Alleviating depression only to become problematic mobile phone users: Can face-to-face communication be the antidote?

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Alleviating depression only to become problematic mobile phone users: Can face-to-face communication be the antidote?

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\begin{abstract}
With the increasing penetration of mobile phones, problematic use of mobile phone (PUMP) deserves attention. In this study, using a path model we examined the relationship between depression and PUMP, with motivations as mediators. Findings suggest that depressed people may rely on mobile phone to alleviate their negative feelings and spend more time on communication activities via mobile phone, which in turn can deteriorate into PUMP. However, face-to-face communication with others played a moderating role, weakening the link between use of mobile phone for communication activities and deterioration to PUMP.
\end{abstract}

1. Introduction

Mobile phone has become so pervasive that 90\% of American adults own a mobile phone, and 58\% of them are smartphone users (PewResearch, 2014). At its core, mobile phone is an interpersonal communication technology and its main function is to connect people. Therefore, it is natural to assume that heavy users of mobile phones would be less lonely and more connected with others, thus improving their psychological well-being. However, a mobile phone, especially a smartphone, is more than a connectivity device. It offers diverse features and functions such as games, texting, and Internet browsing in addition to being a telephone, which draws some users to use the phone not just as a tool but as a device for play and temporary relief from their negative status. Anything in excess is not healthy, and as Edgar Allen Poe lamented, some people cannot regulate their excessive use of mobile phone although they do not take much pleasure from it. Pertaining to excessive use, there is a growing body of research on the potential pathology of mobile phone use (e.g., Billieux, 2012; Billieux, Van der Linden, D’Acremont, Ceschi, & Zermatten, 2007; Kamibeppu & Sugiuira, 2005; Merlo, Stone, & Bibbely, 2013). The ease of use and accessibility of diverse features that are available at any time in a mobile phone becomes a trap for some users who quickly develop dysfunctional habits, such as constantly checking mobile phone without specific goals (Oulasvirta, Rattenbury, Ma, & Raita, 2012), which grows rapidly into problematic use (Park, 2005). Studies have shown that compulsive and excessive mobile phone use leads to sleep disturbance (Thomee, Harenstam, & Hagberg, 2011), psychological distress (Chesley, 2005), and financial problems (Billieux, Van der Linden, & Rochat, 2008). Among possible contributors of problematic use of mobile phone, in this paper we focus on depression as a key antecedent (e.g., Caplan, 2007; LaRose, Lin, & Eastin, 2003). Further, we examine the mediating role of motivations and the amount of time spent on communication activities available via mobile phones such as social media, texting, and email. Integrating these constructs, we tested a hypothesized path model that connects depression, mood alleviation and pass-time motivations for mobile phone use, time spent on communication activities via mobile phone, and problematic use of mobile phone. Further, we examined whether the amount of time spent on face-to-face (FtF) communication, which is known to enhance psychological well-being and increase...
positive mood (Pea et al., 2012), moderates the path from depression to problematic use of mobile phone.

2. Literature Review and Hypotheses

2.1. Problematic use of mobile phone and the Internet

Using the term “addiction” for problematic mobile phone use is controversial. Still, the fact that addiction to TV (e.g., Horvath, 2004; Winn, 1977) or the Internet (e.g., Davis, 2001) has been used in the past serves as the foundation for associating addiction and media. In terms of mobile phones, some people experience excessive or uncontrolled use of mobile phones (Billieux, 2012), which shares similarities to other behavioral addictions, such as pathological gambling, compulsive shopping or video game addition (Chóliz, 2010). Unregulated mobile phone use symptoms include preoccupation with mobile phone-based communication activities, excessive use with a high economic cost, using mobile phone to alleviate unpleasant mood, interference with other activities in daily life such as problems with family and friends as well as interference with school or other activities, using mobile phone in socially inappropriate or physically dangerous situations (e.g., texting while driving), and emotional frustration when mobile phone use is inhibited (Bianchi & Phillips, 2005; Chóliz, 2010; Chóliz & Villanueva, 2009; Jenario, Flores, Gómez-Vela, González-Gil, & Caballo, 2007; Toda, Monden, Kubo, & Morimoto, 2006). Although problematic use of mobile phones does not involve any chemical or substance, the aforementioned list of cognitive symptoms shares common characteristics with substance addiction as listed in DSM-IV (Diagnostic and Statistical Manual of Mental Disorders) (American Psychiatric Association, 2006): preoccupation with and obsessive thoughts about mobile phone (craving), spending more and more time on mobile phones to the point that some users cannot afford mobile phone costs (tolerance), experiencing anxiety when not using mobile phones (withdrawal), diminished impulse control and inability to cease mobile phone use to the point that users have to look at mobile phone even while driving, and the feeling that other activities that used to be fun are no longer enjoyable.

