



An examination of problematic mobile phone use in the United Arab Emirates: Prevalence, correlates, and predictors in a college-aged sample of young adults

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ABSTRACT

Despite a number of benefits, mobile phones can carry many deleterious effects. We aimed to determine the extent of problematic mobile phone use in a sample of college-aged young adults in the United Arab Emirates. We also examined whether a number of factors were correlated with and predicted problematic use. We conducted a cross-sectional, correlational study in which a sample of 350 young adults ($M = 20.70$, $SD = 2.14$, range: 18–33 years) completed a survey that included socio-demographic variables, and measures of problematic mobile phone use (MPPUS-10), depression, and low self-esteem. One third of the sample evidenced scores indicative of problematic mobile phone use ($M = 47.14$, $SD = 19.98$). Logistic regression identified female gender, increasing daily time using the mobile phone, and elevated depressive symptomatology predicted higher MPPUS-10 scores. The MPPUS-10 evidenced acceptable reliability and validity in this sample. The prevalence of problematic mobile phone use was considerable in this sample, higher in comparison to previous reports from Europe and the Far East.

1. Introduction

Rates of mobile phone ownership have grown exponentially in recent years and these devices are now, for many people, their primary means of communication, access to information, and multimedia entertainment. According to the ICT Indicators Database (International Telecommunication Union [ITU], 2017), access to mobile-cellular devices is presently approaching 100% in many regions of the world, particularly in Europe, although penetration rates vary as a function of the region of the world. For example, in Africa, penetration rates have remained low (around 20%) in comparison to elsewhere in the world (ITU, 2017). In the Middle East, the prevalence of mobile communication has grown at an especially prolific rate. The United Arab Emirates (UAE), for example, the country in which the present study was conducted, has witnessed dramatic socio-economic and infrastructural development over a relatively short period of time. As a result, the rate at which mobile phone use has increased in this locale closely mirrors the country's wider developmental growth, particularly the sophistication of its information and telecommunication network. Within a 10-year period, from 2007 to 2017, the ITU (2017) reported an almost three-fold increase in mobile device ownership (around 20

million at the time of the report's release).

Over the last two decades, a plethora of studies have investigated the many benefits that accompany mobile phone use. Mobile phones have been used for educational purposes, to readily facilitate access to information, and to establish and maintain social relationships (Billieux, Maurage, Lopez-Fernandez, Kuss, & Griffiths, 2015; Elhai, Dvorak, Levine, & Hall, 2017; López-Fernández et al., 2017). A number of studies have investigated the efficacy of mobile phone-delivered interventions in the health and psychological sciences. Studies have found mobile-delivered interventions to be efficacious in promoting healthy lifestyle behaviors and in the delivery of self-help psychological programmes, particularly for individuals for whom regular access to the needed in-person treatment might not be feasible (Fjeldsoe, Marshall, & Miller, 2009; Norris, Swartz, & Tomlinson, 2013; Tsai et al., 2014; Watts et al., 2013). However, it has now been established, since the mid-2000's when scholars first coined the term 'problematic mobile phone use' (Bianchi & Phillips, 2005), that use of one's mobile phone may also pose a number of deleterious consequences. Problematic users report feelings of dependence and craving (Bianchi & Phillips, 2005). Physical health consequences such as neck, shoulder and hand pain, headaches, concentration difficulties, and fatigue are also commonly

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reported (Haug et al., 2015; Randler et al., 2016; Thomée, Härenstam, & Hagberg, 2011). Problematic mobile phone use has also been linked to financial problems (Billieux, Van der Linden, & Rochat, 2008), risky driving and a greater likelihood of motor vehicle accidents (White, Eiser, & Harris, 2004), a tendency towards a sedentary lifestyle (Kim, Kim, & Jee, 2015), and the experience of cyberbullying (Nicol & Fleming, 2010). Psychologically, sleep disturbances (Thomée et al., 2011), depression and anxiety (Elhai et al., 2017), and reduced life satisfaction (Lepp, Barkley, & Karpinski, 2014) have been found to be prevalent among problematic users. López-Fernández et al. (2017) predict that as technology continues to advance and mobile devices continue to adopt greater functionality, there is an increasing likelihood of addictive use of mobile phones.

Despite a burgeoning body of literature that has investigated problematic mobile phone use among adolescents and young adults, these studies are predominantly limited to European and Far East Asian samples. The reported proportions of problematic mobile phone users tend to vary widely from as low as 1% to 15% (Haug et al., 2015; Hwang & Park, 2017; López-Fernández et al., 2017). Moreover, a recent review estimated a mean prevalence rate of mobile phone addiction to be around 19% and observed a decreasing prevalence with increasing age (De-Sola, Talledo, de Fonseca, & Rubio, 2017). In the Middle East, empirical examinations of problematic mobile phone use remain scant, but in a rare evaluation in this region of the world, Nahas, Hlais, Saberian, and Antoun (2018) report that 20.2% of participants in their Lebanese sample evidenced problematic smartphone use. We hypothesized that our investigation would yield a marginally larger figure given that our study focused specifically on the young adult age group, 18 to early 30's, whereas Nahas et al. (2018) included a wider age range which would have reduced the mean prevalence rate given the observation of diminishing problematic engagement with mobile phones in older categories. Moreover, the additional contextual factors in the UAE of rapid socio-economic development, increased financial prosperity, and the large percentage of expatriate workers, most of whom are young adults, render the hypothesis of obtaining a comparably larger prevalence of problematic engagement with mobile phones a sound one.

