Fear of Missing Out, online social networking and mobile phone addiction: A latent profile approach

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Summary. Fear of missing out (FoMO) is described as a pervasive, unpleasant sensation that others might be having rewarding experiences of which one is not part, as well as the desire to stay continually connected with what others are doing. It has been shown to play an important mediating role in predicting negative outcomes of heavy use of social networks. The aim of the present study was to analyze the different profiles found among users. 5,280 Spanish speaking social media users from Latin America replied via an online survey to the Spanish version of the FoMO scale, as well as to a short set of questionnaires on online social network use (frequency, intensity and type of access) and indicators of mobile phone addiction. FoMO correlated with the number of different networks used and with all indicators of social network use and mobile phone addiction. Using a Latent Profile Analysis, four classes of users were identified: low-engagement light users, high-engagement heavy users, high-engagement low-risk users, and high-engagement high-risk users; individuals from the fourth class (7.6 % of the sample) can be considered at risk of developing addiction to online social networks. Accessing social networks via the mobile phone and presenting addictive behavior seem to be important correlates of FoMO.

Keywords: Fear of missing out (FoMO); social media engagement; online social networking; mobile phone addiction; latent profile analysis (LPA)

La por de perdre's alguna cosa, xarxes socials en línia i addicció al telèfon mòbil

Resum. La por de perdre's alguna cosa (fear of missing out, FoMO) es descriu com una sensació aguda i desagradable que altres podrien estar tenint experiències gratificants dels quals un no és part, així com el desig de mantenir-se en contacte contínuament amb el que altres estan fent. S'ha demostrat que té un paper mediador important en la predicció dels resultats negatius de l'ús intensiu de les xarxes socials. L'objectiu del present estudi va ser analitzar els diferents perfils que es troben entre els usuaris. 5.280 usuaris de xarxes socials online d'Amèrica Llatina castellanoparlants van respondre a través d'una enquesta en línia a la versió espanyola de l'escala FoMO, així com a una sèrie de qüestionaris curts sobre l'ús en línia de xarxes socials (freqüència, intensitat i tipus d'accés) i a indicadors d'addicció al telèfon mòbil. Es va trobar que FoMO correlaciona amb el nombre de diferents xarxes socials que s'utilitzen, amb tots els indicadors d'ús de xarxes socials, i amb l'addicció al telèfon mòbil. Mitjançant una Anàlisi de Perfils Latents es van identificar quatre classes d'usuaris: usuaris amb us moderat i compromís baix, usuaris amb ús fort i compromís fort, usuaris amb ús fort i baix risc, i usuaris amb ús fort i alt risc; els individus de la quarta classe (7,6% de la mostra) poden ser considerats en risc de desenvolupar addicció a les xarxes socials en línia. L'accés a les xarxes socials a través del telèfon mòbil i l'existència d'una conducta addictiva sembla ser correlats importants de FoMO.

Paraules clau: La por de perdre's alguna cosa (fear of missing out, FoMO); compromís amb les xarxes socials en línia; xarxes socials en línia; addicció al telèfon mòbil; Anàlisi de Perfil Latents (LPA)

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Introduction

Studies on outcomes of social media use

The development of the Internet has led to an exponential increase in two-way communication channels. While oral communication has remained practically unchanged, written communication has undergone a revolution, especially through social networking sites (SNS) (Carbonell & Oberst, 2015). Virtual forums for communication are increasingly present in our daily lives, and although their use is expanding throughout the entire population, they are especially popular among teens and young adults. Facebook, with its 1.74 billion active users worldwide (Statista, 2016), is the most popular platform. The possibilites to connect to one's online networking sites have become nearly boundless thanks to the ubiquity of smartphones with permanent online access. Since online social networking using Facebook, Instagram, Twitter or text messaging services has become one of the most popular activities among teens, researchers have begun to look into the consequences of this behavior. Evidence has been provided that overuse or maladaptive use of these technologies can have negative effects on the well-being and psychological functioning of children, adolescents, and young adults (Baker & Algorta, 2016; Brooks, 2015; Fox & Moreland, 2015; Kross et al., 2013; Lin et al., 2016; Oberst, Renau, Chamarro & Carbonell, 2016; Sampasa-Kanyinga & Lewis, 2015), as well as on their academic achievement (Kalpidou, Costin, & Morris, 2011).

