Abstract: The problematic use of mobile phones in some adolescents is a cause for concern throughout the world, although this problem has rarely been studied in more than one culture. The Mobile Phone Problem Use Scale (MPPUS) has been considered a gold standard, and recently has been adapted to adolescents (MPPUSA) to estimate problem users’ prevalence and their characteristics. A mixed methods approach was used through a questionnaire administered to a European sample of 2356 (48% Spanish and 52% British adolescents) aged between 11 and 18 years (M=14.05, SD=1.729; 60.9% male). The problem users’ prevalence, with a cut-off point extracted from the 95th percentile score estimated 14.9% in Spain and 5.1% in United Kingdom. These potential problem users presented higher scores in the symptomatology measured by the scale in comparison with those considered non-problematic, and the classification proposed showed an excellent accuracy. However, cultural differences has been detected between both user’s countries in relation with the addictive symptoms presented, standing out were withdrawal symptoms against the negative consequences, also commonalities appeared in this psychosocial problem. In conclusion, the findings shed light on the main addictive symptoms which appear in the use of mobile phones, similar to other technological behavioural addictions; therefore, the first steps are proposed to study the mobile phone problem based on cyber-addictions in a cross-cultural perspective.

13.1 Introduction

Research on problematic mobile phone use (PMPU) began to appear around a decade ago, and although it is still at a relatively early stage (Carbonell, Guardiola, Beranuy, & Bellés, 2009) considerable international progress has been made. Essentially this uncontrolled or excessive use of the mobile phone, which affects the daily user’s life, has been classed as a potential technological behavioural addiction (also called in French-speaking countries a cyber-addiction) by several researchers (e.g., Billieux, 2012; Pedrero Pérez, Rodríguez Monje, & Ruiz Sánchez De León, 2012). The scientific community has begun to consider the addictive potential of mobile phones, although research has not yet addressed specific aspects of PMPU or analysed certain psychological facets of the disorder. According to Billieux (2012); we should adopt an integrative pathways model based on the adverse consequences of excessive or
uncontrolled mobile phone use generating a vicious circle through the perpetuation of negative affection, which should consider four factors associated with this problem: impulsivity, relationship maintenance, extraversion, and the cyber-addiction, with this final factor being the focus of this chapter. This pathways model could explain the debate of PMPU defending mobile phone abuse (Ahmed, Qazi, & Perji, 2011) versus mobile phone addiction (Chólis, 2010).

### 13.1.1 Cross-cultural research on cyber-addictions

As there is no more than two decades of research on cyber-addictions, few studies have attempted a cross-cultural perspective on the cyber-addiction spectrum; usually these studies are between two European countries treating the sample as one (e.g., Lemmens & Bushman, 2006) or from different continents with a real cross-cultural comparative (e.g., Li, Kirkup, & Hodgson, 2001); or directly between several countries (Durkee, 2012; Sariyska, 2014). However, almost all of them are centred on Internet and gaming addiction. As such there is a gap in cyber-addictions cross-cultural studies regarding PMPU.

### 13.1.2 Problematic mobile phone use versus problematic Internet use

Comparing the potential PMPU with the well-recognized and scientifically developed Problematic Internet Use (PIU), also known as Internet Addiction (IA), the area of mobile phone cyber-addiction has the benefit of having more reliable scales which measure its problematic with more psychometric support than PIU scales. On the other hand, PMPU shares with PIU a need for greater conceptualization and suffers from the same disparity in the sources of the diagnostic criteria and instruments with standard cut-off points to classify problematic users; so that the comparability of estimating the prevalence of users who present addictive symptomatology remains difficult.