Focusing on adolescents and young adults when examining problematic use of mobile phones is highly pertinent. Some scholars argue that individuals navigating this developmental stage are more likely to engage in risky behaviors. Individuals aged 18 to the late 20's have been found to be more susceptible to the development of unhealthy and risky behaviors (e.g. substance use, problematic gaming, social media use; Männikkö et al., 2018; Nelson & Padilla-Walker, 2013). Much research effort is being directed towards understanding how young adults use mobile uses, particularly as technology advances, mobile phones acquire a greater variety of functions. Young people whose primary means of socialization and engagement with the world is digital in nature may become highly dependent on this visual and electronic means of communication, crave instant gratification facilitated by their digital devices, and are more likely to take risks and engage in technology misuse (López-Fernández et al., 2017; Selwyn, 2009; Teo, 2013).

1.1. Aims of the study

As a contribution to the literature, we sought to examine the prevalence of problematic mobile phone use in a sample of college-aged young adults resident in the UAE. The association of problematic mobile phone use with a range of demographic and psychopathological (depression and low self-esteem) variables is reported. We also investigated using logistic regression whether any of these variables predicted an increased likelihood of participants falling above the clinical cut-off for problematic mobile phone use. The reliability and validity of the Problematic Mobile Phone Use Scale-10, a frequently employed measure of problematic use of mobile phones, was also

evaluated by computing its internal consistency, concurrent validity in relation to depression and low self-esteem, and its structural validity using an exploratory factor analysis.

2. Methodology

2.1. Procedure

This study was conducted at a university in the UAE and employed a cross-sectional, correlational design. The sample was recruited from all undergraduate and postgraduate courses taught by the first author during the Spring and Fall semesters of 2018. Participants were invited to participate by completing a series of questionnaires administered electronically via Qualtrics. The survey required 15 min to complete and participants received course credit for participation. The following inclusion criteria was applied during recruitment. Participants were included in the sample if they owned and used a mobile phone; as we were interested in limiting our sample to the young adult age range, we excluded any participants older than 35 years of age (some post-graduate students tend to be beyond this cut-off point); and, as the survey was administered in English, participants were required to be adequately competent in English. Despite Arabic being the official language of the citizens of the UAE, the university at which the study was conducted is an English-medium institution. All classes are taught in English and students are required to possess a substantially high level of proficiency in English to gain admission demonstrated by requisite scores on standardized English tests. Thus, we were confident that the administration of surveys in English would not be problematic, especially when considering that not all the assessment measures used in the study were available in Arabic.

The study received approval for its conduct from the internal review board in the Faculty of Humanities and Social Sciences at the first author's institution (Reference number: ERS_2018_5745).

2.2. Participants

A convenience sampling strategy was employed. All students who attended courses taught by the first author during the study's timeframe were invited to participate in the study. This consisted of a potential sampling frame of 353 participants. Only 3 declined to participate. Thus, a total of 350 participants consented to participate ($M = 20.70$, $SD = 2.14$, range: 18–33 years). Those participants who did not consent to participate in the study were not penalized and instead were provided with an alternate assignment from which equivalent extra credit could be earned. The complete sample was Emirati citizens and identified as Arab in terms of ethnicity. The wide age range allowed us to stratify the sample into two sub-groups, a young adult group (18–22 years, $n = 276$) and an older group (23–33 years, $n = 74$) to determine whether any differences between age groups might emerge. The majority of the sample was female (74.4%), unmarried (90.7%), and engaged in undergraduate study (91.1%). As a result, the sample tended to be primarily young adults in the 18 to 22 age range (77.7%).

2.3. Assessment measures

2.3.1. Demographic information

The following pieces of demographic information were collected: age, gender, number of years of education completed, current relationship status, whether they owned a smartphone, the number of hours per day that their mobile phone was used, and a subjective question about their own opinion about whether they engaged in problematic use of their mobile phone.

2.3.2. Problematic mobile phone use

The Problematic Mobile Phone Use Scale-10 (MPPUS-10, Foerster, Roser, Schoeni, & Röösl, 2015), is a shortened version of the longer 27-

item version, which we selected to assess participants' problematic usage of their mobile devices. The MPPUS is frequently employed in the study of problematic mobile phone use and various iterations have been validated across a great many languages and cultural contexts (Kalhori et al., 2015; López-Fernández, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014). The MPPUS-10 includes items to evaluate symptoms of craving, withdrawal, smartphone addiction, and the negative effects of problematic use on the individual's health and social functioning (Foerster et al., 2015). The 10-item version is highly correlated with the original, possesses excellent internal consistency, and concurrent validity (Foerster et al., 2015; Nahas et al., 2018). Items are scored to tally 10 points each with the scale's maximum possible score being 100. The literature is equivocal regarding which cut-off score should be used to determine problematic mobile phone use, but Nahas et al. (2018) suggested that, for the short version, a cut-off score of 59 should be used and, in the absence of alternate recommendations, for the purposes of the present study we have followed suit and adopted this suggestion in our analyses.

2.3.3. Depression

The 10-item version of The Centre for Epidemiological Studies Depression Scale (CESD-10) is a Likert scale questionnaire that assesses depressive symptoms in the past week (Andresen, Malmgren, Carter, Patrick, & Radloff, 1994). It includes three items on depressed affect, five items on somatic symptoms, and two on positive affect. Options for each item range from 0 ("rarely or none of the time") to 3 ("all of the time"). Scoring is reversed for items 5 and 8, which are positive affect statements. Total scores can range from 0 to 30 with higher scores indicative of greater severity. In Andresen's original study, a cut-off score of 10 on the CESD-10 was identified as optimal to identify individuals at risk of depression. Internal consistency for the CESD-10 tends to be high ($\alpha = 0.84\text{--}0.88$), including among samples from the Arabian Gulf region (Ghubash, Daradkeh, Al Naseri, Al Boushi, & Al Daheri, 2000; Kazarian & Taher, 2010).