There is also an ongoing debate concerning the addictive potential of social media and online social networking (Billieux et al., 2015; Muench, Hayes, Kuerbis, & Shao, 2015; Ryan, Chester, Reece, & Xenos, 2014), because of the emergence among users of certain phenomena that are present in other behavioral addictions: excessive use with loss of control (like an inability to stop using the network despite having to attend to other tasks like homework), withdrawal symptoms such as anxiety when the individual is temporarily unable to access the network, and the building up of tolerance in the form of an increasing need to spend more time online. Although the evidence for social networking as a candidate for a potential behavioral addiction is still too scant (Carbonell & Panova, 2016), the use of online social networking has been identified as a potential mental health problem, at least in individuals with a specific vulnerability, e.g. low emotional stability (Andreassen, Torsheim, Brunborg, & Pallesen, 2012) or displaying other personal characteristics and cognitive factors (Wegmann, Stodt & Brand, 2015; Brand, Young, Laier, Wolfling & Potenza, 2016). In this context, *fear of missing out* has become a focus of interest as a variable that mediates the relationship between these specific personal characteristics and negative outcomes of social networking (Oberst, Wegmann, Stodt, Brand & Chamarro, 2017).

The fear of missing out construct

Wanting to be socially connected, a desire to know what others are doing and to be a part of rewarding experiences is a basic human need present from infancy and is therefore not restricted to social media use. However, the options for connecting, sharing, and having rewarding experiences with acquaintances have increased considerably due to the permanent accessibility of social media via portable devices. Mobile phone apps make it easier to share and to check friends' status updates, and they offer us a chance to stay in touch without regard to place and time, thus increasing the opportunity and frequency of engaging with SNSs (Salehan & Negahban, 2013) and making seeking out new social information a constant possibility. The easier the access to this type of information, the higher the possibility for users to compare their lives with those of others, sometimes coming to believe that these others are better off than themselves (Chou & Edge, 2012). Some authors have argued that excessive social networking can be pathological and a form of behavioral addiction, especially when SNS are accessed through mobile devices, although the use of pathological descriptors has generated much controversy (Andreassen, 2015; Billieux, Philippot, Schmid, Maurage, & de Mol, 2015; Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; Griffiths, Kuss, & Demetrovics, 2014). In this context, new phenomena and «iDisorders» (Rosen, Whaling, Rab, Carrier, & Cheever, 2013) have been described and generated not only a considerable degree of popular interest and media attention (Dossey, 2014), but also some empirical scientific studies. The terms used include *phubbing* (Chotpitayasunondh & Douglas, 2016; Karadağ et al., 2015), *technostress* (Brooks, 2015; Tarafdar, Pullins, & Ragu-Nathan, 2015), *nomophobia* (Bragazzi & del Puente, 2014; King et al., 2013), and *Fear of missing out* (FoMO) (Przybylski, Murayama, DeHaan, & Gladwell, 2013).

Fear of missing out is described as «(...) a pervasive apprehension that others might be having rewarding experiences from which one is absent (...)» and «(...) a desire to stay continually connected with what others are doing» (Przybylski et al., 2013, p.1). Although FoMO is not necessarily a phenomenon exclusive to social media users, individuals with high FoMO might feel compelled to check their social media more often to keep up to date on their friends' plans and activities. Frequent use of social media may also trigger or increase this fear of missing out, because of the individual's heightened awareness of the numerous possibilities for interaction. Przybylski was the first to present an operationalized and empirically-based account of the FoMO phenomenon, together with a self-report questionnaire – the FoMO scale (FoMOs), published in a study that also gathered empirical evidence of the concept's construct validity and psychological correlates (Przybylski et al., 2013). According to these authors, the scale is meant to reflect the fears and worries people may have in relation to being out of touch with experiences across their extended social environment. Although

there is still very little literature available on this relatively new construct and its theoretical underpinnings, it has been shown that FoMO serves as a mediator linking deficits in psychological needs to the use of social media (Przybylski et al., 2013). For instance, it was found (Alt, 2015), that unmotivated or extrinsically motivated students were more likely to use social media in the classroom than intrinsically motivated students. However, these direct relations were insignificant when they were mediated by the FoMO variable, a finding that confirms the mediating role of FoMO in explaining the link between motivation and social media engagement (Alt, 2015). In a study of adolescents, both FoMO and social networking intensity mediated the link between psychopathological symptoms (depression and anxiety) and negative outcomes of using SNS via mobile devices (Oberst et al., 2017).