### 13.1.3 Evaluating problematic mobile phone use

As with PIU, PMPU has been measured with scales describing generalised use (i.e., the mobile phone device and its functions) and, to a lesser extent, with scales describing specific use (e.g., text messaging). Sources of study include observation of user behaviour (Mobile Phone Dependence Questionnaire, MPDQ; Toda, Monden, Kubo, & Morimoto, 2006), diagnostic symptoms (MPPUI; Bianchi & Phillips, 2005), disorder criteria (like pathological gambling, the Cell-phone Over-Use Scale, COS; Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007) or substance use (the Test of Mobile Phone Dependence; Chólis, & Villanueva, 2011), other cyber-addictions scales (such as the Internet Addiction Diagnostic Questionnaire used for the Mobile...
Phone Addiction Scale or MPAS; Leung, 2007), and other underlying psychological dimensions (as the impulsivity for the Problematic Mobile Phone Use Questionnaire, PMPUQ; Billieux, Van der Linden, & Rochat, 2008). Overall, the PMPU scales have obtained high indexes of reliability and satisfactory factorial and construct validity, and the Mobile Phone Problem Use Scale (MPPUS; Bianchi & Phillips, 2005) has been considered “a gold standard” (Pedrero Pérez et al., 2012).

However, the estimated prevalence of PMPU varies between 0% and 38% (Pedrero Pérez et al., 2012) in the adolescent and young population of different Asian (the Cell Phone Addiction Scale [CPAS]; Koo, 2009), European (the “Cuestionario de Experiencias Relacionadas con el Móvil” [CERM]; Beranuy Fargues, Chamarro Lusar, Graner Jordania, & Carbonell Sánchez, 2009) and Oceanic (the Mobile Phone Involvement Questionnaire [MPIQ]; Walsh, White, & Young, 2010) countries. Proposals for diagnostic criteria for PMPU have been scarce but the most notable comes from Taiwan (Yen et al., 2009), whose PIU proposals are considered one of the most reliable for achieving clinical validation (Ko, Yen, Chen, Chen, & Yen, 2005; Ko, Yen, Chen, Yang, Lin, & Yen, 2009). Currently, PMPU diagnostic criteria do not seem to differ across cultures (Bianchi & Phillips, 2005; Yen et al., 2009), even though cross-cultural studies will be needed to guarantee scale validity (Baron, 2010) and address cultural differences in mobile phone use in countries (Baron & Segerstad, 2010). Current research also suggests that it may be that young female mobile phone users (Geser, 2006) and secondary school students (Kawasaki, Tanei, Ogata, Burapadaja, Loetkham, Nakamura, & Tanada, 2006) who are at the greatest risk of PMPU.

13.1.4 Problematic mobile phone use in adolescents

Chóliz (2010) argued for the inclusion of PMPU in the DSM-5, because the disorder affected adolescents whose problems were apparent in their social, affective, and behavioural sphere. Beranuy Fargues and colleagues (2006) observed that this group age is more vulnerable by not being in complete control of their impulses, moreover they affirm that adolescents are influenced by advertising campaigns, and they consider this device as a status symbol that facilitates their identity. Indeed, the mobile phone is already the media by which adolescents and their parents establish relationships (Weisskirch, 2011). Therefore, it seems that this technology is for several reasons one of the most relevant in adolescents’ life, which could in turn facilitate addictive and problematic behaviour through its daily use.

13.1.5 Research problem and objectives

The question is, in the case of European adolescents, does PMPU exist? More specifically, in the case of high-school students from Barcelona and London, what
kind of symptoms are the most prevalent? And finally, how do they perceive this potential cyber-addiction? In order to examine these questions it was necessary to use a validated scale which measures PMPU in adolescents, for this purpose the Mobile Phone Problem Use Scale for Adolescents (MPPUSA; Lopez-Fernandez, Honrubia-Serrano, & Freixa-Blanxart, 2012) was selected. Furthermore an adaptation of the MPPUSA (Bianchi & Phillips, 2005) has also been validated for both Spanish (Lopez-Fernandez et al., 2012) and British adolescents (Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2013). The main objective of this chapter, is to open the door to cross-cultural research in this area through the comparison of PMPU in these two cultural adolescent groups; to do this three specific objectives have been outlined: (i) to describe the characteristics and patterns of mobile phone usage in adolescents, (ii) to estimate the prevalence of potentially problematic mobile phone users demonstrating its accuracy in classification based on addictive symptomatology, and (iii) to examine adolescent perception of PMPU.