2.3.4. Self-esteem

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1989) was used as an estimate of overall self-esteem. The 10 items are rated on a Likert scale from 1 ("totally disagree") to 4 ("totally agree"). Scores can range from 10 to a maximum of 40 with higher scores being reflective more positive self-esteem. Using Rosenberg's (1989) rules of thumb, self-esteem should be considered very low when the overall score is less than 25, low when scores are between 25 and 30, average for scores between 31 and 34, high for those between 35 and 39, and very high when scores are above 39. Internal consistency across a number of studies has been uniformly good, including among Arab populations (Abdel-Khalek, Korayem, & El-Nayal, 2012) with reported Cronbach's α values ranging from 0.74 to 0.88 (Boduszek, Hyland, Dhingra, & Mallett, 2013; Martín-Albo, Núñez, Navarro, & Grijalvo, 2007).

2.4. Data analytic strategy

We first computed means and standard deviations for the MPPUS-10, CES-D, and RSES variables. Recommended cut-off scores were used to determine the proportion of participants falling below and above the clinical cut-off for each variable. Means were compared for each variable between age-defined and gender-defined subgroups using a series of student's *t*-tests. Pearson's correlations were conducted between the three psychopathology variables and the demographic variables for two purposes; first, as a measure of the MPPUS-10's concurrent validity and, second, to provide an indication of potential predictor variables. Where significant associations were present, we conducted logistic regression analyses (enter method) using these variables to determine which predicted a higher tendency towards problematic mobile phone use. To examine the MPPUS-10's structural validity, an exploratory factor analysis using a principal components analysis with a varimax rotation

Table 1
Demographic characteristics of the sample.

| Variables | Total sample (n = 350) | Younger group (n = 276) | Older group (n = 74) |
|---|---------------------------|----------------------------|-------------------------|
| Older group (n = 74) | | | |
| Sex | | | |
| Male | 86 (24.2) | 71 (25.7) | 15 (20.3) |
| Female | 264 (74.4) | 205 (74.3) | 59 (79.7) |
| Age | 20.69 (21.4) | 19.85 (1.27) | 23.84 (1.74) |
| Level of education | | | |
| Undergraduate | 319 (91.1) | 274 (99.0) | 45 (60.8) |
| Postgraduate | 31 (8.9) | 2 (1.0) | 29 (39.2) |
| Marital status | | | |
| Single | 322 (92) | 259 (93.8) | 63 (85.1) |
| Married | 28 (8) | 17 (6.2) | 11 (14.9) |
| Mobile phone ownership | 350 (100) | 276 (100) | 74 (100) |
| Daily time using phone (hours) | 7.55 (4.12) | 7.51 (4.04) | 7.69 (4.43) |
| Subjective question - excessive use? | | | |
| Yes | 41 (11.7) | 30 (10.9) | 11 (14.9) |
| No | 309 (88.3) | 246 (89.1) | 63 (85.1) |

Note. Data are frequency (%) for categorical variables and Mean (SD) for continuous variables.

and Kaiser normalization was conducted. We also computed a Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy as indicators of the data's factorability.

3. Results

3.1. Demographic information

In addition to the demographic information outlined in the participants section above, the following three pieces of data were also procured from the demographic questionnaire. All participants reported owning a smartphone (100%). The number of daily hours of mobile phone use varied dramatically from 1 to 24 h but the majority were centred around the 3–10 h range ($M = 7.55$, $SD = 4.12$). Participants were also asked a subjective, closed-ended question ("Do you feel that you engage in problematic use of your mobile phone?") to which 11.7% responded in the affirmative. Table 1 illustrates frequencies for all the demographic variables (results are displayed for the complete sample as well as the two age-defined sub-groups).

3.2. Prevalence of problematic mobile phone use

Problematic mobile phone use was highly prevalent ($M = 47.14$, $SD = 19.98$). When MPPUS-10 scores were stratified using the recommended cut-off score of 59, a total of 102 participants fell above the cut-off, indicating that approximately 29% of this sample engage in problematic use of their mobile phones. When the sample was sub-divided into two age groups, a younger group that included those participants aged 18 to 22 years ($n = 276$) and those aged between 23 and 33 years ($n = 74$), MPPUS-10 mean scores did not significantly differ, ($M = 46.88$, $SD = 20.29$ vs $M = 48.12$, $SD = 18.87$ for younger and older groups, respectively, $t(348) = 0.47$, $p > .05$) nor were there differences between males and females ($t(348) = 0.48$, $p > .05$).

3.3. Prevalence of depression and low self-esteem

Depression was widespread in the sample ($M = 12.99$, $SD = 4.66$). On the CESD-10, using Andresen et al.'s (1994) recommendation of a cut-off score of 10, a total of 240 participants were deemed to be at high risk for depression, equating to a prevalence of 68.6%. Females more readily reported depressive symptomology compared to males ($t(348) = -2.98$, $p = .003$). Prevalence of risk for depression was

marginally higher in the younger-aged group (69.9%) compared to the older group (63.5%), although not significantly so. On the RSES, the sample produced scores in the normal range ($M = 20.86, SD = 5.07$). Fifty-five participants (15.7%) produced overall scores less than 15, indicative of low self-esteem. There were no differences on the RSES between males and females and between those in the younger and older groups.

Given that the three primary outcome variables showed significant associations between each other, particularly between problematic phone use and depression, which concurs with a preponderance of previous studies that have examined this subject, we tested whether low self-esteem might potentially influence this relationship. To do so, we conducted a mediational analysis using the PROCESS macro and the bootstrapping procedure described by Hayes (2013) to test the hypothesis that the relationship between problematic use and depression would be mediated by low self-esteem. This was not the case, as the confidence intervals for the model of the indirect path contained zero, indicating a non-significant model ($\beta = -0.19, SE = 0.18, 95\% CI [-0.56, 0.16]$).

