(Compulsive) Mobile Phone Checking Behavior Out of a Fear of Missing Out: Development, Psychometric Properties and Test-Retest Reliability of a C-FoMO-Scale

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Abstract

People use their mobile phones to communicate with significant others constantly, to maintain relationships and to gain instant access to the most up-to-date information by means of mobile phone features and network services. Due to anytime-anyplace connectivity, the need for being constantly linked to the outside world is nowadays stronger than ever. This may lead to a fear of losing the aforementioned ubiquitous contact. Rosen's (2012) study showed that adolescents use and check Internet and their smartphones almost continuously. Perhaps adolescents cannot stand the idea of missing out on certain happenings and are thus prone to check their mobile phones on a regular basis. Our study sought to develop a scale which assesses to what extent people check their mobile phone out of a fear of missing out in five distinctive domains (we therefore call the scale C-FoMO). To assess the reliability of the constructed C-FoMO (sub-)scale(s), the scale was retested and validated by examining its relationship with smartphone engagement, the FoMO-scale of Przybylski et al. (2013) and mobile phone checking behavior. The results of the analysis have shown that the C-FoMO-scale, built on five conceptual domains (*Social* domain, *General* domain, *News* domain, *Work/school* domain and *Safety* domain) has good psychometric properties in terms of test-retest reliability. Our findings demonstrated that C-FoMO is positively correlated to smartphone engagement and checking frequency of mobile phone. C-FoMO scores also correlated highly with Przybylski et.al's (2013) FoMO scale.

Keywords: fear of missing out (FoMO), mobile phone, checking behavior, anytime-anyplace connectivity

Introduction

The adoption of mobile devices has increased exponentially worldwide in both developing and developed countries (Aoki & Downes, 2003; *The Mobile Consumer*, 2013). According to the latest data, 87 % of Americans above the age of 18 have a mobile phone. Of these, 45 % are smartphone users (*Device ownership*, 2013). Nowadays, for many people, the idea of not having a mobile phone seems almost unimaginable. We organize our everyday activities by making phone calls, texting, and using web-based services and other real-time interactions. When people start using a mobile phone on a regular basis, it becomes an essential part of their lives and they tend to feel lost without having it with them (Bianchi & Phillips, 2005). Palen et al (2000) suggest that the connection with the mobile phone has reached a level of use that is more extensive and intensive than it was initially anticipated.

Today many people deem it essential to be linked to other persons by means of their mobile phones throughout the day, and to not lose this connection by any means (Aoki & Downes, 2003). This phenomenon is ascribed to a fundamental human need for being connected with our social environment any time without physical constraint (Geser, 2004). Research evidence shows that (due to the multi-functionality of the mobile phone), young people can become dependent on the technology, not only for matters of interpersonal communication (Leung & Wei, 2000), but also for several other activities that can be carried out by means of smartphone use: news-seeking online, entertainment, time-killing, multimedia uses and other applications (Leung, 2007). A study, conducted by Oulasvirta et al. (2011), identified three types of ‘reward values’ that people can experience when checking their mobile phone (interactional, informational and awareness). They suggested that checking the phone on a frequent base is habit forming and identified this habit as a ‘checking habit’ (rather than ‘smartphone

dependency'). They defined it as "brief, repetitive inspection of dynamic content quickly accessible on the device" (Oulasvirta et al., 2011, p. 105). This checking may lead to lengthier usage sessions because it "may function as a 'gateway' to other functionality and content on the device" (Oulasvirta et al., 2011, p. 107).

Studies that examined the importance of awareness of most up-to-date news, social happenings and social events showed that a potential lack of anytime-anyplace connectivity, thereby losing the connection to others and to the outside world is believed to lead to feelings of anxiety and fear (Rosen 2012; Przybylski, Murayama, DeHaan & Gladwell, 2013). This phenomenon is referred to as the fear of missing out (FoMO) phenomenon. According to Przybylski et al. (2013) the fear of missing out, then, refers to an aspiration to connect constantly due to a fear that other people may have pleasing experiences from which one is left out. Przybylski et al. examined the FoMO phenomenon from a social aspect; however, our study focuses on several other aspects (discussed below) that can be related to the phenomenon in terms of mobile phone use. Consequently, because people cannot stand the idea of missing the newest updates, information and events related the aforementioned aspects, they may feel inclined to check their phones on a regular base, suggesting that FoMO may be associated with checking behavior.

Only very recently, the FoMO-concept has begun to draw the attention of scholars. To date, there is only one study (Przybylski, Murayama, DeHaan & Gladwell, 2013) that has yielded further investigation concerning the indicators of FoMO and what relationships can be revealed between FoMO and new media usage. Given that the scholarly attention for the FoMO-concept is scarce, and research into this area is necessary in order to gain a better insight into people's relationships with their media tools, this study takes a step forward by developing a domain-

specific scale that assesses to what extent people check their mobile phones out of (1) a fear of missing out on social activities/news, (2) a fear of missing out on urgent questions/matters of family or friends in need,(3) a fear of missing out on work/school related questions, (4) a fear of missing out on important news headlines, and (5) a fear of missing out in general (a C-FoMO scale).

The purpose of this study is threefold: drawing from online survey-responses of 159 Dutch university students, we first attempt to develop a C-FoMO-scale that could serve as a valid measurement system for further studies. Thereto, we examine the underlying factor structure of a set of (self-constructed) C-FoMO-items and its psychometric properties. Second, we assess the reliability of the (sub-)scale(s) by means of a test-retest analysis (carried out among the same group of students). Third, we assess the validity of our scale by exploring a number of associations between our C-FoMO-scale on the one hand and checking behavior, smartphone engagement, and Przybylski et al.'s (2013) FoMO-scale on the other hand.

The notion of fear of missing out

According to Przybylski et al. (2013) the FoMO can be described as a "pervasive apprehension that others might be having rewarding experiences from which one is absent, and is characterized by the desire to stay continually connected with what others are doing" (p.1841). JWT Intelligence (2011) defined FoMO as "the uneasy and sometimes all-consuming feeling that you're missing out – that your peers are doing, in the know about, or in possession of more or something better than you" (p.4). It is also regarded as an outcome of experiencing the overwhelming amount of quick and endless changes that occur in one's social environment (Przybylski et al., 2013). Although, the definitions of FoMO differ somewhat, they both have

one thing in common: people who experience a FoMO may report various negative feelings when lacking the ubiquitous contact to others and what they are doing.

As a result of the anytime-anyplace connectivity offered by mobile phones and the evolution of mobile technologies, people's FoMO is believed to have increased. The increase of a FoMO may make people more vulnerable to develop problematic mobile phone use. Studies suggest, for example, that people experience anxiety and sensitiveness as well as sleep disorders and other types of more serious health-related issues that are attributable to turned-off mobile phones **(**Hassanzadeh & Rezaei, 2011**).** Moreover, students, who are apprehensive about missing out, believe that leaving their home without their mobile phone is unimaginable. In 2010, an experiment investigated the problematic use of media technology. In the study, a group of high-school students were not allowed to use technology that would allow them to keep in touch with others for a full week. Students reported that they felt anxious because they did not know if they missed out something important, and they could not wait for the experiment to end ("53 students unplugged", 2010).

Bianchi and Phillips (2005) identified one of the signs of mobile phone dependency as being worried with the thought of missing a call and feeling lost and depressed when attempting to decrease the time spent on mobile phones. These findings indicate that the FoMO indeed appears to be related to mobile phone use.