Among diverse cases of problematic or addictive use of media, the current study suggests a pertinent connection between problematic use of mobile phone and problematic use of the Internet. This is because a wide range of activities and features available on mobile phones (especially smartphones) are Internet-based (e.g., social media, Internet browsing, chatting, managing emails, playing games) (Billieux, 2012), and mobile phone has replaced computers for majority of online activities. Furthermore, a group of prior researchers has found some common characteristics between excessive mobile phone use and unhealthy use of the Internet (e.g., excessive use and intermittent craving to engage in online activities) (Ezoe & Toda, 2013) as well as a positive correlation between the two (Ha, Chin, Park, Ryu, & Yu, 2008). Still, with its ubiquitous presence and using all the online functions without being constrained to any specific place, mobile phones have the potential to be even more disruptive than a desktop-or laptop-based Internet. Such excessive mobile phone use has been called problematic mobile phone use (Chóliz, 2010; Takao, Takahashi, & Kitamura, 2009) or mobile phone addiction (Leung, 2008; Park, 2005), and the current study will use the term problematic use of mobile phone (we will use the term “PUMP” as an abbreviation from now on) for this phenomenon.

2.2. Psychological ill-being and PUMP

Individuals’ psychological conditions influence people’s media user behaviors and outcomes. Lonely or depressed people, for instance, tend to seek an immediate diversion from their problems such as watching TV or browsing the Internet, even though they know it is a temporal relief (Young, 2007). Given that today’s mobile phone has become one of the most accessible and ubiquitous media, it is natural to assume that people would use their mobile phones to alleviate stress and tension. However, relying on mobile phones does not guarantee that it would provide long-term relief from problems or resolve original issues. Rather, using mobile phone as a temporal relief could worsen psychological conditions and even drag the user into unregulated and problematic mobile phone use. This proposition was supported by a group of studies (e.g., Ha et al., 2008; Smetaniuk, 2014) showing that depression, low self-esteem, and emotional instability led to excessive and problematic mobile phone use.

Such positive association between users’ psychological ill-being and PUMP also can be explained by a theoretical perspective called social enhancement model (Kraut et al., 2002). This model is also called “the rich get richer, the poor get poorer” model, because it posits that those who already have affluent social resources enjoy more benefits from using media, while problems are only compounded for those who have psychological or social deficits, thus limiting the benefits of media experiences. In other words, individuals with psychological problems are not only unable to relieve their original problems through media, but also are more vulnerable to the trap of problematic media use than those who exhibit a healthier psychological makeup (Caplan, 2007; LaRose et al., 2003). Given that the Internet provides diverse functions or features that can distract people from their problems, the social enhancement model has been applied to the Internet-based services. Specifically, depressed people rely on the Internet expecting that it can alleviate their psychological problems (Morahan-Martin, 2007; Morahan-Martin & Schumacher, 2000) because they believe the Internet is relatively less risky and easier than face-to-face interaction to get support and build relationships. However, deficiency in self-regulation, which is a common manifestation among those with depression, makes it difficult for them to maintain a healthy level and amount of Internet use (Bandura, 1999). Such loss of control over the Internet use leads to more social isolation, forcing the depressed go back to the only option—the Internet—, thus causing a cascade of problematic Internet use (Kim, LaRose, & Peng, 2009). Because most of the frequently used functions and features on today’s mobile phones are Internet-based (e.g., Internet messaging or chatting, online games, social network sites), we predicted the positive association between psychological ill-being and problematic Internet use would be replicated for mobile phone. Thus, the present study suggests that those who have a high level of depression would rely on mobile phone as an attempt for temporary relief, but eventually they are more likely to deteriorate into PUMP.

H1. Depression will be positively associated with problematic use of mobile phone (PUMP).

2.3. Motivations to use mobile phone and PUMP

Besides depression, certain motivations also are associated with PUMP. Among various motivations, two that are closely associated with individuals with depression are alleviation motivation and pass-time motivation. Alleviation motivation is triggered when one uses a specific medium to moderate or improve negative moods (Bandura, 1986; Rubin, 1983). Relying on mobile phone as a way to alleviate negative mood has been found to be associated with unregulated mobile phone use (e.g., Chóliz, 2010; Chóliz & Villanueva, 2009; Toda et al., 2006). Although their initial intention is to alleviate their negative status temporarily, depressed people
have a higher chance of engaging in problematic media use because of their inability to self-regulate (Kim et al., 2009; Park, 2005), which will not eliminate their original problems but rather add a new problem—PUMP in the case of mobile phone.