3.4. Zero-order correlations between all variables

Computation of zero-order correlations between the primary variable (MMPUS-10), the two additional psychopathological variables (CESD-10 and RSES), and the demographic variables revealed a number of significant associations. The primary variable, problematic mobile phone use, was significantly and positively correlated with the number of hours of daily mobile phone use ($r = 0.23, p < .001$), subjective perception of problematic mobile phone use ($r = 0.13, p < .05$), and presence of depression symptomology ($r = 0.29, p < .001$), and negatively correlated with self-esteem ($r = -0.17, p = .001$). None of the other demographic variables were correlated with MMPUS-10 scores. While both psychopathological variables (depression and low self-esteem) were associated with problematic mobile phone use, providing evidence of the MMPUS-10's concurrent validity, they were also, expectedly, associated with each other ($r = -0.48, p < .001$). Table 2 illustrates means, standard deviations and zero-order correlations for all the demographic and outcome variables.

3.5. Variables predictive of problematic mobile phone use

Where significant associations were present between MMPUS-10 scores and the demographic or psychopathological variables, we subjected these variables to a logistic regression (enter method) to determine whether any of these predicted a greater likelihood of problematic mobile phone use. We also tested gender as a potential predictor as it has, in previous research (López-Fernández et al., 2017), been shown to predict problematic usage. A dependent variable was created by dichotomising MMPUS-10 scores thus rendering a categorical variable with two levels (scores below and above the cut-off of 59). In block 0, the overall model was not significant ($\chi^2(1) = 57.05, p > .05$).

Similarly, according to the Hosmer and Lemeshow test, the ranks were as expected and nonsignificant ($\chi^2(8) = 8.29, p > .05$). The addition of the inserted predictors, however, was significant ($\chi^2(15) = 39.49, p = .001, Nagelkerke R^2 = 0.15$) and the following specific variables emerged as statistically significant predictors: gender (females were more likely to produce higher MMPUS-10 scores, $B = 0.75, SE = 0.32, p < .05$), daily time spent using the mobile phone ($B = 0.09, SE = 0.03, p < .05$), and depression scores ($B = 0.10, SE = 0.03, p < .05$).

3.6. Validity and reliability of the MPPUS-10

To examine the measure's structural validity, we conducted an exploratory factor analysis using a principal components analysis with a varimax rotation and Kaiser normalization. This was verified as the most appropriate extraction and rotation method as the correlations between the factors resulting from this analysis in the component transformation matrix were all above 0.5. A highly significant Bartlett's test of sphericity ($\chi^2 = 1176.19, df = 45, p < .001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy (0.85) indicated that the data had adequate factorability. Using an eigenvalue of 1 as the cut-off, the analysis extracted two components that explained 54.29% of the total variance. This was confirmed by examination of a scree plot (see Fig. 1).

The first factor included six items (items 1, 2, 3, 4, 6, and 8) and explained 41.79% of the variance. These items all relate to the exaggerated emotional elements of mobile phone use (craving, dependency, emotional satisfaction, and withdrawal). We use the term, 'craving and dependency' to refer to this factor. The second factor comprised of items 5, 7, 9, and 10 and explained 12.49% of the variance. These four items all relate to the negative consequences of the respondent's mobile phone use behavior (impact on social relationships, the financial cost, and impairment to meeting obligations) and thus the term 'negative consequences' was retained to refer to this factor. We then tested, using a correlational analysis, whether any associations would emerge between these two factors and our demographic and psychopathological variables. Both factors 1 and 2 were significantly and positively associated with depression, daily hours spent using the mobile phone, and subjective report of problematic use, and conversely, they were negatively correlated with self-esteem.

Internal consistency of the MPPUS-10 was excellent (Cronbach's $\alpha = 0.84$). Table 3 provides a summary of the descriptive statistics for each item (M and SD), item-factor loadings for each item, and Cronbach's alpha values if each individual item were to be deleted. All item-factor loadings were adequate (above 0.5). All Cronbach's α values were equally satisfactory ($\alpha = 0.64-0.79$). These indicated that the measure did not require removal of any of the items to potentially improve its internal consistency.

Table 2
Correlational matrix for all demographic and outcome variables for the complete sample ($n = 350$).

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | M (SD) |
|-----------------------------|--------|--------|--------|-------|--------|--------|--------|---------|---------|----|---------------|
| 1. Gender | 1 | | | | | | | | | | |
| 2. Age | 0.15** | 1 | | | | | | | | | 20.70 (2.14) |
| 3. Level of education | 0.29** | 0.75** | 1 | | | | | | | | |
| 4. Relationship status | 0.12* | 0.26** | 0.24** | 1 | | | | | | | |
| 5. Type of mobile phone | -0.09 | -0.01 | -0.09 | -0.07 | 1 | | | | | | |
| 6. Daily use (hours) | 0.14** | -0.01 | 0.75 | 0.91 | 0.07 | 1 | | | | | 7.57 (4.18) |
| 7. Subjective opinion of PU | 0.01 | 0.11* | 0.13* | -0.04 | 0.11* | 0.08 | 1 | | | | |
| 8. MPPUS-10 | -0.03 | -0.00 | -0.04 | 0.02 | 0.12* | 0.23** | 0.13* | 1 | | | 47.14 (19.98) |
| 9. CESD-10 | 0.16** | -0.11* | -0.03 | -0.06 | 0.07 | 0.11* | 0.20** | 0.29** | 1 | | 12.99 (4.66) |
| 10. RSEC | 0.02 | 0.05 | 0.05 | 0.05 | -0.12* | -0.06 | -0.09 | -0.17** | -0.48** | 1 | 20.86 (5.07) |

Note. Means and standard deviations are provided for continuous variables. PU – problematic use. ** $p < .01, *p < .05$.

