fortunati L, Katz JE, Riccini R. Mediating the human body: Technology, communication and fashion. Manwah (New Jersey): Lawrence Erlbaum; 2003. Chapter 8, Mobile phone tribes: Youth and social identity; p. 87-92.
4. Ling RS, Pedersen, PE. Mobile communications: Re-negotiation of the social sphere. Kent (United Kingdom): Springer-Verlag; 2006. Chapter 5, Mobile phones as fashion statements: The co-creation of mobile communication's public meaning; p. 63-81.
5. Nyiri K. Mobile Democracy: Essays on Society, Self, and Politics. Vienna (Austria): Passagen Verlag; 2003. Chapter 16, Virtual strangers: Young love and texting in the Filipino archipelago of cyberspace; p. 225-35.
6. Donner J. The rules of beeping: Exchanging messages via intentional "missed calls" on mobile phones. *J Comp Mediated Com.* 2007; 13(1):1-22. Available from: <http://jcmc.indiana.edu/vol13/issue1/donner.html>.
7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR (Text Revision). Washington DC: American Psychiatric Association; 2000.
8. World Health Organization. International Classification of Diseases (ICD-10). Geneva: WHO Press; 2010.
9. Petry NM. Should the scope of addictive behaviours be broadened to include pathological gambling? *Addiction* 2006 Sep; 101(Suppl.1): 152-60.
10. Potenza MN. Should addictive disorders include non-substance-related conditions. *Addiction.* 2006 Sep; 101(Suppl.1): 142-51.
11. Dickerson M. The evolving contribution of gambling research to addiction theory. *Addiction.* 2003 Jun; 98(6): 709.
12. Griffiths MD. Technological addictions. *Clin Psychol Forum* 1995; 76: 14-9.
13. Griffiths M, Wood RTA. Risk factors in adolescence: The case of gambling, videogame playing, and the Internet. *J Gambli Studies.* 2000 Fall; 16(2-3):199-225.
14. Chiu SI, Lee JZ, Huang DH. Video Game Addiction in Children and Teenagers in Taiwan. *CyberPsychol Behav.* 2004 Oct; 7(5):571-81.
15. Douglas AC, Mills JE, Niang M, Stepechenkova S, Byun S, Ruffini C, Lee SL, Loutfi J, Lee JK, Atallah M, Blanton M. Internet addiction: Meta-synthesis of qualitative research for the decade 1996–2006. *Comp Human Behav.* 2008 Sept; 24(6): 3027-44.
16. Yang Z. Research on the correlation between life events and video game addiction in junior middle school students. *Chin J Clin Psychol.* 2005 May; 13(2): 192-3.
17. Cao F, Su L. Internet addiction among Chinese adolescents: prevalence and psychological features. *Child Care Health Dev.* 2006 May; 33(3): 275-81.
18. Yen JY, Ko ChH, Yen ChF, Chen SH. Psychiatric symptoms in adolescents with Internet addiction: Comparison with substance use. *Psychiatry Clin Neurosci.* 2008 Feb; 62(1): 9-16.
19. Chang MK, Law SPM. Factor structure for Young's Internet Addiction Test: A confirmatory study. *Comp Human Behav.* 2008 Sept; 24(6): 2597-619.
20. Demetrovics Z, Szeredi B, Rózsa S. The three-factor model of Internet addiction: The development of the Problematic Internet Use Questionnaire. *Behav Res Methods* 2008 May; 40(2): 563-74.
21. Young KS. Internet addiction: The emergence of a new clinical disorder. *Cyberpsychol Behav.* 1998 Fall; 1(3):237-44.
22. Toda M, Monden K, Kubo K, Morimoto K. Mobile phone dependence and health-related lifestyle of University students. *Soc Behav Person.* 2006; 34(10):1277-84.
23. Bianchi A, Phillips JG. Psychological Predictors of Problem Mobile Phone Use. *Cyberpsychol Behav.* 2005 Feb; 8(1):39-51.
24. Igarashi T, Motoyoshi T, Takai J, Yoshida T. No mobile, no life: Self-perception and text-message dependence among Japanese high school students. *Comp Human Behav.* 2008 Feb; 24:2311-24.
25. Chóliz M, Villanueva V, Chóliz MC. Ellas, ellos y su móvil. Uso, abuso (y dependencia?) del teléfono móvil en la adolescencia. *Rev Esp Drogodep.* 2009; 34(1): 74-88.
26. National Research Council. Pathological Gambling: A critical review. Washington: National Academic Press; 1999. 352 p.
27. Gorsuch RL. Factor Analysis. 2nd Ed. Hillsdale: Lawrence Erlbaum Associates; 2003. 427p.
28. Gogtay N, Giedd JN, Lusk L, Hayashi KM, Greenstein D, Vaituzis AC, Nugent TF, Herman DH, Clasen LS, Toga AW, Rapoport JL, Thompson PM. Dynamic mapping of human cortical development during childhood through early adulthood. *Proc Natl Acad Sci USA.* 2004 May; 101(21): 8174-9.
29. Walsh SP, White KM, Young RMD. Needing to connect: the effect of self and others on young people's involvement with their mobile phones. *Aust J Psychol.* 2010; 62(4): 194-203.