The present study

As recent studies have highlighted the need for more detailed analyses of risky behavior related to social media, the aim of the present study is to refine the knowledge about maladaptive use of social networking sites with the inclusion of the fear of missing out variable. In a previous study applying the Spanish adaptation of the FoMOs, fear of missing out proved to be an important predictor, together with mobile phone addiction, of emotional distress (Gil, Del Valle, Oberst, & Chamarro, 2015). In the present study, we expected to identify different profiles of SNS users, according to their reported levels of FoMO, SNS engagement and mobile phone addiction, by means of Latent Profile Analysis (LPA). LPA is commonly used to find subtypes of related cases (latent classes) from multivariate data. It has been used time and again to find distinct criteria (e.g., symptoms, attitudes, personality traits, behavioral data, etc.) that help identify subpopulations relevant to the studied phenomena, and it has been used in research similar in scope to the present study (e.g., Pontes, Király, Demetrovics, & Griffiths, 2014; Rumpf et al., 2014). Clustering the population into different empirical subgroups would allow us to compare their response patterns (i.e., reported behavior) and infer which of these patterns may lead to problematic social media use. It would therefore allow for the identification of a subgroup of users that are at risk of developing a pathological social media use. Users with extensive social media use (high engagement) and those with a pervasive use (e.g., social networking via mobile devices)should also have higher scores for FoMO and on mobile phone addiction indicators.

Methods

Instruments

Socio-demographic data

Information regarding age, gender, occupation, as well as type and number of social media used was recorded.

Fear of missing out

Fear of missing out was assessed using the Spanish translation of the FoMO scale (Gil et al., 2015). The Spanish version consists of 10 items to be answered on a 5-point-Likert scale from *not at all true of me* to *extremely true of me* (e.g. «I get worried when I find out my friends are having fun without me»).

The CFA model for a unifactorial structure showed an acceptable fit: χ^2 (35; n = 5280) = 1470.06, p < .0001; CFI = .94; TLI = .92; RMSEA = 0.06 (90% CI: 0.058-0.066). All factor loadings were superior to .50. The Cronbach's alpha values of this and the other scales used in the present study are depicted in table 1.

Social network use: engagement, intensity, and type of access

Social media *engagement* was measured with the Social Media Engagement Questionnaire (SMEQ) (Przybylski et al., 2013). Using five items, participants are asked on a 7-point Likert scale to indicate the frequency with which they use social media in their everyday lives, e.g. «How often did you use social media in the 15 minutes before you go to sleep?» Response alternatives ranged from 1-*not one day* to 7-*every day*.

Social network *intensity* (SNI) was measured with a scale drawn from a survey by Salehan & Negahban (2013), consisting of five items, e.g. «Visiting social networking sites is part of my everyday activity», to be answered using a 7-point-Likert scale from *never* to *always*.

The five items on *social network access via mobile phone applications* (SNMA) from the same survey were used to assess pervasive use, the degree to which participants used their mobile phones to access their social network sites, e.g. «I use the social networking application(s) on my mobile phone». Participants used a 7-point Likert scale with anchors ranging from 1-*strongly disagree* to 7-*strongly agree*.

Mobile phone addiction

Mobile phone addiction was measured using the five items on mobile phone addiction from the abovementioned survey (MPA) (Salehan & Negahban, 2013), e.g. «I feel lost when I do not have my mobile phone with me». Participants replied on a 7-point-Likert scale ranging from 1-*strongly disagree* to 7-*strongly agree*.

As mobile phone addiction was a core construct of our study, the Spanish *Cuestionario de Experiencias Relacionadas con el Móvil* [Questionnaire on experiences related to mobile phone use, CERM] (Beranuy, Chamarro, Graner, & Carbonell, 2009) was also used to assess addictive behavior in relation to the mobile phone. This instrument consists of 10 items employing a 4-point Likert scale, assessing negative outcomes of mobile phone use, e.g. «Have you been at risk of losing an important relationship, job, or academic opportunity due to your mobile phone use?» Response alternatives were 1-*hardly ever*, 2-*sometimes*, 3- *frequently*, 4- *nearly always*.

Procedure

The FoMO scale had been adapted into the Spanish language in the pilot study (Gil et al., 2015); the other scales, because they were short and consisted of items assessing frequency, intensity and type of use rather than psychological constructs, were translated and revised by a team of experts and bilingual English-Spanish speakers. The CERM was used in its original Spanish version.