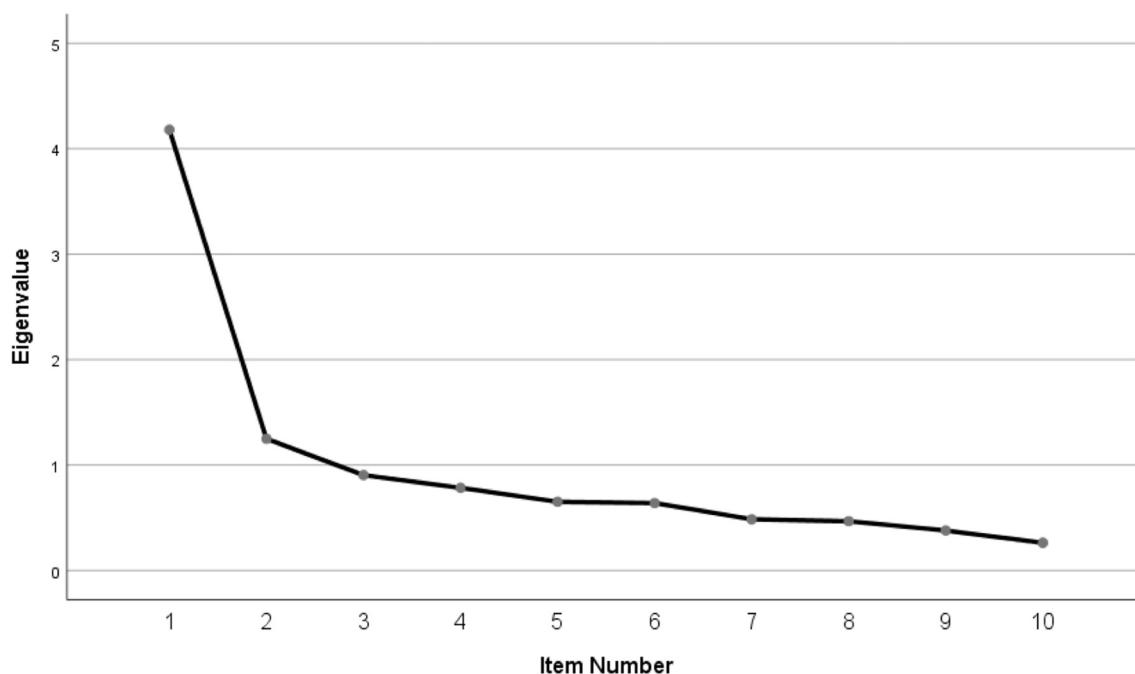


Fig. 1. Scree plot illustrating eigenvalues of the MMPUS-10 items.

4. Discussion

The objectives of this study were to investigate the prevalence of problematic mobile phone use in a sample of college-aged, young adults resident in the UAE and to determine potential predictors associated with dependence on mobile phones. This study provides the first empirical evidence of problematic mobile phone use in this country. It provides supportive evidence for the contention that ownership and use of mobile phones are ubiquitous in this demographic group (100% owned a mobile phone) and demonstrated that a relatively large proportion, almost one third of the sample, engaged in using their mobile phones in a manner that could be characterised as dependent and potentially addictive. Furthermore, the study also demonstrated that the MPPUS-10, a brief and commonly used measure of problematic use of mobile phones, is a psychometrically sound tool when used with a sample from this region of the world.

The prevalence of problematic mobile phone use was 29%. The number of studies that have investigated this phenomenon in other regions of the world is gaining momentum. These studies, conducted primarily with European and Far East Asian samples, have reported prevalence rates of problematic use far lower than the present study's approximation. Nahas et al.'s (2018) recent study found a 20% prevalence but included a sample of a much wider age range. This

collection of studies has reported a similar pattern of results – problematic use across a wide range, from very low rates to moderate prevalence, and a progressive reduction in the prevalence with increasing age of the sample. Thus, our finding of a prevalence rate that is measurably higher than any previous estimation is most likely, in part, the result of our explicit focus on a young adult group which many have suggested possess a greater proclivity for engaging in risky and unhealthy behaviors. Moreover, contextual and economic factors specific to the UAE may also have contributed. A rapidly developing society, a buoyant economy, the prevalence of wealth and economic stability, and the presence of a primarily young adult population culminate in a climate in which excessive ownership and problematic engagement with technological devices is likely.

While we have ascertained that use of mobile phones is high, the specific purposes and types of use remain undetermined. This is an important consideration given that previous studies have found differences between participants when type of use was considered. For example, individuals from Northern European countries have expressed a preference for engaging in solitary activities (e.g. gaming, reading, searching for information) (Kongaut & Bohlin, 2016), whereas those in Southern European countries use mobile phones to facilitate interpersonal activities (e.g. chatting, social networking) (Cambra &

Table 3
MPPUS-10 per-item means and standard deviations (Cronbach's $\alpha = 0.84$).

| Item | M (SD) | α if item deleted | Loading |
|--|-------------|--------------------------|---------|
| Factor 1 (Cronbach's $\alpha = 0.78$) | | | |
| 1. I have used my mobile phone to make myself feel better when I was feeling down. | 5.37 (3.37) | 0.749 | 0.649 |
| 2. When out of range for some time, I become preoccupied with the thought of missing a call. | 4.92 (3.46) | 0.750 | 0.554 |
| 3. If I don't have a mobile phone, my friends would find it hard to get in touch with me. | 7.33 (2.99) | 0.781 | 0.713 |
| 4. I feel anxious if I have not checked for messages or switched on my mobile phone for some time. | 5.40 (3.31) | 0.716 | 0.664 |
| 6. I find myself engaged on the mobile phone for longer periods of time than intended. | 5.89 (3.18) | 0.742 | 0.691 |
| 8. I find it difficult to switch off my mobile phone. | 4.87 (3.45) | 0.737 | 0.560 |
| Factor 2 (Cronbach's $\alpha = 0.76$) | | | |
| 5. My friends and family complain about my use of the mobile phone. | 3.48 (2.94) | 0.637 | 0.720 |
| 7. I am often late for appointments because I'm engaged on the mobile phone when I shouldn't be. | 3.24 (2.83) | 0.699 | 0.719 |
| 9. I have been told that I spend too much time on my mobile phone. | 4.42 (3.27) | 0.674 | 0.633 |
| 10. I have received mobile phone bills I could not afford to pay. | 2.21 (2.28) | 0.785 | 0.735 |

Herrero, 2013); but despite these differences with regard to type of use, they were equally problematic and similarly associated with heightened levels of dependence. We did not collect data on usage patterns on this occasion, but this remains a necessary course of action in future studies, as we know that the association between certain mobile uses/activities and problematic engagement is especially strong (e.g. mobile social networking applications appear to be significantly associated with mobile addiction, Salehan & Negahban, 2013). This is congruent with the now generally accepted notion that individuals may not necessarily be dependent on mobile phones per se, but on the activity that the device facilitates access to and engagement with (López-Fernández et al., 2017).