30. Yen CF, Tang TC, Yen JY, Lin HC, Huang CF, Liu SC, Ko CH. Symptoms of problematic cellular phone use, functional impairment and its association with depression among adolescents in Southern Taiwan. *J Adolesc.* 2009 Aug; 32(4): 863-73.
31. Rutland JB, Sheets T, Young T. Development of a scale to measure problem use of short message service: the SMS problem use diagnostic questionnaire. *Cyberpsychol Behav.* 2007 Dec; 10(6): 841-3.
32. Siegel S, Hinson RR, Krank MD. The role of predrug signals in morphine analgesic tolerance: support for a Pavlovian conditioning model of tolerance. *J Exp Psychol Anim Behav Process.* 1978 Apr; 4(2): 188-96.

Appendix
Test of Mobile-phone Dependence (TMD)

Indicate how frequently the statements that appear below apply to you using the following scale as a guide:

0	1	2	3	4
Never	Rarely	Sometimes	Often	Frequently

1	I have been called on the carpet or warned about using my mobile phone too much.	0	1	2	3	4
2	I have put a limit on my mobile phone use and I couldn't stick to it.	0	1	2	3	4
3	I have argued with my parents or family members about the cost of my mobile phone.	0	1	2	3	4
4	I spend more time than I would like to talking on the mobile phone, sending SMSs, or using WhatsApp.	0	1	2	3	4
5	I have sent more than five messages in one day.	0	1	2	3	4
6	I have gone to bed later or slept less because I was using my mobile phone.	0	1	2	3	4
7	I spend more money on my mobile phone (calls, messages...) than I had expected.	0	1	2	3	4
8	When I'm bored, I use my mobile phone.	0	1	2	3	4
9	I use my mobile phone (calls, SMSs, WhatsApp...) in situations where, even though not dangerous, it is not appropriate to do so (eating, while other people talk to me, etc.).	0	1	2	3	4
10	I have been criticized because of the cost of my mobile phone.	0	1	2	3	4

Indicate to what degree you agree or disagree with the statements presented below.

0	1	2	3	4
Completely disagree	Disagree somewhat	Neutral	Agree somewhat	Completely agree

11	When I haven't used my mobile phone for a while, I feel the need to call someone, send an SMS, or use WhatsApp.	0	1	2	3	4
12	Since I got my mobile phone, I have increased the number of calls I make.	0	1	2	3	4
13	If my mobile phone were broken for an extended period of time and took a long time to fix, I would feel very bad.	0	1	2	3	4
14	I need to use my mobile phone more and more often.	0	1	2	3	4
15	If I don't have my mobile phone, I feel bad.	0	1	2	3	4
16	When I have my mobile phone with me, I can't stop using it.	0	1	2	3	4
17	Since I got my mobile phone, I have increased the number of SMSs I send	0	1	2	3	4
18	As soon as I get up in the morning, the first thing I do is see who has called me on my mobile phone or if someone has sent me an SMS.	0	1	2	3	4
19	I spend more money now on my mobile phone now than when I first got it.	0	1	2	3	4
20	I don't think I could stand spending a week without a mobile phone.	0	1	2	3	4
21	When I feel lonely, I use the mobile phone (calls, SMSs, WhatsApp...).	0	1	2	3	4
22	I would grab my mobile phone and send a message or make a call right now.	0	1	2	3	4