Very recently, FOMO as a concept has been developed and operationalized in the study of JWT Intelligence (2011) and of Przybylski et.al. (2013). The former examined FoMO in terms of social media use, while the latter investigated the correlation of FoMO to well-being and motivational factors. Our study, however, investigates FoMO as a motivator for regular mobile phone checking.

Research evidence for FOMO

Owing to the fact that not much has been written about the conceptualization and measurability of FoMO, as well as about its relationship with mobile phone usage, our research is based on only two studies (Przybylski et al., 2013; JWT Intelligence, 2011) that investigated the relationships between FoMO and new media use.

First, JWT Intelligence published an extensive trend report based upon a quantitative and qualitative study on the FoMO phenomenon in terms of social media use (JWT Intelligence, 2011). The authors claim that with the exponential growth of mobile devices, the FOMO has increased, which in turn, has led to an increase in the societal awareness of the phenomenon. Based on their research findings, they conclude that a FoMO urges people to check their mobile phone on a regular basis in order to soothe the feeling of missing out. Their findings also showed that individuals between 13 and 33 years old comprise the most at risk group of developing a FoMO. More than half of the students, who participated in their research, reported that they could not stand the idea of missing out. 65% of those respondents reported that they felt left out when they were aware (by means of their social media use) that their friends were doing something without them.

A recent study conducted by Przybylski et al. (2013) was the second basis for the present research. In Przybylski et al.'s study, FoMO is considered a personality trait. The study aimed to build a scale that measures an individual's level of FoMO based on a self-reported assessment. They focused on the extent to which people feared missing out on socially rewarding experiences, activities, and discourse (e.g. in jokes). The study examined FoMO in relation to demographic factors, well-being, motivational and behavioral factors. Their results suggested that young males tend to score higher on FoMO. Furthermore, those who reported lower levels

of satisfaction with psychological needs (connectedness to others, autonomy, competence) also tend to display higher levels of FoMO. In addition, FoMO was negatively associated with general mood and overall life satisfaction. Moreover, FoMO was related to social media engagement. In particular, they investigated how FoMO was related to Facebook use by examining the engagement with it throughout a day. Students, who scored high on FoMO, were more likely to experience mixed feelings while using social media and to use Facebook during lectures. Besides, they found that those who scored high on FoMO were more prone to use their mobile phones while driving. As mobile phone checking while driving is regarded as dangerous, it may also signal problematic use (Billieux, 2012).

FoMO and (compulsive) checking behavior

With regard to the relationship between FoMO and checking behavior, little is known. Nevertheless, it was demonstrated by Przybylski et al. (2013) that a FoMO mostly occurs among people between the ages of 13-33. What specific to this age group is that they were the first to have grown up using media technologies such as smartphones that are said to be indicators of fear of missing out (JWT Intelligence, 2011; Rosen, 2012). Several studies were conducted measuring the relationship between social media use and student's focus as well as the frequency of checking such tools and applications (e.g. Rosen, 2012*;* Wilska, 2003; Billieux, 2012; Campbell & Park, 2008). Rosen's study (2012) showed that adolescents use and check the Internet and their smartphones almost subconsciously. The vast majority of this age group considers social media as a great place in order to find out what their friends are doing. This suggests that to obtain knowledge of most current updates is a good indicator for one to check social media sites. Besides that, the awareness of friends' most recent updates is a motivator for

one to check and use applications that enable relationship maintenance. Gaining knowledge of other's newest updates and other types of news via checking one's mobile phone can be rewarding. Oulasvirta et al. (2011), defined three types of rewards associated with checking behavior: 1) awareness rewards, for example, being aware of the newest information, emails, and news, 2) informational rewards (obtaining dynamically updated, but non-interactive information), and 3) interactional rewards that includes social interactions (e.g. social networking, checking latest updates). According to Oulasvirta et al's (2011) in order to obtain rewarding experiences people may feel an urge to check their mobiles phones frequently. According to their findings, the "strongest habitual patterns" were associated with checking e-mail, Facebook update feeds and checking news-headlines. These were mainly carried out in 'empty moments' (in between activities) – while traveling, between lectures, or at home.

The trend report of JWT Intelligence (2011) on FoMO and social media impact also suggests that those who have a greater fear of missing out make more use of social media, e-mailing and other kinds of real-time applications. These types of uses of smartphones are also popular among those who are inclined to engage with their smartphones as a second screen activity regardless of the theme of use (Nielsen, 2012). That could indicate that those who have a greater fear of missing out also tend to be engaged with their smartphones more. In the current study, we examine to what extent people engage in the checking of their smartphone out of a FoMO, by developing a scale that examines the aforementioned checking behavior related to five distinctive domains of mobile phone use, namely the C-FoMO scale.

Domain specific C-FoMO

FoMO has been conceptualized in studies (Przybylski et al, 2013; JWT Intelligence, 2011) mostly in limited terms – the fear of missing out on rewarding social activities. Nevertheless, it can be assumed that in addition to social activities, there may be other types of 'rewards' or events that can generate a fear of missing out. We propose that people not only check their mobile phone out a fear of missing out on social activities, but also out of a fear of missing out on other aspects. The scale the present study focuses on, intends to measure to what extent people check their phone out of a fear of missing out in the following five domains:

C-FoMO in general

A first domain that we examine is checking of mobile phone out of a fear of missing out in general. All dimensions of mobile phone use that have been examined in connection with FoMO, suggest that certain general fears (e.g. anxiety, nerve or worry) are generated by (the prospect of) being 'unplugged'. In 2010, an experimental study with the participation of university students from all over the world showed that a day without any kind of socio-technological interaction, (including emailing, text-messaging, social network sites), caused a fear in students ("The world unplugged", 2010). In the research, students were asked to write about the way they felt while being 'unplugged' and many of them used expressions of addiction to describe their feelings. These included, but were not limited to: crazy, addicted, panicked, depressed, jittery, and paranoid. They also reported that without being anytime-anyplace available – emphasizing mobile phones - they felt that they "lost a part of themselves". A study, carried out by Blenford (2006), also suggests that people feel disconnected if they do not have their mobile phone with them, so they tend to leave the device on all the time. A study carried out by Hooper and Zhou (2007) aimed to categorize mobile phone usage behavior based on the underlying motivation.

Participants of the study reported that they felt upset to think that they might have missed a call or message, and the idea of not having their mobile phone with them caused fear and anxiety, which support the aforementioned research results of Rosen (2012) who stated that when students did not have the opportunity to check their mobile phones regularly, they got extremely anxious.

Hence, we assume that a main reason for people to regularly check their mobile phone may be because not checking it elicits a general emotional state of fear and anxiety in them. This notion of "Checking the phone out of a Fear of Missing Out in General" will be referred to in our study as "C-FoMO-General".

C-FoMO in social activities/news

A second domain that we examine is checking of mobile phone out of a fear of missing out on social interactions and information. According to media scholars, the mobile phone is regarded as the dominant means of contacting others (Davie et al., 2004; Castells et al., 2007). Aoki and Downes (2003) examined the motives for mobile phone use and found that mobile phones are oftentimes used for staying in touch with family and friends. Additionally, several other media scholars suggest that social use is frequently reported as the most common dimension for using mobile phones (Ling 1995; Blinkoff, 2001; Ling, 2000; Roos 1993; Peters & Allouch, 2005; Palen et al., 2000). Along texting and calling, social networking sites and emailing are also popular tools to keep contact when it comes to socially driven smartphone use (JWT Intelligence, 2011).