Our study also identified several predictors associated with increased likelihood of problematic mobile phone use. First, as expected, the amount of daily time spent using the device was related to objective measurement of problematic behavior, a finding that is consistent with previous findings (e.g. Lee, Chang, Lin, & Cheng, 2014; López-Fernández et al., 2017). Second, females tended to report higher scores on the MPPUS-10 which is indicative of greater problematic engagement. This is consistent with a number of prior investigations (Billieux et al., 2008; Demirci, Akgönül, & Akpınar, 2015; López-Fernández, Losada-Lopez, & Honrubia-Serrano, 2015; Nahas et al., 2018). We do not know whether the prevalence of problematic use is correlated with any specific mobile activities, as the latter was not assessed on this occasion, but López-Fernández et al. (2017) have suggested that the relationship between female gender and problematic use may be the result of the value females place on interpersonal communication. Thus, if the primary goal of engaging with mobile devices entails the establishment and maintenance of social relationships, perhaps via social networking applications, and gendered differences are obtained, this may be a potential explanation. An alternate explanation for the preponderance of females engaged in problematic mobile phone use is that this behavior may be an attempt at coping, albeit in a dysfunctional manner, with an unpleasant and unwanted affective state. This is a likely explanation given that females, or at least those resident in Western contexts, are more susceptible to experience depression and anxiety (Nolen-Hoeksema, 2001). Moreover, there is evidence to suggest that young adults frequently engage in dysfunctional coping strategies when facing life challenges, for example, problematic gaming (Gentile, 2009) and a reduction in direct interpersonal contact with others (Drouin, Kaiser, & Miller, 2015) have been noted. This explanation gains additional credence when one considers that, in the present study, depression was highly prevalent in the sample, and emerged as a significant predictor of engagement in problematic use. This is in concurrence with the literature which has found that a large proportion of individuals who meet the diagnostic criteria for major depression also evidence problematic mobile phone use, and this is especially the case among samples of adolescents and college-aged individuals (e.g. Demirci et al., 2015; Elhai et al., 2017; Yen et al., 2009), however, the specific nature of this relationship remains unclear. The evidence on which our understanding of this relationship is based is primarily correlational in nature. Thus, some scholars have suggested that depression may precede the emergence of problematic use as these individuals seek to remedy their sense of loneliness and disconnection from the social world (Bian & Leung, 2014). Others have posited that low self-esteem and social inadequacy, typical characteristics of those struggling with depression, may be the factors that connect depression and problematic use (Thadani & Cheung, 2011). Others still, have proposed, that because sleep is a central biological mechanism by which one's mood is regulated, individuals whose sleep is frequently disrupted or diminished following problematic use of their mobile phones may begin to evidence typical markers of depression such as lack of energy, difficulties concentrating, and daytime sleepiness (Demirci et al., 2015). Our data allowed us to test one possibility, that low self-esteem might, in part, explain some of the relationship between problematic use and depression. However, our mediation analysis was

not significant suggesting that, on this occasion, low self-esteem did not influence the obtained relationship. Our study though was correlational. Thus, even in the event of a significant mediational result, we would not be able to draw any conclusions about the temporal relationships between these variables.

4.1. Implications

This study draws attention to the startling finding that problematic use of mobile phones is highly prevalent in this location. And given that addictive use of varying forms of technology is increasingly being identified as a focus of clinical attention for researchers and clinicians, this study's findings suggest that resources should be devoted towards a greater understanding of the phenomenon in this part of the world. Specifically, investigations of risk factors, correlates, the range of poor negative health outcomes, and, of most importance, the development and evaluation of modes of treatment designed to manage the deleterious effects of problematic use are needed.

4.2. Limitations

Despite the novel findings demonstrated in this study, it is not without limitations. First, we used a convenience sample of university students. Even though this allowed access to a sample of our desired age (i.e. young adults), not all young adults attend university in the UAE. Some enrol vocational colleges (the military and police services are common). Thus, the choice of a convenience sample may affect the generalizability of the study's findings. The sample was also predominantly female, but this was not due to selection bias. Rather the sample's gender distribution is reflective of the university's profile which tends to consist of approximately 79% females. However, despite this, there are indications in the literature that problematic behaviors related to technology tend to present more frequently among women compared to men (Pezoa-Jares, Espinoza-Luna, & Medina, 2013). Thus, the preponderance of females in our sample is an acknowledged limitation as this may impact our study's external validity and the generalizability of our results. Second, the data were based on self-report measures that may be subject to social desirability and thus may affect the study's external validity. Mobile phone researchers have previously questioned the notion that participants are always aware of and willing to accurately report their behaviors (Boase & Ling, 2013), which is an assumption that all self-report measures are based on. We did not, as previously discussed, gather evidence of specific uses and activities for which participants used their mobile devices. This is an acknowledged limitation. But, as an initial investigation, the present study provides an overall determination of prevalence from which future studies should build upon. Future investigations should determine the extent to which specific mobile phone activities such as social networking, messaging, emails, internet surfing, and gaming is preferred so that predictive analyses for each type of activity can be computed. This will provide a more nuanced understanding of problematic mobile use.

Conflicts of interests

The authors declare no conflicts of interest.