In addition to alleviation motivation, depressed people are found to use mobile phone just to pass time more than those who are psychologically healthy. According to Park’s (2005) study on mobile phone addiction, those who use mobile phone in a ritualistic manner are more prone to develop mobile phone addiction than those who use mobile phone with instrumental motivations such as information seeking. Those who are using a specific medium out of habit or just to pass time tend to have a high affinity with the medium itself, while people who are using the medium with instrumental motivations tend to be attached to specific content or functions (Rubin, 1983). Therefore, habitual users would be dependent or addicted to mobile phone itself and tend to engage in different communication activities available on mobile phone (e.g., texting, email, social media) without specific and clear goals in mind.

H2. Individuals who are depressed would be motivated to use mobile phone as a way to (a) alleviate their negative feelings, and (b) pass time.

H3. (a) Alleviation motivation and (b) pass-time motivation are positively associated with communication activities (texting, email, and social media) available via mobile phone.

H4. Using mobile phone as a way to (a) alleviate negative feelings, and (b) pass time is positively associated with problematic use of mobile phone (PUMP).

2.4. Diverse communication activities via mobile phone

Increasingly, mobile phone is used for common online activities replacing personal computers. According to Nielsen (2012), 47% of the world’s social media use is carried out via mobile devices. In Singapore, 70% of the traffic in social network sites comes from mobile phones (smartphones). In the U.S., both Facebook and Twitter users spend more time on these services via mobile devices (7 h/day and 2 h/day respectively) than via personal computers (6 h/day and 20 min/day respectively) (CNET., 2012). In general, the amount of time spent on a media activity has been found to be positively correlated with problematic media use. For example, time spent online is associated with Internet addiction (Leung, 2004; Widyanto & McMurran, 2004), and those who watch TV a lot are more likely to be addicted to TV (Horvath, 2004). Thus, it is reasonable to predict that spending much time on diverse communication activities (texting, emails, SNS) via mobile phone can increase the likelihood of PUMP (Chóliz, Villanueva, & Chóliz, 2009).

H5. The amount of time spent on communication activities via mobile phone (texting, emails, and social network sites) will be positively associated with problematic use of mobile phone (PUMP).

In sum, it is suggested that the depressed rely on mobile phone as a way to actively alleviate negative affect states or ritualistically pass time. But users who use mobile phones mainly from these motivations tend to engage in PUMP because of inability to regulate and moderate excessive use, one of the indicators of the depressed. Rather than achieving what they want—mitigating depression or alleviating their negative state—they fall into a cycle of problematic use as hypothesized in the following path model (Fig. 1).

2.5. Face-to-face communication and PUMP

One variable that has been rarely studied in media research is Face-to-Face (FtF) interaction and its role on bolstering or diminishing media’s negative/positive effects. An exception is a study by Pea et al. (2012) who found FtF communication creates positive social feelings among teenage girls. Furthermore, they found that girls who have frequent FtF interactions reported less need to use media and experienced fewer distractions compared to those who spent less time on FtF interaction. Expecting FtF communication to play an important role as an “antidote” to negative effects of heavy media use, we examined FtF as a moderator of PUMP in the proposed model in Fig. 1.

RQ 1. What is the moderating effect of FtF communication in the proposed path model for problematic use of mobile phone (PUMP)?

3. Method

3.1. Data collection

Data used in this study were collected from a national sample in the U.S. using an online survey during July and August of 2013. Survey participants consisted of 395 adults recruited through the Amazon Mechanical Turk, a crowdsourcing Internet marketplace used for posting work for pay. Recent research indicated that Mechanical Turk workers were fairly representative of the population of U.S. Internet users (see Ross, Irani, Silberman, Zaldivar, & Tomlinson, 2010 cited in Paolacci, Chandler, & Ipeirotis, 2010). Participants were offered a modest incentive ranging from 1 dollar to 1.5 dollars. Their ages ranged from 18 to 68 years (M = 31.64, SD = 9.69) and about a half of them were male (52.9%) and three-fourths of the sample (77.6%) was Caucasian.