Drawing from to the conception of FoMO in Przybylski et al's study (2013) it can be assumed that accessing social network sites and other forms of communication applications on

the mobile phone are a means of fulfilling the needs for social interaction. Therefore, we assume that people are motivated to check their mobile phones out of a fear of missing out on these kinds of social interactions and information. This notion of 'Checking the phone out of a Fear of Missing Out related to Social domain' will be referred to in our study as 'C-FoMO-Social'.

C-FoMO of urgent matters of family/friends in need

A third domain that we examine is checking of mobile phone out of a fear of missing out on safety matters that concerns one's family and friends. Research by Ling (1995) on cell phone users indicated that aside from accessibility and micro-coordination, safety motives also account for the adoption of mobile phones. Safety purposes are suggested as a main motive for possessing mobile phones by several other studies (e.g. Palen et al. 2000; Katz, 1997; Aoki & Downes, 2003; Roos, 1993; Ling, 1995). According to several studies, mobile phone users tend to emphasize that, in several cases, having a mobile phone makes them feel safer, as it means that family and friends are available in case of unforeseen happenings (Aoki & Downes, 2003; Hooper & Zhou, 2007). This indicates that not having a mobile phone with them may lead to decreased levels of safety and increased levels of fear.

Therefore, we assume that people may be motivated to check their mobile phones out of a fear of missing out on possible urgent calls/messages of family members or friends who are in danger or in need of help. This notion of 'Checking the phone out of a Fear of Missing Out in relation to the Safety domain' will be referred to in our study as 'C-FoMO-Safety'.

C-FoMO of important news headlines

A fourth domain that we examine is checking of mobile phone out of a fear of missing out on important news headlines. Besides gathering the newest information about friends, news-checking and Internet surfing are also common practices of mobile phones (Wei, 2006; JWT Intelligence, 2011). News-seeking online is one of the reasons that may explain why young people can become dependent on technology (Leung, 2007). In addition, according to Oulasvirta (2011) the checking of news headlines is one of the most common habitual practices in relation with Internet use.

Therefore, we assume that another main reason for people to regularly check their mobile phone may be because they fear they miss out from the newest updates and events. This notion of 'Checking the phone out of a Fear of Missing Out in related to News domain' will be referred to in our study as 'C-FoMO-News'.

FOMO of work/school related questions

A fifths domain that we examine is checking of mobile phone out of a fear of missing out on work/school related matters. According to the findings of a qualitative study that investigated mobile phone practices (Palen et al., 2000), professional work life is a common theme of mobile phone usage. In this study, people reported that they had adopted the mobile phone because they were able to take care of personal and work-related business anywhere due to anytime-anyplace connectivity. A study by Peters and Allouch (2005) examined the uses and gratifications of mobile PDA (Personal Digital Assistant) also in relation with task-related purposes. People reported that they used their mobile devices to always be available for colleagues and fellow students or clients. They also reported that the mobile PDA was useful for emailing with colleagues as well as for the constant accessibility to and connection with the

workplace/company. The authors write that "people who make use of the new mobile communication technology use it almost constantly and everywhere in both personal and work-related situations for both social and business purposes" (p.250).

Work and business uses haven't been investigated in relation to FoMO. Given that work use accounts for a large amount of overall mobile phone usage (Palen et al., 2000), we assume that another main reason for people to regularly check their mobile phone may be because it not checking it elicits a fear in them that they miss out on information and issues that concern the domain of work/school. This notion of 'Checking the phone out of a Fear of Missing Out in related to Work/school domain' will be referred to in our study as 'C-FoMO-work/school'.

Proposed C-FoMO-scale and concurrent validity

We propose a scale that measures to what extent people check their phones out of a fear of missing out in five distinctive domains:

a., General: consists of the general fear that the lack of mobile phone could cause.

b., Social: concerns the essential need to have knowledge on all the current happenings and events that occur in one's social environment concerning friend related activities.

c., Safety/security: the importance of being available for friends and family members

Additional information about the actual development and assessment of the C-FOMO scale is discussed in the method and results section.

d., News: concerns the need for being up-to-date with current events and latest headlines regarding everyday life.

e., Work and school-related: involves the importance of contact with work, school.

Additionally, we will examine the concurrent validity of our scale, by assessing its relation to three other measures.

Although the article of Przybylski only came out after our study was already launched, the social domain of our C-FoMO-scale consisted of several statements that were very similar to items of the FOoMO-scale of Przybylski et al. Thus, we assume to find positive relationship between Fomo and C-F-oMO and that the relationship between the social sub-scale of our C-FoMO and the FOMO of Przybylski et al. will be higher than with the other sub-scales.

Besides, it was found that those who have a greater fear of missing out make more use of social media, e-mailing and other kinds of real-time applications (JWT Intelligence, 2011) and these types of uses of smartphones are also popular among those who are inclined to engage with their smartphones as a second screen activity regardless of the theme of use (Nielsen, 2012). Therefore, we expect smartphone engagement to be positively correlated with C-FoMO.

Due to anytime-anyplace connectivity, the need for being constantly linked to the outside world is nowadays stronger than ever. As it was stated by Rosen (2012), adolescents use and check Internet and their smartphones almost continuously because of a fear of losing the ubiquitous contact with the outside world. Therefore we assume that:

H1: People, who report checking their phone more out of a FoMO, are more likely to experience FoMO and the strongest relationship is between social sub-scale of C-FoMO and FoMO

H2: People who report checking their phone more out of a FoMO, are engaged more with their smartphones

H3: People who report checking their phone more out of a FoMO, use their phone more frequently to use apps that offer dynamic content

Method

Initial generation of an item pool

As an initial step, we brainstormed the sub-domains that we assumed could provide the underlying domains of C-FoMO. We discussed what we thought were important areas in everyday life, what areas people may fear to miss out on, and how these areas translated into the way we use our mobile phones. Consequently, in order to define distinctive domains of use, we went through daily activities that are related to mobile phone use, including the main purposes of checking the mobile phone (e.g. to obtain information about exams, to have a conversation with others, to find certain information, make sure that everybody is fine in our families).

First, we thought about the anxiety and fear that may occur when we leave our mobiles at home. We agreed that these fears could arise because we do not have the opportunity to use our mobile phones anytime we wanted. This idea led to the domain of C-FoMO-General, referring to checking mobile phones out of a fear of missing out in general (e.g. "If I don't check my phone regularly, I feel anxious"). Then, we defined the domain of social use as this was the most evident purpose of checking our mobile phones - i.e. to not miss out on any sort of fun event or activity that may occur within one's circle of friends. This gave way to the domain of C-FoMO-Social which refers to checking mobile phones out of a fear of missing out in social terms (e.g. "If I don't check my phone regularly, I worry I might miss out on funny things happening with my friends"). As we deemed that it might be important to people to be up-to-date with current events/news locally or around the world, we defined C-FoMO-News domain as checking that stems from a fear of missing out on headlines and (sports) news (e.g. "If I don't check my phone regularly, I feel anxious that I won't know what's happening in the world"). Besides these, we

regarded work/school related tasks as a distinctive dimension of mobile phone use since people tend to use different applications and check certain websites on a daily basis in order to obtain information about grades, notifications from school/work, or to communicate with colleagues. Thus, we defined the C-FoMO-Work/school domain, which concerns checking out of a fear of missing out related to work/school (e.g. "I worry that I might miss a request from my teacher or boss", "I worry I might miss updates on my (school) work"). Finally, we considered that having a mobile phone makes people feel safer, as they have the ability to call family members in case of an emergency, and also can be notified if anything happens with them. Thus, we defined the C-FoMO-Safety domain as one that concerns checking out of a fear of missing out on safety issues (e.g. "I feel anxious that I might be unavailable for a family member or friend who needs me").