References

- Abdel-Khalek, A. M., Korayem, A. S., & El-Nayal, M. A. (2012). Self-esteem among college students from four Arab countries. *Psychological Reports, 110*(1), 297–303. <https://doi.org/10.2466/07.09.17.PR0.110.1.297-303>.
- Andresen, E. M., Malmgren, J. A., Carter, W. B., Patrick, D. L., & Radloff, L. S. (1994). Screening for depression in well older adults: Evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *American Journal of Preventive Medicine, 10*, 77–84.
- Bian, M., & Leung, L. (2014). Smartphone addiction: Linking loneliness, shyness, symptoms and patterns of use to social capital. *Media Asia, 41*(2), 159–176.
- Bianchi, A., & Phillips, J. G. (2005). Psychological predictors of problem mobile phone

- use. *Cyberpsychology & Behavior*, 8(1), 39–51. <https://doi.org/10.1089/cpb.2005.8.39>.
- Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D. J., & Griffiths, M. D. (2015). Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. *Current Addiction Reports*, 2(2), 156–162.
- Billieux, J., Van der Linden, M., & Rochat, L. (2008). The role of impulsivity in actual and problematic use of the mobile phone. *Applied Cognitive Psychology*, 22, 1195–1210. <https://doi.org/10.1002/acp.1429>.
- Boase, J., & Ling, R. (2013). Measuring mobile phone use: Self-report versus log data. *Journal of Computer-Mediated Communication*, 18, 508–519. <https://doi.org/10.1111/jcc4.12021>.
- Boduszek, D., Hyland, P., Dhingra, K., & Mallett, J. (2013). The factor structure and composite reliability of the Rosenberg Self-Esteem Scale among ex-prisoners. *Personality and Individual Differences*, 55(8), 877–881.
- Cambra, U. C., & Herrero, S. G. (2013). Análisis motivacional del uso del smartphone entre jóvenes: Una investigación cualitativa [Motivational analysis of smartphone use among young people: A qualitative research]. *Historia y Comunicación Social*. Vol. 18. *Historia y Comunicación Social* (pp. 435–447).
- Demirci, K., Akgönül, M., & Akpinar, A. (2015). Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *Journal of Behavioral Addictions*, 4(2), 85–92.
- De-Sola, J., Talledo, H., de Fonseca, F. R., & Rubio, G. (2017). Prevalence of problematic cell phone use in an adult population in Spain as assessed by the Mobile Phone Problem Use Scale (MPPUS). *PLoS One*, 12(8), e0181184.
- Drouin, M., Kaiser, D., & Miller, D. A. (2015). Mobile phone dependency: What's all the buzz about? In L. D. Rosen, N. Cheever, & L. M. Carrier (Eds.). *The Wiley handbook of psychology, technology and society* (pp. 192–207). Chichester, UK: Wiley-Blackwell.
- Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders*, 207, 251–259.
- Fjeldsoe, J. S., Marshall, A. L., & Miller, Y. D. (2009). Behavior change interventions delivered by mobile telephone short-message service. *American Journal of Preventive Medicine*, 36, 165–173. <https://doi.org/10.1016/j.amepre.2008.09.040>.
- Foerster, M., Roser, K., Schoeni, A., & Röösli, M. (2015). Problematic mobile phone use in adolescents: Derivation of a short scale MPPUS-10. *International Journal of Public Health*, 60(2), 277–286. <https://doi.org/10.1007/s00038-015-0660-4>.
- Gentile, D. (2009). Pathological video-game use among youth ages 8 to 18: A national study. *Psychological Science*, 20(5), 594–602. <https://doi.org/10.1111/j.1467-9280.2009.02340.x>.
- Ghubash, R., Daradkeh, T. K., Al Naseri, K. S., Al Boushi, N. B. A., & Al Daheri, A. M. (2000). The performance of the Center for Epidemiological Studies-Depression Scale in an Arab female community. *International Journal of Social Psychiatry*, 46, 241–249.
- Haug, S., Castro, R. P., Kwon, M., Filler, A., Kowatsch, T., & Schaub, M. P. (2015). Smartphone use and smartphone addiction among young people in Switzerland. *Journal of Behavioral Addictions*, 4(4), 299–307.
- Hayes, A. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Press.
- Hwang, Y., & Park, N. (2017). Is smartphone addiction comparable between adolescents and adults? Examination of the degree of smartphone use, type of smartphone activities, and addiction levels among adolescents and adults. *International Telecommunications Policy Review*, 24(2), SSRN <https://ssrn.com/abstract=2997905>.
- ITU World Telecommunication/ICT Indicators Database (2017). Country ICT Data (Mobile cellular subscriptions until 2017). Retrieved December 21, 2018, from <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>.
- Kalhor, S. M., Mohammadi, M. R., Alavi, S. S., Jannatifard, F., Sepahbodi, G., Reisi, M. B., et al. (2015). Validation and psychometric properties of mobile phone problematic use scale (MPPUS) in University students of Tehran. *Iranian Journal of Psychiatry*, 10(1), 25–31.
- Kazarian, S. S., & Taher, D. (2010). Validation of the Arabic Center for Epidemiological Studies Depression (CES-D) scale in a Lebanese community sample. *European Journal of Psychological Assessment*, 26(1), 68–73. <https://doi.org/10.1027/1015-5759/a000010>.
- Kim, S., Kim, J., & Jee, Y. (2015). Relationship between smartphone addiction and physical activity in Chinese international students in Korea. *Journal of Behavioral Addictions*, 4(3), 200–205. <https://doi.org/10.1556/2006.4.2015.028>.
- Kongaut, C., & Bohlin, E. (2016). Investigating mobile broadband adoption and usage: A case of smartphones in Sweden. *Telematics and Informatics*, 33(3), 742–752. <https://doi.org/10.1016/j.tele.2015.12.002>.