13.2 Method

13.2.1 Participants

A cross-sectional survey study was carried out in nine schools in Barcelona (Spain) and London (United Kingdom [UK]) between 2009 and 2010. The schools themselves were a number of different types (private, public and state schools) and located within a number of different areas in the cities. The sample from Spain was formed by high school students from “Educacion Secundaria Obligatoria” (ESO; Compulsory Secondary Education) and “Bachillerato” (Baccalaureate is to prepare them for University) which cover adolescent education between 12 and 18 years old. Whereas in the UK Year 7 to Year 13 were used (from Year 7th to 11th is the compulsory, and Years 12 and 13 are Sixth Form/A Level to access University) which ages from 11 to 18 years old. In both cases the school years are between Primary and Higher Education. A sample 2356 students were surveyed, 1132 from Spain and 1224 from UK; however only 833 students from Barcelona (73.6% of Spanish sample) and 725 Londoners (59.2% of British sample) answered all the MPPUSA items correctly.

A mixed methods research design was used, specifically with an embedded design (Creswell & Plano Clark, 2007) through a survey. This research design implies that the quantitative part was the most important aspect of the standardized questionnaire, while a small qualitative component was also included in the data collection through open questions. The data analysis then combines the qualitative and quantitative findings, being the latter being the primary emphasis of the discussion.
13.2.2 Instruments

The pencil-and-paper questionnaire had three sections: (a) socio-demographic variables; (b) mobile phone usage data; and (c) the Spanish/British MPPUSA (for a more detailed description see Lopez-Fernandez et al., 2012; Lopez-Fernandez et al., 2013).

The socio-demographic variables were gender, age, school level, residence location (central city the surrounding area), the family size living in the adolescents’ home (including themselves), parents’ educational level and their employment status, nicotine and alcohol consumption, as well if they use other non-technological entertainments (see Table 1).

In mobile phone usage, they answered if they were owners of at least one device, what their main type of mobile phone use was (to communicate or for entertainment), how old they were when they had their first mobile phone, who is responsible for its cost, if they perceive addiction to mobile phones in their peers, the negative aspects of mobile phone use, and an open question about what definition they could propose to recognize a potential mobile phone problem user of their age.

The MPPUSA is comprised of 26 items, each with a 10-point Likert scale (being 1 “totally false” to 10 “completely true”) (see Appendix A: Spanish version: Lopez-Fernandez et al., 2012; English version: Lopez-Fernandez et al., 2013). These questions themselves cover six dimensions (tolerance, escape, withdrawal, craving, negative life consequences, and social motivational aspects). The psychometric results were quite similar in both countries, achieving the factorial validity through exploratory factor analysis with the principal components technique, that showed its unidimensionality with 61% of variance explained in the Spanish version, and 57% in the British version (this second analysis with construct validity achieved through associations with the perception of mobile phone use with peer and self-perception uses); moreover, the reliability was equal in both version, with an excellent value (Cronbach alpha of 0.97 in both Spain and UK).

For the quantitative analysis, the confidence interval used was 95%, and it was performed using PASW 21.0 for Windows; in terms of the qualitative data a thematic analysis was performed.

13.2.3 Procedure

Permission was obtained from head teachers and the students in both countries, and anonymity and confidentiality was guaranteed. Furthermore, in the UK permission was granted from the ethics committee of Tower Hamlets Research and Performance Development Team under special conditions (Lopez-Fernandez et al., 2013). All students were voluntarily invited to participate without any reward.
13.3 Results

13.3.1 Socio-demographic variables, usage patterns, and symptomatology data for each country

The quantitative data was analysed with the initial sample from each country. Initial findings indicated that both countries have quite similar adolescent characteristics (see Table 1), even though they are from different European cultures.

Table 13.1. Socio-demographic characteristics of the initial sample (N=2356) per country (percentage and frequency, or mean and standard deviation)

| Variable                      | Spain  | UK     |
|-------------------------------|--------|--------|
|                               | (N=1132) | (N=1224) |
| Gender (n=1129)               |         |        |
| Males                         | 53.5(604) | 67.8(824) |
| Age – Years old               | (n=1131) | (n=1202) |
| 11                            | 0(0)    | 2.9(35)  |
| 12                            | 15.3(173)| 23.3(280)|
| 13                            | 21.3(241)| 29(349)  |
| 14                            | 13.5(153)| 19.2(231)|
| 15                            | 14.9(169)| 16.5(198)|
| 16                            | 17.9(202)| 1.1(13)  |
| 17                            | 11.7(132)| 7.9(95)  |
| 18                            | 5.4(61)  | 0.1(1)   |
| School levels (n=1132)        |         | (n=1218) |
| ESO/Years 7-11                | 74.5(843)| 89.1(1085) |
| Bachillerato/Years 12-13      | 25.5(289)| 10.9(133) |