As a result of the brainstorming procedure, we collected 34 items, 5 of which regarded the C-FoMO-General domain, 10 the C-FoMO-Social domain, 5 the C-FoMO-Safety domain, 8 the C-FoMO-Work/school and 6 the C-FoMO-News domain (see Appendix A).

These items were presented to a group of students by means of an online websurvey and re-tested in the same group of students. The remainder of the method section details the respondents (taking part in the test and the re-test), and the additional measures that were included in the re-rest questionnaire to assess concurrent validity. More information on the C-FoMO scale and its psychometric properties is discussed in the results section.

Respondents

Both for the test and the retest, an online survey was distributed among undergraduate students from Tilburg University. Following the collection of the surveys, and after deleting invalid responses, a total of 159 valid questionnaires were retained. Among the participants 59 (37 %)

were male and 100 female (63 %), ranging between the age of 16 and 37 (*M* = 21.29, *SD* = 2.98). 96 % of the students reported having Internet access on their phone, and of these, 98 % had a data plan subscription.

The retest questionnaire contained a shortened version of our original C-FoMO scale, the FoMO-scale of Przybylski et al. (2013), a measure of checking frequency and a measure of smartphone engagement (see measures section below). In order to assess the test-retest reliability of our scale, the scores of the same sample of subjects from the initial test and the retest had to be compared (Stangor, 1998). 132 students of the original 159 students participated in the retest.

Of the 132 respondents who took part in both the pre-test and re-test: 49 were males (37 %) and 83 females (63 %). Respondents ranged between 16 and 37 years old (*M*=21.11, *SD*=2.99). 88 % of the respondents had an Internet subscription, 10 % could access the Internet via wifi and 2 % had no Internet access on their mobile phones.

Measures

Our constructed C-FoMO-scale, the FoMO-scale of Przybylski (2013), mobile phone checking behavior, and social media engagement were employed in this study as measurements. The factor structure of the C-FoMO scale and its psychometric properties will be discussed in the results section. The other measures used in our study were:

Checking behavior

The retest survey contained 9 questions regarding the frequency of mobile phone use in terms of applications and functions. Respondents could rate the frequency of these activities on a 7-point Likert-scale: 1=”less than once in a week”, 2=”on a weekly basis”, 3=”more than once a

week", 4="on a daily basis", 5="several times a day", 6="once in an hour", 7="several times in an hour", the "non-applicable" answer was also an option.

The functions that they had to rate were the following: mobile-messaging (*M*=6.29, *SD*=0.99), calling (*M*=3.11, *SD*=1.16), checking Facebook or other social network site (*M*=5.40, *SD*=1.39), responding on a comment or adjusting one's status on Facebook or on another social network site (*M*=2.95, *SD*=1.76), checking Twitter feed (*M*=4.83, *SD*=2.86), posting a tweet *(M*=3.68, *SD*=3.09), checking personal e-mail (*M*=4,77, *SD*=1.57), checking university email (*M*=3,95, *SD*=1.99), and checking sport news and weather (*M*=3,70, *SD*=1.89). The scale items showed an acceptable level of consistency (α=.67). As a result, scores across these items were averaged to create a checking behavior-score for each participant (*M* = 4.30, *SD* = 1.03).

Confirming Aoki and Downes' (2003) findings, the vast majority of students (85%) used their mobile phones frequently. 45 % of the respondents used their phones several times a day in terms of the above mentioned activities.

FoMO–scale of Przyblyski et al. (2013)

As mentioned in the literature review, the single pre-existing scale that measures fear of missing out is the one developed by Przybylski et al. (2013). Their scale focuses on the extent to which people fear missing out on rewarding social experiences, activities, and methods of discourse (e.g. in jokes) in everyday life.

The 10-item scale (see Table 10 in Appendix B) of Przyblyski et al. (2013) was assessed on a 5-point Likert-scale ranging from 1 ("not at all true of me") to 5 ("extremely true of me"). The scale items showed good consistency (α=.84). Scores across these items were averaged to create a FoMO-score for each participant (*M* = 2.49, *SD* = 0.72).

Smartphone engagement

Smartphone engagement was measured with a series of questions assessing the extent to which participants used the smartphone in their daily lives. Participants were asked to indicate the number of times they had used their smartphones the previous week. An 8-point Likert-scale was used ranging from 1 = "Not one day last week" to 8 = "Every day last week" to rate the following statements: "within 15 min of waking up" (*M*=7.10 *SD*=1.95) "when eating breakfast" (*M*=4.25 *SD*=2.75), "when eating lunch" (*M*=4.73 *SD*=2.68) "when eating dinner" (*M*= 3.23 *SD*=2.57), "within 15 min of going to sleep" (*M*=7.32 *SD*=1.66), "when talking to my friends, family" (*M*=3.69 *SD*=2.40), "when watching TV" (*M*=6.27 *SD*=2.33).

The scale items showed good consistency (α=.79). As a result, one smartphone engagement score was created for all participants (*M* = 5.22, *SD* = 1.57).

Results

Factor structure and psychometric properties of the C-FoMO scale

As mentioned above, the first version of the C-FoMO scale was consisted of 34 items. Via an online web survey, these items were offered to undergraduate students in a random order.

We asked respondents to what extent they agreed with the items. Responses to the statements were given on a 7-point Likert scale, ranging from 'strongly disagree' (coded 1) to 'strongly agree' (coded 7). The aim was to check the strength of the conceptual model (with its five domains) and the appropriateness of the items used for the scale, and to reduce the total item number to 20 based on the results of a factor analysis.

The scale-evaluation procedure was comprised of two steps. First, we conducted a principle components factor analysis to assess the underlying factor structure of our scale. To

obtain the best fit of the data, we examined item loadings above .30. Second, we decreased the number of items to 20 with 4 items in each factor (discussed below) by dropping the problematic items (low loading, high cross loading).

Factor structure

The results of a principal component analyses with obliminal rotation suggested a five factor solution (see Table 1, organized by predetermined domains). These five factors explained 72.11% of the variance.