- Lee, Y., Chang, C., Lin, Y., & Cheng, Z. (2014). The dark side of smartphone usage: Psychological traits, compulsive behavior and technostress. *Computers in Human Behavior*, 31, 373–383. <https://doi.org/10.1016/j.chb.2013.10.047>.
- Lepp, A., Barkley, J. E., & Karpinski, A. C. (2014). The relationship between cell phone use, academic performance, anxiety, and satisfaction with life in college students. *Computers in Human Behavior*, 31, 343–350.
- López-Fernández, O., Honrubia-Serrano, L., Freixa-Blanxart, M., & Gibson, W. (2014). Prevalence of problematic mobile phone use in British adolescents. *Cyberpsychology, Behavior and Social Networking*, 17(2) <https://doi.org/10.1089/cyber.2012.0260>.
- López-Fernández, O., Kuss, D. J., Romo, L., Morvan, Y., Kern, L., Graziani, P., et al. (2017). Self-reported dependence on mobile phones in young adults: A European cross-cultural empirical survey. *Journal of Behavioral Addictions*, 0, 1–10.
- López-Fernández, O., Losada-Lopez, J. L., & Honrubia-Serrano, M. (2015). A proposed method for the study of predictors for detecting excessive use of technology: Problematic Internet and mobile phone usage in adolescents. *Aloma*, 33(2), 49–58.
- Männikkö, N., Ruotsalainen, H., Demetovics, Z., López-Fernández, O., Myllymäki, L., Miettunen, J., & Kääräinen, M. (2018). Problematic gaming behavior among Finnish junior high school students: Relation to socio-demographics and gaming behavior characteristics. *Behavioral Medicine*, 44(4), 324–334. <https://doi.org/10.1080/08964289.2017.1378608>.
- Martín-Albo, J., Núñez, J. L., Navarro, J. G., & Grijalvo, F. (2007). The Rosenberg Self-Esteem Scale: Translation and validation in university students. *Spanish Journal of Psychology*, 10(2), 458–467.
- Nahas, M., Hlais, S., Saberian, C., & Antoun, J. (2018). Problematic smartphone use among Lebanese adults aged 18–65 years using MPPUS-10. *Computers in Human Behavior*, 87, 348–353. <https://doi.org/10.1016/j.chb.2018.06.009>.
- Nelson, L. J., & Padilla-Walker, L. (2013). Flourishing and floundering in emerging adult college students. *Emerging Adulthood*, 1(1), 67–78. <https://doi.org/10.1177/2167696812470938>.
- Nicol, A., & Fleming, M. J. (2010). “I h8 u”: The influence of normative beliefs and hostile response selection in predicting adolescents’ mobile phone aggression – A pilot study. *Journal of School Violence*, 9, 212–231. <https://doi.org/10.1080/15388220903585861>.
- Nolen-Hoeksema, S. (2001). Gender differences in depression. *Current Directions in Psychological Science*, 10(5), 173–176. <https://doi.org/10.1192/bjpp.177.6.486>.
- Norris, L., Swartz, L., & Tomlinson, M. (2013). Mobile phone technology for improved mental health care in South Africa: Possibilities and challenges. *South African Journal of Psychology*, 43(3), 379–388. <https://doi.org/10.1177/0081246313493376>.
- Pezoa-Jares, R. E., Espinoza-Luna, I. L., & Medina, J. A. V. (2013). Internet addiction: A review. *Journal of Addiction Research & Therapy*, 8, 292e298. <http://dx.doi.org/10.4172/2155-6105.1000004>.
- Randler, C., Wolfgang, L., Matt, K., Demirhan, E., Horzum, M. B., & Beşoluk, Ş. (2016). Smartphone addiction proneness in relation to sleep and morningness-eveningness in German adolescents. *Journal of Behavioral Addictions*, 5(3), 465–473.
- Rosenberg, M. (1989). *Society and the adolescent self-image*. Middletown, CT: Wesleyan University Press.
- Salehan, M., & Negahban, A. (2013). Social networking on smartphones: When mobile phones become addictive. *Computers in Human Behavior*, 29(6), 2632–2639. <https://doi.org/10.1016/j.chb.2013.07.003>.
- Selwyn, N. (2009). The digital native – Myth and reality. *ASLIB Proceedings*, 61(4), 364–379. <https://doi.org/10.1108/00012530910973776>.
- Teo, T. (2013). An initial development and validation of a Digital Natives Assessment Scale (DNAS). *Computers & Education*, 67, 51–57. <https://doi.org/10.1016/j.compedu.2013.02.012>.
- Thadani, D. R., & Cheung, C. M. K. (2011). Online Social Network Dependency: Theoretical Development and Testing of Competing Models. *Proceedings of the 44th Hawaii International Conference on System Sciences*.
- Thomé, S., Härenstam, A., & Hagberg, M. (2011). Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults—a prospective cohort study. *BMC Public Health*, 11(1), 66.
- Tsai, A. C., Tomlinson, M., Dewing, S., le Roux, I. M., Harwood, J. M., Chopra, M., & Rotheram-Borus, M. J. (2014). Antenatal depression case finding by community health workers in South Africa: Feasibility of a mobile phone application. *Archives of Women's Mental Health*, 17(5), 423–431.
- Watts, S., Mackenzie, A., Thomas, C., Griskaitis, A., Mewton, L., Williams, A., & Andrews, G. (2013). CBT for depression: A pilot RCT comparing mobile phone vs. computer. *BMC Psychiatry*, 13, 49. <https://doi.org/10.1186/1471-244X-13-49>.
- White, M. P., Eiser, J. R., & Harris, P. R. (2004). Risk perceptions of mobile phone use while driving. *Risk Analysis*, 24, 323–334. <https://doi.org/10.1111/j.0272-4332.2004.00434.x>.
- Yen, C.-F., Tang, T.-C., Yen, J.-U., Lin, H.-C., Huang, C.-F., Liu, S.-C., & Ko, C.-H. (2009). Symptoms of problematic cellular phone use, functional impairment and its association with depression among adolescents in Southern Taiwan. *Journal of Adolescence*, 32(4), 863–873.