| Types of schools surveyed     | (n=1132) | (n=1220) |
|-------------------------------|----------|----------|
| State                         | 94.5 (1070) | 66.3(809) |
| Public/Private                | 5.5 (62)  | 33.7(411) |
| Family members (type) (n=1123) |         | (n=1178) |
| ≤ 2 (mono-parental)           | 4.02(1.050) | 5.19(1.855)|
| 3-4 (traditional)             | 5.3(59)  | 3.9(46)  |
| ≥ 5 (extensive)               | 70.1(788) | 53.7(422) |
|                               | 24.6 (276)| 60.3(710) |
Similarly, the patterns of usage were quite similar between Spain and the UK. Almost all adolescents used mobile phones (Spain: 92.2%; UK: 85.1%), with the greater part being for entertainment (Spain: 63.7%; UK: 75.7%). The initial age of obtaining a mobile device was also quite similar (Spain: $M=11.18$, $SD=1.915$; UK: $10.01$, $SD=2.157$). The cost for the device was above all covered by (Spain: 68% parents, 23.4% adolescent, 6.7% parents and adolescent, 1.9% other family members; UK: 52.7% parents, 25.9% adolescent, 16.7% parents and adolescent, 4.7% other family members). More than an half of adolescents perceived mobile phone addiction (Spain: 60.7%; UK: 54.6%); however, compared against other negative considerations they are more worried about other matters than mobile phone addiction(Spain: 51.6% economic, 21.8% addiction, 3.6% isolation, 2.6% pain and aches, among 20.3% of other negative aspects; UK: 21.2% pain and aches, 16.6% economic, 15% addiction, 10.2% isolation, 37% of other negative aspects).

In relation with the MPPUSA symptoms measured (using the grouping items proposed by Lopez-Fernandez et al., 2013); in Spain the most prevalent were (in order

|                        | Spain         | UK            |
|------------------------|---------------|---------------|
| Parents’ educational level | (n=1081)     | (n=1224)     |
| Father                 | Primary       | 16(173)       |
|                        | Secondary     | 54.5(543)     |
|                        | University    | 41.2(412)     |
| Mother                 | Primary       | 16.8(185)     |
|                        | Secondary     | 55.6(551)     |
|                        | University    | 39.4(390)     |
| Parents’ working       | (n=1102)      | (n=1140)     |
| Father                 | 93.7(1033)    | 74.2 (8456)  |
| Mother                 | (n=1120)      | (n=1163)     |
|                        | 82.7(936)     | 46.9(574)     |
| Nicotine/alcohol habitual consumptio |     |               |
| Yes                    | (n=1118)      | (n=1201)     |
|                        | 23.3(261)     | 12.4(149)    |
| Entertainment without technology (n=1009) | | |
| No                     | (n=1120)      | (n=1170)     |
|                        | 21(235)       | 30.6(358)    |

Note: The percentage (%) presented is the valid percentage.
of frequency): withdrawal (34%), escape (33.1%), craving (26.7%), tolerance (24.3%), and negative consequences (26%). On the other hand, the most prevalent symptoms in the UK were: escape (19.3%), withdrawal (17.8%), tolerance (17.7%), craving (12.1%), and negative consequences (7.5%).

13.3.2 Proposal for classification of problem mobile phone users

13.3.2.1 Estimation of prevalence in each country
PMPU was classified according to the statistical criteria previously used on Internet addiction (Chow, Leung, Ng, & Yu, 2009). This method involves classifying non-problem and potential problem users through the cut-off point of the 95th percentile (Spain: 182, UK: 181). Based on this method the number of adolescent problem users is estimated to be 14.9% in Spain and 5.1% in UK. Analysis of this cut-off point revealed a statistically significant difference between potential problem (Spain: Mdn=201; UK: Mdn=182) and non-problem (Spain: Mdn=61; UK: Mdn=62) mobile phone users (Spain: U: Z=17.809, p<.001; UK: U: Z=10.267, p<.001).