Table 1

Factor solution for initial C-FoMO items

	1	2	3	4	5
C-FoMO-General (*If I don't check my phone regularly..)*					
I feel anxious	.71				
I worry that I might have missed something	.63				.34
I get nervous	.54				
I get nervous that I might be missing out on something important	.46				
I fear I will miss out on something		.72			
C-FoMO-Social (*If I don't check my phone regularly..)*					
I worry that I might miss a social invitation		.80			
I worry I may miss out on fun events		.80			
I worry I might miss out on funny things happening with my friends		.77			
I worry that my friends might be interacting without me		.70			
I worry that I might miss social updates		.59			
I get nervous that I might miss updates from my friends	.31	.52			
I feel anxious that I might miss a response to my text, call, mail or update	.50	.34			
I am afraid I might be left out	.48	.38			
I feel anxious that I might miss a text, call, mail or update	.73				
I feel anxious that I might miss a question from a friend or family member			-.52		
C-FoMO-Safety (*If I don't check my phone regularly..)*					
I am afraid that I might not be available for a family member who urgently needs to contact me			-.90		

I feel anxious that I might miss a text, call, mail or update from my friends or family			-.89		
I feel anxious that I might be unavailable for a family member or friend who needs me			-.87		
I fear that I might miss a call, text, or other form of message from a family member who's in trouble			-.83		
I am afraid that I might not be available for a friend who urgently needs to contact me			-.62		
C-FoMO-News (*If I don't check my phone regularly..)*					
I get nervous that I might miss out on the latest headlines				.74	
I feel anxious that I may not be up to date with current events				.71	
I feel anxious that I won't know what's happening in the world				.71	
I worry I may miss out on important sports news				.59	
I worry I may miss out on important news				.50	
I feel anxious that I will miss breaking news reports	.42			.43	
C-FoMO-Work/school (*If I don't check my phone regularly..)*					
I get nervous that I might miss a work or study invitation					.89
I feel anxious that I might miss an important message from school or work					.87
I worry that I might miss a request from my teacher or boss					.84
I worry I might miss updates on my (school)work					.68
I feel anxious that I might miss an important appointment					.67
I worry because I am not sure if my message was received					.61
I feel anxious that might not be available for a classmate or colleague			-.43		.59
I worry that I might miss a request from a classmate or colleague			-.42		.51
% Variance	50.22	3.68	9.65	3.74	4.83
Obliminal rotation, converged in 14 iterations.					

According to this initial solution, four out of the five predetermined C-FoMO-General items were loaded onto one factor. One item ("I fear I will miss out on something") loaded onto the factor that we defined as C-FoMO-Social factor (see Table 1).

As for the C-FoMO-Social items, nine out of the ten predetermined items were loaded onto one factor, however, two items of these nine scored higher on C-FoMO-General factor ("I feel anxious that I might miss a text, call, mail or update"; "I am afraid I might be left out") and one

item ("I feel anxious that I might miss a question from a friend or family member") loaded only onto the factor with those items that we regarded as C-FoMO-Safety items.

As for C-FoMO-Safety, all five presumed items were loaded onto the same factor, independently from all the others (see Table 1).

All the items that we regarded as C-FoMO-News items were loaded onto one factor; however, one item ("I feel anxious that I will miss breaking news reports") scored highly also on C-FoMO-General factor.

The C-FoMO-Work/school domain consisted of the same eight items that we predetermined, however, two of these items also loaded onto C-FoMO-Social factor, but with lower scores ("I worry that I might miss a request from a classmate or colleague"; "I feel anxious that might not be available for a classmate or colleague").

Marsh and Hau (1999) (as cited in ten Holt et al., 2010) suggest retaining four or five items per factor for small samples. Thus, we aimed to retain 4 items for each factor with low cross-loadings, the item-selection procedure was guided both by theoretical reasons (which items represent the underlying factor best theoretically?) and data-driven reasons (which items are cross-loading, have low factor loadings?).

The factor solution of our final item-selection can be found in Table 2. Only two items of the final 20 loaded onto more than one factor, those were item 3 and item 16 (see Table 2).

Table 2

The 20-item C-FoMO-scale, pre-test

		1	2	3	4	5
C-FoMO-General (*If I don't check my phone regularly..)*						
1.	I feel anxious that I might miss a text, call, mail or update	.73				
2.	I feel anxious	.71				
3.	I get nervous	.57				.32
4.	I get nervous that I might be missing out on something important	.42				

C-FoMO-Social (*If I don't check my phone regularly..)*						
5.	I worry I may miss out on fun events		.86			
6.	I worry that I might miss a social invitation		.86			
7.	I worry I might miss out on funny things happening with my friends		.77			
8.	I fear I will miss out on something		.74			
C-FoMO-Safety (*If I don't check my phone regularly..)*						
9.	I am afraid that I might not be available for a family member who urgently needs to contact me			-.92		
10.	I feel anxious that I might miss a text, call, mail or update from my friends or family			-.87		
11.	I feel anxious that I might be unavailable for a family member or friend who needs me			-.86		
12.	I fear that I might miss a call, text, or other form of message from a family member who's in trouble			-.86		
C-FoMO-News (*If I don't check my phone regularly..)*						
13.	I get nervous that I might miss out on the latest headlines				.76	
14.	I feel anxious that I may not be up to date with current events				.75	
15.	I feel anxious that I won't know what's happening in the world				.74	
16.	I worry I may miss out on important sports news	-.39			.61	
C-FoMO-Work/school (*If I don't check my phone regularly..)*						
17.	I get nervous that I might miss a work or study invitation					.91
18.	I feel anxious that I might miss an important message from school or work					.89
19.	I worry that I might miss a request from my teacher or boss					.84
20.	I feel anxious that I might miss an important appointment					.72
Cronbach Alpha		.91	.86	.94	.79	.91
% Variance		48.15	5.08	11.63	5.78	6.50

Obliminal rotation, converged in 12 iterations.

The five factor solution explained 77.14% of the variance. Regarding the reliability of the total scale, the Cronbach Alpha was satisfactory (α=.94, *M*=2.49, *SD*=0.78). The examination of each sub-scale separately showed that all of them were highly satisfactory in terms of internal consistency: C-FoMO-General items (α=.91), C-FoMO-Social items (α=.86) C-FOMO-News items (α=.79) C-FoMO-Work/school-related items (α= .91) C-FoMO-Safety items (α=.94).

Test – retest reliability

According to Stangor (1998) one way of assessing scale reliability is to conduct the measurement twice with the same sample and correlating the scores obtained. Given that in our case, the construct of interest, was assumed not to change much over time, such a test-retest reliability procedure was conducted. Six weeks went by in between the pre-test and the re-test. We calculated the internal consistency of the pre -and re-test version of the scale, and the inter-correlation among the sub-dimensions and the individual scale items.

Principal component analysis was conducted. As an initial analysis revealed four, rather than five factors, the analysis was repeated under the condition that the numbers of factors to be extracted was set to five (see Table 3).

Table 3

The 20-item C-FoMO-scale, retest

	1	2	3	4	5
C-FoMO-General					
I get nervous that I might be missing out on something important	.52				
I get nervous					-.66
I feel anxious	.35				-.66
I feel anxious that I might miss a text, call, mail or update	.33				-.48
C-FoMO-Social					
I worry I might miss out on funny things happening with my friends		.88			
I worry I may miss out on fun events		.83			
I fear I will miss out on something		.74			
I worry that I might miss a social invitation		.63			.41
C-FoMO-Safety					
I feel anxious that I might miss a text, call, mail or update from my friends or family	-.43				
I am afraid that I might not be available for a family member who urgently needs to contact me			-.93		
I feel anxious that I might be unavailable for a family member or friend who needs me			-.86		

I fear that I might miss a call, text, or other form of message from a family member who's in trouble			-.85		
C-FoMO-News					
I get nervous that I might miss out on the latest headlines				.87	
I feel anxious that I may not be up to date with current events				.83	
I worry I may miss out on important sports news	.44			.81	
I feel anxious that I won't know what's happening in the world				.75	
C-FoMO-Work/school					
I feel anxious that I might miss an important appointment				-.48	.32
I get nervous that I might miss a work or study invitation					.89
I feel anxious that I might miss an important message from school or work					.75
I worry that I might miss a request from my teacher or boss					.68
Cronbach Alpha	.88	.88	.86	.88	.84
% Variance	4.19	47.93	11.26	5.01	7.77
Obliminal rotation, converged in 17 iterations.					