The questionnaire was hosted online with Surveygizmo software and configured such that data collection was anonymous. Participants were invited via a message posted on Facebook to join the study by clicking on a link where participants replied to the scales in about 8-10 minutes. A total of 5,280 completed questionnaires were received. After completing the full questionnaire, participants were given qualitative feedback on their degree of FoMO based on statistical parameters (mean and quartiles).

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the Ramon Llull University Barcelona approved the study. Participants were informed about the study at the start of the online survey and gave their informed consent by clicking the corresponding button.

Statistical analyses

To identify the different profiles of social media users, latent profile analysis (LPA) was performed. LPA is a mixture modeling technique used to identify groups of people that are similar in their responses to certain variables, in this case FoMO, SME, CERM, SNI, MPA, and SNMA. Our LPA tested solutions of 2 to 6 classes; models were compared to determine the solution that provided the best fit with the data. In the process of determining the number of latent classes, the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the BIC adjusted to sample size (SSABIC) were examined as indicators of model fit. The best solution is chosen on the smallest index. Overall model fit was determined by the likelihood-ratio difference test (Lo-Mendell-Rubin Adjusted LMR Test). As data may be sparse, the Bootstrap Likelihood Ratio Test (BLRT) was used to determine differences between models. The BLRT provides a *p* value that indicates which model fits best. A simulation study examining

the performance of the bootstrap for LPA models indicates that the BLRT is an excellent indicator of the true number of classes (Nylund, Asparouhov & Muthén, 2007). An additional index of entropy was calculated for accuracy; values close to 1 mean better homogeneity of the classes. Finally, the LPA classes were compared alongside other variables (age, gender, type of social media used), using the Wald's Chi-square test of mean equality for latent class predictors. The statistical analyses were performed using MPLUS 6.12 (Muthen & Muthen, 2011).

Results

Sample characteristics

The final sample consisted of 5,280 Spanish speaking Latin-American social media users (76.18% females) between 13 and 50 years of age ($M = 15.47$, $SD = 6.1$), most of them students (89.56%). Participants indicated using an average of 3.57 different social media networks, with Facebook by far the most used (99.15%), followed by WhatsApp (55.02%). Other social media were used at rates below 50%.

Correlations

Total FoMO score was negatively, but only weakly, related to age ($r = -.088$; $p < .001$) and to the number of social media networks used ($r = .175$; $p < .001$). There were significant correlations between the FoMO score and the rest of the instruments (see table 1).

Latent profile analysis

A four-class solution proved to be the best fit with the observed variables; the features of the four classes are represented in table 2 and in figure 1. AIC, BIC, and SSABIC diminished with more classes added to the model, and the LMR and BLRT tests indicated that no more than four classes were needed. The entropy index indicated a good fit for the four-class model.

In table 3, the observed differences between the predictors of LPA are depicted, together with the average number of social media used. Using a similar nomenclature to Pontes (Pontes, Király, Demetrovics, & Griffiths, 2014), the categories were named, considering the scores of the different variables measured, such as engagement (i.e., SME and SNI), pervasive use (i.e.,

Table 1. Descriptive statistics and correlations of FOMO, SME, CERM, SNI, MPA and SNMA

	Mean	SD	α	FOMO	SME	CERM	SNI	MPA	SNMA
FOMO	22.42	8.39	.847	1	.324*	.565*	.429*	.452*	.262*
SME	18.39	10.91	.807		1	.433*	.438*	.461*	.330*
CERM	20.29	6.35	.845			1	.502*	.692*	.455*
SNI	23.64	7.90	.804				1	.551*	.466*
MPA	16.92	9.70	.896					1	.511*
SNMA	23.87	10.85	.950						1

Note: * *p* < .001; FOMO = Fear of missing out; SME = Social Media Engagement; CERM=Cuestionario de experiencias con el móvil; SNI = Social network intensity; MPA = Mobile phone addiction; SNMA = social network access via the mobile phone.