Using this method to extract an extreme cut-off point, the adolescents classified as potential problematic users in both countries showed that there were almost no differences among the variables measured, except for a few slight cross-cultural differences in the intensity of the relationships detected: in Spain, for example, significant differences were found between those who habitually consume alcohol/tobacco ($\chi^2_{(1)}=7.609$, $p < .01$, $V=.96$) and those who perceive mobile addiction tended to be problematic users ($\chi^2_{(1)}=28.607$, $p < .001$, $V=.201$); similarly, in the UK those consuming alcohol/tobacco ($\chi^2_{(1)}=28.674$, $p < .001$, $V=.2$) and those who only enjoy with technologies tended to be the more problematic users ($\chi^2_{(1)}=4.104$, $p < .05$, $V=.076$).

To check this proposed classification of problem and potential non-problem users, a statistical verification of the suggested cut-off scores for each country was made to calculate the sensitivity, specificity, and classification accuracy of the addictive symptomatology (see Lopez-Fernandez et al., 2013; Phillips, Saling, & Blaszczynski, 2008, for the procedure followed); therefore, the social dimension was removed. The sensitivity of the scale was almost perfect in both countries, which is the particularly important, the specificity was noteworthy, and classification accuracy was very good in all symptomatology (see Table 2); therefore, this cut-off point support this precise classification.

13.3.2.2 Potential problem users’ perception of PMPU in each country
The qualitative part of this study, addressed through the open question regarding the definition of PMPU, collected 124 quotations from the Spanish sample and 37 from the British, which means that 100% of potential problem users classified.

The problematic Spaniards pointed out clearly that dependency on mobile phones is when adolescents are attending to this device all day, including bringing it to his or
Table 13.2. Proposal of the classification function of the MPPUSA (N=1558; symptoms, answers of non-problem and potential problem users, sensitivity, specificity, and overall accuracy for each country)

| Symptoms       | Spain (N=833) | UK (N=725) |
|----------------|---------------|------------|
|                | Mdn n Yes n No | Mdn n Yes n No | Sensiti-Speci-Overall Accuracy | Mdn n Yes n No | Mdn n Yes n No | Sensiti-Speci-Overall Accuracy |
| Tolerance      | 2 86 623 7* 123 1 99.2 87.9 89.6 3 91 597 8* 36 1 97.3 86.8 87.3 |
| Escape         | 3 161 548 7* 124 0 100 77.3 80.7 3 97 591 8* 36 1 97.3 85.9 86.5 |
| Withdrawal     | 2 166 543 7* 124 0 100 76.6 80.1 2.3 90 598 9* 37 0 100 86.9 87.6 |
| Craving        | 1 107 602 7* 123 1 99.2 84.9 87 1.7 54 634 8* 34 3 91.9 92.2 92.1 |
| Negative conseq. | 1 81 628 7* 122 2 98.4 88.6 90 1.9 22 666 7* 31 6 91.2 96.8 96.1 |

Note: *p < .001
her hand in any situation. To some of them, this dependency is social, like an escape symptom, illustrated by quotations such as “it is the need to talk through the mobile with the rest of people and to be always in contact with them” (boy, 15 years old); for others it seems that the most prevalent symptoms are withdrawal and craving, like “when you are nervous because you have forget the mobile phone” (girl, 16) or “it is recognized because you cannot leave it, and if you forget it you are anxious for having it again with you. Moreover addicts are always calling and sending messages” (girl, 17). However, in their quotations they highlighted negative consequences, such as the economic issues: “it is recognized above all for its excessive use, and as a consequence you must pay a great quantity of money” (boy, 17) or the time spend on it: “the need to use it, to communicate, to play... it could be recognized observing the time that (this behaviour) is consuming” (girl, 16).

The British students also highlighted several aspects that could be matched with the addictive symptomatology measured by the MPPUSA. For example, the negative consequence symptom for its common, constant, and daily use, checking it continuously “every minute of the day” (girl, 17), presenting some kind mobile phone withdrawal symptom “feeling lost without it” (girl, 17) or “people who can't live without their mobile phone” (girl, 15), and sometimes in order to “talk to people” (boy, 12) as a form of escape. In summary, from their own perception, the mobile phone seems to be addictive because it is a necessary device to be in contact with others (calling, texting, etc.) and enjoy oneself (listening music, playing games, etc.).