The re-test (α=.94, *M*=2.65, *SD*=0.73) of the C-FoMO-scale showed good consistency. The five factor solution explained 77.14% of the variance. Regarding the reliability of the total scale, the Cronbach Alpha was highly satisfactory (α=.94, *M*=2.49, *SD*=0.78). The examination of each sub-scale separately showed that all of them were highly satisfactory in terms of internal consistency: C-FoMO-General items (α=.88), C-FoMO-Social items (α=.88) C-FoMO-News items (α=.88) C-FoMO-Work/school-related items (α= .84) C-FoMO-Safety items (α=.86).

Factor structure and comparison of pre-test and re-test sub-scales

Considering the correlation between the two scales, the C-FoMO pre-test and re-test were highly positively correlated to each other (r=.77, p<.001). As regards to the comparison between the original total scale and the retest total scale, on average, participants on the re-test reported significantly lower C-FoMO (*M* = 2.47, *SD* =0.78) than in the pre-test (*M* = 2.65, *SD* = 0.73; $t(131) = -3.97$, $p < .05$). This can be considered a small-sized effect (d = .33).

The domains that were supposed to measure the same construct were compared through an examination of the items of the pre-test C-FoMO-scale and re-test version (see Table 4).

In terms of factor structure, C-FoMO-General sub-scale of the re-test (*M*=2.76, SD=0.95), three out of four items were overlapped with the pre-test version (*M*=2.57, *SD* 1.06). The correlation between the C-FoMO-General sub-scales confirmed the significant positive relationship (*r*=.77, *p*<001). The one exception was the "I get nervous that I might be missing out on something important" (.520) as it loaded the strongest onto the factor with the four items of what we regarded as 'Social' sub-scale. Two items of the C-FoMO-General sub-scale, "I feel anxious" (.354) and "I feel anxious that I might miss a text, call, mail or update" (.332) also loaded strongly onto the C-FoMO-Social factor, but still scored higher on the social sub-scale. All four items of this sub-scale were significantly correlated to one another.

As for the C-FoMO-Social re-test sub-scale (*M*=2.73, *SD*=0.92), it consisted of the same items as it did in the pre-test (*M*=2.22, *SD*=0.88). The correlation also confirmed the strong positive relationship between the C-FoMO-Social sub-scales (*r*=.67, *p*<.001). The"I worry that I might miss a social invitation" item of this sub-scale also loaded (.407) on the sub-scale that we regarded as C-FoMO-Work/school factor.

The C-FoMO-News sub-scale (*M*=1.94, *SD*=0.76) of the pre-test was in complete overlap with the corresponding re-test C-FoMO-News sub-scale (*M*=2.00, *SD*=0.80) (see Table 4). The two sub-scales were significantly correlated (*r*=.65, p<.001).

Considering the C-FoMO-Safety re-test sub-scale (*M*=3.16, *SD*=0.94), the "I feel anxious that I might miss a text, call, mail or update from my friends or family"-item scored highest on the factor of the C-FoMO-General (-.430), rather than on the Safety-subscale. Even so, the

correlational analysis between the pre-test (*M*=3.06, *SD*=1.13) and re-test version of this sub-scale (*r*=65, *p*<.001) confirmed a significant positive relationship.

The C-FoMO-Work/school pre-test sub-scale (*M*=2.56, *SD*=1.06) was also similar to the corresponding re-test sub-scale (*M*=2.59, *SD*=0.89) and the correlation also confirmed a high overlapping (*r*=.66, *p*<001).

All the corresponding items from the pre-test and the re-test were significantly correlated at a level of significance of p < .01 (see Table 4).

Table 4

Correlation between corresponding items of C-FoMO pretest (column) and retest (row)

	C-FoMO-News	1.	2.	3.	4.
1.	I get nervous that I might miss out on the latest headlines	,378**			
2.	I feel anxious that I may not be up to date with current events		,508**		
3.	I feel anxious that I won't know what's happening in the world			,596**	
4.	I worry I may miss out on important sports news				,654**
	C-FoMO-Work/school	1.	2.	3.	4.
1.	I get nervous that I might miss a work or study invitation	,557**			
2.	I feel anxious that I might miss an important message from school or work		,516**		
3.	I worry that I might miss a request from my teacher or boss			,529**	
4.	I feel anxious that I might miss an important appointment				,507**
	C-FoMO-Safety	1.	2.	3.	4.
1.	I feel anxious that I might be unavailable for a family member who urgently needs to contact me	,559**			
2.	I feel anxious that I might miss a text, call, mail or update from my friends or family		,441**		
3.	I feel anxious that I might be unavailable for a family member or friend who needs me			,424**	
4.	I fear that I might miss a call, text, or other form of message from a family member who's in trouble				,614**

C-FoMO-General	1.	2.	3.	4.
1. I feel anxious that I might miss a text, call, mail or update	,626**			
2. I feel anxious		,659**		
3. I get nervous			,646**	
4. I get nervous that I might be missing out on something important				,526**
C-FoMO Social	1.	2.	3.	4.
1. I worry I may miss out on fun events	,510**			
2. I worry that I might miss a social invitation		,464**		
3. I worry I might miss out on funny things happening with my friends			,629**	
4. I fear I will miss out on something				,355**

** *correlation is significant at the 0.01 level*

* *correlation is significant at the 0.05 level*

According to the correlations between the sub-scales of the original C-FoMO scale and the re-test, the final structure of the scale thus showed good psychometric properties in terms of both reliability and validity (see Table 5).

Table 5

Correlation between corresponding sub-scales of pre – and retest version of C-FoMO

Sub-scales	*r*
C-FoMO-General	.77**
C-FoMO-Social	.68**
C-FoMO-Safety	.65**
C-FoMO-News	.65**
C-FoMO-Work/school	.66**

** *correlation is significant at the 0.01 level*

Additionally, we examined the stability in people's responses with regard to the pre and – re-test sub-scales by doing paired samples t-tests. On average, participants on the retest reported

significantly lower C-FoMO-General (M = 2.57, SD = 1.06) than in the pre-test (M = 2.76, SD = 0.95; $t(131) = -3.04$, $p < .05$). This can be considered a small-sized effect (d = .26). In addition, participants on the re-test reported significantly lower C-FoMO-Social (M = 2.22, SD = 0.88) than in the pre-test (M = 2.73, SD = 0.92; $t(131) = -8.10$, $p < .05$). This can be considered a large-sized effect (d = .71). There was no significant difference between the pre and –re-test responses, in terms of C-FoMO-Work/School, C-FoMO-Safety and C-FoMO-News aspects.

C-FoMO and checking behavior

To assess the concurrent validity of our scale, we examined its relationship with self-reported checking frequency. A significant positive relationship was found between overall checking behavior and C-FoMO (r=.18, p=.04). Regarding the correlation between the sub-scales of C-FoMO and checking behavior (see Table 6), significant positive relationship was found between overall checking behavior and C-FoMO-News *(*r=.21, $p < .05$). Also a significant positive relationship was found between C-FoMO-Social and checking behavior *(*r=.20, p<.05*).* Other C-FoMO domains did not relate significantly to overall checking frequency.