Table 2. Fit indices for the latent profile analysis of the Spanish FoMO scale

Number of classes	AIC	BIC	SSABIC	p-value of LMR test	p-value of BLRT test	entropy
2 classes	344239.05	344384.84	344314.93	< .01	< .01	.862
3 classes	341783.50	341982.31	341886.98	< .01	< .01	.814
4 classes	**339857.68**	**339709.50**	**339988.75**	**< .05**	**< .01**	**.855**
5 classes	338578.52	338883.36	338737.18	.09	.07	.863

Note: AIC: Akaike Information Criteria; BIC: Bayesian Information Criteria; SSABIC: Sample size adjusted Bayesian Information Criteria. LMR Test: Lo-Mendell-Rubin adjusted likelihood ratio test. BLRT: Bootstrap Likelihood Ratio Test.
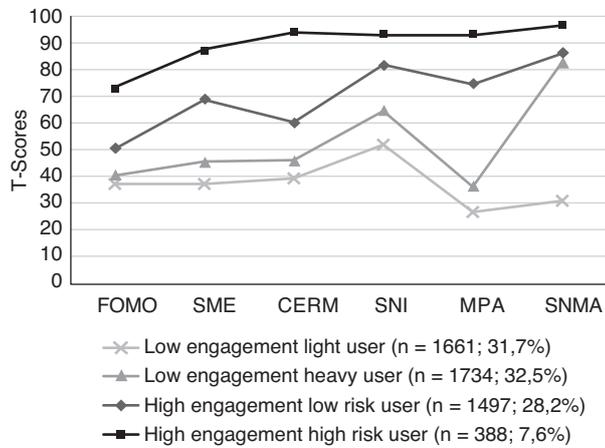

Figure 1. Latent classes profiles.

SNMA) and risk of problem use (i.e., FOMO, CERM, MPA). The first of the four resulting classes represents the *low-engagement light users,* and the second the *low-engagement heavy users,* characterized by below-average scores (except for SNMA). These users are considered to have low engagement due to their low scores on the SME. The basic difference between the first two classes is the higher SNMA score, indicating for class two a pervasive social media use via mobile phone that is similar to the other two classes (i.e., *high-engagement low-risk users and high engagement high-risk user*s). The third and fourth classes represent the *high-engagement low-risk users* and the *high engagement high-risk user*s, respectively, both displaying above-average scores on the scales that measure problem behavior when using social media (i.e., FOMO, CERM and MPA). Both classes are highly engaged (i.e., SME and SNI scores) and make pervasive usage of social networks (i.e., SNMA scores). The main difference between these classes is the significantly higher scores across-the-board of the

high-risk users, indicating a possibly pathological use of the mobile device and social networks. Potentially disordered users show significantly higher FoMO and use more types of social media.

Discussion

Construct validity of the FoMO scale

The results of the CFA confirmed the unifactorial nature of the scale, with a Cronbach alpha value similar to the pilot study (α =.85) and to the original version (α = .90) (Przybylski et al., 2013). The correlation between FoMO and number of networks used can be taken as an indicator of criterion validity. However, probably more relevant than the number of networks an individual has accounts on is how these networks are used. In a recent study, it has been shown that different sorts of activities also differ in their impact on potential addictive use (Rothen, Deleuze, Karila, & Billieux, 2016).

User profiles

The main purpose of the present study was to explore the role of FoMO in social media use and to identify users' behavioral patterns. As FoMO presented a moderate-strong association with the other indicators of social network use (social media engagement, social network intensity, social network access via the mobile phone), these can be taken as important correlates of FoMO. The correlations with the measures of problematic use (as measured with the CERM and the MPA) can be interpreted as risk indicators for addiction, although more evidence is needed to sustain this possibility. From the latent profile analysis, four groups of users could be identified: low-engagement light users, low-engagement heavy users, high-engagement low-risk users, and high-engagement high-risk users. The

Table 3. Comparison of the four latent classes: testing mean equality for latent class predictors

	Low use (N = 1661)	High use (N = 1734)	Low risk (N = 1497)	High risk (N = 388)
FOMO	18.66 a	20.16 a	25.36 b	37.21 c
SME	12.96 a	15.91 b	24.06 c	30.79 d
CERM	15.76 a	18.34 a	24.08 b	33.81 c
SNI	18.18 a	22.55 b	28.61 c	32.63 d
MPA	9.28 a	12.52 b	26.38 c	32.74 d
SNMA	10.49 a	29.12 b	30.06 c	33.79 d
Number of social media used	2.89 a	3.61 b	3.97 b	4.79 c

Note: Means having different subscript letters are different on at least p<.05 level according to the pairwise Wald Chi-square test of mean equality for latent class predictors in mixture modeling.