**13.4 Discussion**

The findings demonstrate that, although no differences among users’ characteristics and usage of the mobile phones between Spanish and British adolescents were found, a number of cultural differences were observed in terms of the symptomatology of PMPU between the two samples, which is contradictory with Internet usage characteristics detected in a previous cross-cultural inter-continental study (Li et al., 2001). These researchers found that experience of computers and the Internet was more negative for British individuals compared to Chinese. This finding is markedly different from the present results, which found that Spanish adolescents have a higher potential for PMPU compared with their British peers. This is potentially due to their cultural communicative background (among other cultural factors, etc.). To the author’s knowledge, this is the first study that aimed to compare PMPU between two countries, and as such provides a novel cross-cultural examination of this potential technological addiction.

In relation to the MPPUSA test, similar to Yen et al. (2009), the prevalence of PMPU symptoms was examined using a cut-off point established according to classification criteria. In their study, Yen et al. established the four most relevant symptoms to PMPU: conflict with other activities, excessive use despite consequences,
and tolerance. These findings are in contrast to the present study, which found that the most prevalent symptoms were withdrawal, escape, and negative consequences. Furthermore, both countries studied here show different rates of these addictive symptoms, with the Spaniards reporting higher scores to all symptoms measured, similar to the Taiwanese. However, it should be noted that Yen et al. (2009) used a different scale (Problematic Cellular Phone Use Questionnaire; PCPU-Q). As well as this, their study examined an oriental culture, which are notably different from the western cultures studied here. As such it is possible that the differences between the two studies are cultural in nature. A further findings worth discussing is the new methodological approach to examining cyber addiction outlined in this chapter, in which the most quantitatively prevalent symptoms corresponded with the symptoms qualitatively perceived to be the most prevalent, that is, withdrawal, escape and negative consequences. In terms of the socio-demographic and educational factors associated with PMPU, previous research has examined variables such as social class, type of educational centre, family environment, substance abuse, etc. However, the present study found no associations between these factors and PMPU, with the exception of alcohol/nicotine consumption, which seem to be related with those classified as potential problem users in both countries (Sánchez-Martínez & Otero, 2009). In the literature (Koo, 2010; Walsh, White, Cox, & Young, 2011) a number of factors having been suggested as a possible predictors: frequently checking the phone for new calls or messages, the number of text messages sent or contacts, the time devoted to calls or other applications (such as games or social networking), the danger behaviour produced for the phone, etc. Furthermore, in contrast to Geser (2006), who found that PMPU was more prevalent in girls, the present study also found no gender differences in. However, this disparity may once again be due to the difference in measures employed, as the present study, Geser used a more generalised scale measuring PMPU, which entails the possibility that boys and girls excessively use mobile phones in different ways (e.g., social networking in girls and gaming in boys). Another explanation may lie in the technological improvements to mobile phones inherent in smartphones, as no longer are mobile devices used simply for communication, but also for more complex behaviour which includes online applications.

Following Billieux (2012), the most important concern associated with this technology is that it may be having an uncontrolled impact on daily life, for what his integrative model, which considers the heterogeneity of dysfunctional mobile use and the specificity of the factors involved, offers to the scientific and clinic community a framework to situate, in any case, if a potential mobile phone/smartphone problem user belong to one (or more) specific pathway. For example, Imamura et al. (2009) observed the considerable effect that mobile phone email has on Japanese adolescents’ emotional state, and for what may be some of these users could be considered in the relationship maintenance pathway and/or the cyber addiction pathway. Considering this later pathway, the range of online activities promoted through smartphones, such
as video games (such as MMORPGs) and social networks (like Facebook), and the excessive use of such online activities through these devices could produce PMPU. Conversely, however, these problems could be considered as real online internet addictions (Griffiths, 1999, 2000) independently of the device used (smartphone or computer).

Overall, the field of cyber-addictions is becoming to open up to more complex addictive phenomenon, with PMPU sharing some commonalities with PIU and being present in a number of different cultures. Future research should further address the issue of PMPU following the assertion of Billieux (2012), in that research must elucidate the factors and pathways that lead to a problematic engagement in an online activity in order to understand this addictive behavioural phenomenon.

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