Table 6

Correlation between C-FoMO sub-scales and checking behavior

	C-FOMO-General	C-FOMO-Social	C-FOMO-Safety	C-FOMO-Work/school	C-FOMO-Work-School
Checking behavior	.17	.20*	.03	.21*	.13

** correlation is significant at the 0.05 level*

Next, we examined relationships with the different types of apps for which checking frequency was assessed. The examination showed that all five C-FoMO sub-scales significantly

related to texting frequency (via SMS or Whatsapp) (see Table 7). We expected correlation between similar themed checking behavior types and domains of C-FoMO; therefore we examined the sub-scales of C-FoMO and their relationships with different types of checking behavior (particularly those that can be regarded as corresponding checking types). A significant positive relationship was found between C-FoMO-Social and "checking social networks" (r=.28, p < .05). This supports JWT Intelligence's (2011) findings that social media especially appeals to those who prone to score high in terms of FoMO. In contrast, a negative relationship was found between C-FoMO-News and "checking (sport) news on mobile phone" (r=.-19, p<.05). Also, no relationship was found between C-FoMO-work/school and checking university email in contrast with our expectations.

Table 7

Correlation between C-FoMO sub-scales and different types of checking behavior

	C-FoMO-General	C-FoMO-Social	C-FoMO-Safety	C-FoMO-News	C-FoMO-Work/school
Sending a message (via SMS, Whatsapp)	.35**	.36**	.35**	.23**	.29**
Phone call	.12	.15	.09	.15	.14
Checking Facebook or other social network site	.22*	.28**	.19*	.13	.19*
Comment on a post, doing status update	.11	.17	.09	.03	.09
Checking Twitter feed	.13	.16	-.03	.16	.01
Posting a Tweet	.02	.05	-.14	.02	-.04
Checking university email	.08	.07	.03	.16	.12
Checking personal email	.15	.11	.06	.16	.14
Checking (sport) news, weather forecast	-.12	-.19*	-.13	.,07	-.05

*** correlation is significant at the 0.01 level*
** correlation is significant at the 0.05 level*

Link between FoMO measured by Przybylski et al. (2013) and C-FoMO-scale

A significant positive relationship was found between the FoMO-scale of Przybylski et.al (2013) and our C-FoMO-scale *(r*=.60, p<.001). This finding suggests that students who are more likely

to check their mobile phones out of a fear of missing out, are significantly more likely to experience a fear of missing out on fun events and joyful happenings that occur in their social environment. Our assumption that the social sub-scale would correlate highest with the FoMO-scale of Przybylski et al. (2013) was also supported (see Table 8).

Table 8

Correlations between the sub-scales of C-FoMO-scale and the FoMO scale of Przybylski et al.(2013)

	C-FoMO-General	C-FoMO-Social	C-FoMO-Safety	C-FoMO-News	C-FoMO-Work/school
Przybylski et.al.	.56**	.65**	.40**	.40**	.42**

*** correlation is significant at the 0.01 level*

FOMO and smartphone engagement

In order to test the hypothesis that those who score high on C-FoMO-scale also score high in terms of smartphone engagement, we examined the relationship between the two measurements. A significant positive relationship was found between C-FoMO and smartphone engagement (r=.41, p<.05).

Besides, all the C-FoMO sub-scales were positively correlated to smartphone engagement (see Table 9).

Table 9

The correlation between FoMO sub-scales and Smartphone engagement

	C-FoMO-General	C-FoMO-Social	C-FoMO-Safety	C-FoMO-News	C-FoMO-Work/school
Smartphone engagement	.38**	.35**	.36**	.28**	.34**

*** correlation is significant at the 0.01 level*

Discussion and conclusion

Mobile devices and anytime-anyplace connectivity have revolutionized the way people perceive communicational possibilities in terms of work and personal matters. To be constantly up-to-date with current news, as well as to constantly maintain relationships with those in our social environment and with the outside world has become an essential need. This desire to be always connected can be explained by a recently shaped notion: the fear of missing out (FoMO). To date, FoMO has been investigated only from social aspect. Two definitions of FoMO were defined in terms of social aspect: FoMO refers to the fear that people in our social environment are having fun without us knowing it (Przybylski et al., 2013) and "pervasive apprehension that others might be having rewarding experiences from which one is absent" (JWT Intelligence, 2011, p.4). Hence, this need is believed to drive us to engage with our mobile phones on a continuous level in such a way that we constantly check our devices to soothe the fear of missing out. Our assumption was that not only social use can account for checking our mobile phone out of a FoMO, but other aspects as well. Thus, drawing from the characteristics of FoMO in terms of social use, we broadened the spectrum of the FoMO notion by applying it to other aspects of mobile phone use.

The purpose of this thesis was to develop a scale that measures that what extent people check their mobile phones out of a FoMO (C-FoMO) and could serve as a valid measurement system for further studies. To define potential dimensions of mobile phone checking because of FoMO, we associated important areas of daily life and their translation into the way of mobile phone use. We treated these themes as motives that drive people to regularly check their mobile phones.

We defined five domains that could be considered as main purposes of frequent mobile phone checking. First, a 34-item scale was constructed to measure mobile phone checking behavior out of a fear of missing out in terms of these domains.

After assessing the factor structure and the psychometric properties of this original scale, a selection procedure was conducted to reduce the number of items to 20, divided into five distinctive factors all of which consist of 4 items to identify the conceptual domains that can contribute to C-FoMO: C-FoMO-General domain, C-FoMO-Social domain, C-FoMO-Safety domain, C-FoMO-News domain and C-FoMO-Work/school domain. We assessed the reliability and validity of these five sub-scales by means of a pre-test - re-test analysis (carried out among the same group of students). The results of the analysis have shown that the C-FoMO-scale, built on five conceptual domains has good psychometric properties in terms of test-retest reliability. As the factor structure was found to be sufficiently stable, our goal to present a measurement instrument to assess C-FoMO was obtained.

We further assessed concurrent validity by exploring a number of associations between our C-FoMO-scale on the one hand, and the frequency of mobile phone checking behavior, smartphone engagement, and Przybylski et al.'s (2013) FoMO-scale on the other hand.

Regarding the overall checking behavior, it was supported that people who agree more strongly to regularly checking their phone out of a fear of missing out, also check their mobile phone more frequently. We further assessed which sub-domains of FoMO-motivated checking might lead to more frequent mobile phone checking. Correlation analysis revealed that C-FoMO-News and C-FoMO -Work/School were significantly related to the frequency of mobile phone checking behavior.

In addition, a positive relationship was found between smartphone engagement and our C-FoMO-scale. 84 % of those who agreed or strongly agreed to regularly check their mobile phone out of a fear of missing out, said that they had used their phones within 15 minutes before going to bed every day the previous week. 78 % of these respondents reported that they had used their mobile phones within fifteen minutes after they woke up every day and 63 % of these people reported that they had used their mobile phones while watching TV every day of the previous week. This suggests that those who experience fear of missing out when they have not checked their mobile phones frequently are also more likely to use their smartphones, even when they are already involved with another activity. As all our domains were highly correlated with smartphone engagement it can be concluded that there is no exclusive domain, related to checking behavior out of a fear of missing out that can account for smartphone engagement.