prevalence rate of problematic or «at risk» users found in the present study of 7.6% indicates a degree of prevalence that is slightly higher yet comparable to that found in studies on behavioral addictions, e.g. problem gaming (Fuster, Carbonell, Pontes, & Griffiths, 2016; Pontes et al., 2014). These social media users cannot necessarily be considered addicted, because high engagement with social media is not necessarily problematic; but these users show significantly higher scores in all instruments, a finding that illustrates a possible risk. Here also, FoMO could be interpreted as a driving force behind users' engagement in a greater number of social networks, accessing the social networks via the mobile phone and presenting addictive behavior related to the mobile phone. This interpretation is compatible with other findings in this field (Alt, 2015; Oberst et al., 2017; Przybylski et al., 2013).

The role of FoMO in the maladaptive use of SNS

Whereas these abovementioned studies focused on the impact of social media on psychological outcomes, little has been written about possible personal predictors of excessive or problematic social media engagement. Przybylski et al. (2013) put forward the possibility that FoMO could serve as a mediator between a deficit in psychological need satisfaction and social media use, as individuals with higher deficits in these psychological needs also had higher scores for FoMO. Other studies also confirm the relationship between the need for connectedness or belonging and social networking behavior (Krämer, Hoffmann, & Eimler, 2015). Thus, individuals with a low degree of basic need satisfaction (for instance, the need for connectedness with others) could be more tempted to engage via social media, because SNS serve as an easy resource to stay in touch with others and to participate in their lives. FoMO would explain the tendency of people with chronic deficits in psychological need satisfaction to constantly seek out updates and possibilities to engage in social media, even when this takes place in a potentially inappropriate or dangerous situation, e.g. while driving or attending a lesson (Alt, 2015; Przybylski et al., 2015; Turkle, 2011). As Oberst et al. (2017) showed, the relationship between anxiety and depression on the one hand and negative outcomes of SNS use on the other is mediated by FoMO, especially in girls. The authors argue that for adolescents with depression and social anxiety, online interactions may be an easy way to socialize and to avoid more uncomfortable face-to-face interactions, but that this may also trigger continuous rumation about what they could be missing out on. Thus, intensive social networking can increase the feeling of connectedness and wellbeing on the one hand, but on the other it may also increase the perception of not being able to keep up with all the - nearly unlimited - socially and psychologically relevant information that social networks make available.

Thus, the use of SNS, instead of reducing FoMO, may actually increase it, in a kind of loop or vicious circle, and therefore people may get «hooked» on SNS (Oberst et al., 2017). In this sense, FoMO would not just be a mediator or moderator variable between SNS use and mobile phone addiction, but also a causal factor. This is something that should be considered in further studies.

Limitations of the study

This study presents some limitations that are similar to those of other studies conducted in the field, mainly the use of a self-selected convenience sample with a broad age range (13 to 50), and the use of self-reporting for data selection, so the participants' answers might be subject to biases of social desirability, recall, etc. The cross-sectional design of the study is also a limitation, because it does not provide the opportunity to explore causal relations.

Conclusions

Although we do not have enough indicators to classify the individuals of the fourth class (high-engagement high-risk) as pathological, future studies may confirm this possibility; in this context, fear of missing out construct should be taken into account when explaining the potentially pathological relationship with online social networks. Further studies may use different kinds of samples, e.g. clinical samples (individuals diagnosed with Internet addictions). Despite the limitations of this study, our results can be taken as a good starting point for using the FoMO scale to study problematic online social networking in Spanish speaking SNS users, and thus represents a contribution to the debate on the addictive potential of SNS. Further studies may also be conducted to shed more light on the role of the FoMO construct in a framework of psychological needs, specifically the need for connectedness or belonging (Baumeister & Leary, 1995; Baumeister, Brewer, Tice, & Twenge, 2007). Further studies should therefore investigate FoMO within the framework of a wider range of constructs (e.g. the need to belong), and attempt to determine whether FoMO is only relevant in the context of online social networking or if there is in fact also «offline FoMO», existing as a personality trait.

This study provided some evidence for the usefulness of the Fear of Missing Out construct and for the psychometric properties of the Spanish adaptation of the FoMO scale, which warrants its use for research in a Spanish-speaking context. Although the study was done with a self-selected sample of the general population, the FoMO scale can be considered a useful instrument to help identify individuals at risk of problematic or excessive engagement with online social networks through the mobile phone.

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