With regard to the connection between our C-FoMO-scale and the FoMO-scale of Przybylski et al. (2013), a significant positive relationship was found. This supports our assumption that people who fear missing out on rewarding experiences and activities also check their phone regularly out of a fear of missing out (in terms of domains we defined). Regarding the correlation between the sub-scales of C-FoMO and the FoMO-scale of Przybylski et al. (2013), our assumption that C-FoMO-Social sub-scale would have the strongest correlation with Przybylski et al's scale was supported. It is likely that checking one's mobile phone out of a fear of missing out may also be strongly related to the aforementioned motivational, behavioral and well-being factors that were measured in Przybylski et al's (2013) study. Therefore, it may be the case that C-FoMO is also negatively related to general mood and life satisfaction and positively related to distracted learning and distracted driving.

Limitations and direction for future research

There are a number of important limitations to our study. The most important limitation concerns the suitability of our C-FoMO scale in terms of measuring FoMO. We considered mobile phones as a means of fulfilling our needs in terms of different domains that we regarded important. Therefore, our focus was on the most common themes of mobile phone use that drive people to frequently check their phones. We clustered these themes of use into domains and treated them as possible triggers of FoMO, however, to date no evidence has been found supporting this assumption. That is to say, the study focused on the motives of use divided into five domains that urge people to check their mobile phones on a regular base, rather than defining personality traits that can be related to problematic mobile phone use. It can be the case that it could have been more effective to measure FoMO if it was a personality trait in terms of potential distinctive domains of life, and not directly related to checking behavior frequency. Then the scale could have been examined in terms of its relationship with other measures (e.g. smartphone engagement, checking behavior).

Concerning methodological limitations, a couple of respondents reported not having Internet access on their phone, however, we did not exclude such cases while conducting the analyses, as these respondents may still use their mobile phones for phone-calls and text-messaging, which was also measured in several ways. This may, however, have affected the final results since respondents who did not have Internet on their mobile phones could not use their phones for several activities that we included into our study. Another methodological limitation concerns the fact that not all students from the pre-test took part in the re-test. This might have influenced the retest results as in we only took into account those students who took part in both tests.

Additionally, we investigated checking behavior out of a fear of missing out in terms of mobile phone use as we related C-FoMO to anytime-anyplace connectivity. However, a great deal of the activities that we included into our study can be also carried out by means of other technological devices. This may suggest that our research findings do not exclusively hold for smartphones. Other mobile devices also allow us to check certain sites, or using certain applications that were included in our study (e.g. social networks, emailing), therefore the scale could be devised more generally. However, in reference with checking habit, Oulasvirta et al. (2011) stated that "smartphone use is more aptly characterized by SIRB—short duration, isolated, reward-based—sessions than are laptops" (p.4). Thus, as for future research, examining the duration of smartphone use in terms of total amount of time spent with them and the spread of the use throughout the day (number of times, they are checked, and the duration of each 'slots'), may contribute to define the more exact levels of problematic mobile phone use.

Additionally, given that almost all the participants in this study were Internet users, one could argue whether the same five domains could be distinguished as regards to other groups of people who are less technology-enabled. The C-FoMO-scale may not be regarded as a valuable starting point for future investigations on selected populations in other countries where the preferences of life, and it's translation into mobile phone use may differ from subjects that we included in our study.

Furthermore, our study did not address whether specific events trigger FoMO and result in frequent checking behavior. In other words, we did not examine the particular "life-situation", that is to say, a short period of time in which mobile phone checking because of FoMO occurs. By investigating circumstances that trigger FoMO and distinguishing them from the situations of mobile phone use in general (e.g. one checks his/her university e-mail address frequently only in

examination period; or one reports checking his/her mobile phone frequently out of a fear of missing out in terms of safety only when a family member is abroad) may also contribute to the definition of what domains of uses can be regarded as "constant" triggers of FoMO. Future studies should therefore measure C-FoMO in relation to particular situations of use that are believed to be signal of problematic mobile phone use (e.g. when driving, when learning, when the use it prohibited).

Additionally, future research should investigate the importance of distinctive domains that are assumed to be in relation with checking behavior by employing experimental study that would focus on the fear of missing out experienced in a test period when the users would not have the opportunity to check their mobile phones. Then, in another period of time, the same participants would have the opportunity to check their mobile phones anytime the need arises. This way, on one hand, the mean scores of self-reported FoMO could be compared in the two periods of time that could explain the significance of simply having the opportunity to check their mobile phones. On the other hand, in the second period of time, FoMO would be examined in terms of its relationship also with other measures: the number of times participants access their phone and the total amount of time spent using their mobile phones. Thus, the results could also show whether the excessive use or the frequent checking can account for FoMO and what relationships can be revealed. Research on checking behavior and time spent with mobile phone use by means of longitudinal study has the potential to suggest perspectives on how people develop patterns of fear of missing out in relation with mobile phone use. This could lead to a more accurate definition of which domains can account for FoMO.

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Appendix A

Table 10

The initial pool of items after the brainstorming

C-FoMO-General items
1. I feel anxious
2. I get nervous
3. I fear I will miss out on something
4. I worry that I might have missed something
5. I get nervous that I might be missing out on something important
C-FoMO-Social items
1. I feel anxious that I might miss a text, call, mail or update etc.
2. I feel anxious that I might miss a response to my text, call, mail or update etc.
3. I worry that I might miss social updates
4. I am afraid I might be left out
5. I worry I may will miss out on fun events
6. I get nervous that I might miss updates from my friends
7. I worry I might miss out on funny things happening with my friends
8. I feel anxious that I might miss a question from a friend (or family)
9. I worry that my friends might be interacting without me
10. I worry that I might miss a social invitation
C-FoMO-Safety items
1. I fear that I might miss a call, text, or other form of message from a family member who's in trouble
2. I get nervous that I might miss a call, text, or other form of message from a friend or family member who needs me
3. I feel anxious that I might be unavailable for a friend or family member who needs me
4. I am afraid that I might not be available for a friend who urgently needs to contact me
5. I am afraid that I might not be available for a family member who urgently needs to contact me
C-FoMO-News items
1. I worry I will may miss out on important sports news (e.g. new records, achievements, scandals, etc.)
2. I worry I will may miss out on important news
3. I get nervous that I might miss out on the latest headlines
4. I feel anxious that I will miss breaking news reports
5. I feel anxious that I won't know what's happening in the world
6. I feel anxious that I may not be up to date with current events
C-FoMO-Work/school items
1. I worry because I am not sure if my message was received
2. I worry I might miss updates on my (school)work
3. I feel anxious that might not be available for a classmate or colleague
4. I feel anxious that I might miss an important appointment
5. I get nervous that I might miss a work or study invitation
6. I worry that I might miss a request from my teacher or boss
7. I worry that I might miss a request from a classmate or colleague
8. I feel anxious that I might miss an important message from school or work

Appendix B

Table 11

Przybylski et.al. (2013) FOMO-scale

1.	I fear others have more rewarding experiences than me.
2.	I fear my friends have more rewarding experiences than me.
3.	I get worried when I find out my friends are having fun without me.
4.	I get anxious when I don't know what my friends are up to.
5.	It is important that I understand my friends ''in jokes''.
6.	Sometimes, I wonder if I spend too much time keeping up with what is going on.
7.	It bothers me when I miss an opportunity to meet up with friends.
8.	When I have a good time it is important for me to share the details online (e.g. updating status).
9.	When I miss out on a planned get-together it bothers me.
10.	When I go on vacation, I continue to keep tabs on what my friends are doing.