3.2. Measures

3.2.1. Depression

Depression was measured using a 10-item Center for Epidemiologic Studies Depression (CES-D) scale (Radloff, 1977). On a 4-point scale, participants were asked how often they experienced ten depression symptoms (e.g., felt that everything I did was an effort, felt lonely, my sleep was restless) during the past week [1 = rarely or none of the time (less than one day); 2 = some or a little of the time (1–2 days); 3 = occasionally or a moderate amount of the time (3–4 days); 4 = most or all of the time (5–7 days)]. Responses were later averaged to create a composite score of depression (M = 1.77, SD = .58, α = .88).

3.2.2. Motivations for mobile phone use

Alleviation and pass-time motivations were measured by a set of questions commonly used to measure mobile phone use motivations (Jin & Villegas, 2008; Leung & Wei, 2000; Park & Lee, 2012). All of these items were not initially designed for measuring mobile phone motivations, but modified for mobile phone from TV and Internet use (Kim & Haridakis, 2009; Korgaonkar & Wolin, 1999). With uses and gratification (Rubin, 1983) as the common theoretical core, media use motivation questionnaires can be used interchangeably across different media with some minor modifications. Pass-time motivation items included “I need something to do,” “I want to pass time”, and alleviation motivation items included “It makes me feel less lonely,” “I don’t want to be alone” (see Table 1 for all the items used for this study). These items were rated on a 5-point scale (1 = Strongly disagree, 5 = Strongly agree). An exploratory factor analysis (EFA) with principal axis factoring
extraction and promax rotation was conducted. Promax rotation was chosen because we assumed that the two factors of mobile phone use motivation are potentially correlated. After eliminating items with factor loadings less than 0.5 and with cross loadings that were within 0.2, eight items were retained. Four items loaded on the pass-time motivation factor ($M = 4.76$, $SD = 0.93$, $a = .85$), which accounted for 42% of the variance, and four items loaded on the alleviation motivation factor ($M = 3.49$, $SD = 1.13$, $a = .80$), which accounted for 15% of the variance (see Table 1 for list of items).

Subsequently, we ran a confirmatory factor analysis (CFA) to confirm model fit by analyzing two measurement models: (1) single-factor model and (2) two-factor model. CFA results indicated that the two factor model had significantly better fit than the single-factor model, $CFI = .97$, $TLI = .96$, $SRMR = .05$, $RMSEA = .07$ (90% CI [.05,.09]), $\Delta \chi^2 = 325$, $\Delta df = 1$, $p < .001$.

### 3.2.3. Time spent on FtF communication

FtF communication was measured with one item “In a typical day, how much time you spend doing face-to-face communication or interaction with others (e.g., family, friends, roommates, etc.)?”, which is modified from Pea et al.’s study (2012). To reduce the possibility of participants’ writing down outliers, we used a drop-down menu and asked participants to choose how many hours and minutes they spent on FtF communication in a typical day and the data were transformed into minutes ($M = 237.15$, $SD = 206.47$).

### 3.2.4. Time spent on communication activities via mobile phone

Using the same scale used for time spent on FtF communication, three questions were asked to assess time spent on communication activities via mobile phone: in a typical day, how many minutes they (a) use social media (e.g., Facebook, Twitter) ($M = 93.10$, $SD = 104.86$), (b) communicate via text messages or IM (Instant messenger) ($M = 78.92$, $SD = 111.18$), and (c) communicate via email ($M = 60.10$, $SD = 96.11$). Answers to three questions were later summed to create a summative index of CMC ($M = 232.12$, $SD = 224.54$).

### 3.2.5. Problematic use of mobile phone (PUMP)

Although there are a group of published measures in extant literatures (e.g., MPPUS by Bianchi and Phillips (2005); PMPUQ by Billieux (2012); MPDQ by Toda et al. (2006)), there is no single consensus measure for problematic mobile phone use. Still, as in the case of mobile phone use motivation scale, most published scales commonly rely on symptoms or indicators of substance addiction or Internet addiction scales, such as craving, tolerance, withdrawal, and negative life outcomes.

Thus, the present study used a modified version of an existing scale used for measuring problematic Internet use (Kim & Haridakis, 2009). This scale was chosen because (1) it was composed of existing items from diverse problematic media use scales (Horvath, 2004; Young, 1996) based on DSM-IV (American Psychiatric Association, 2006), and (2) it was tested and proven for reorganization of the existing items from diverse problematic media use scales into two distinctive dimensions of the Internet addiction, and we wanted to test if the same dimensions can be found in problematic mobile phone use. The first dimension consisted of items that explained the disruptive nature of Internet use on offline activities, and the other dimension consisted of items indicative of placing higher priority on online activities than important activities of everyday life. The first dimension, namely disruption, is a manifestation of awareness of problematic Internet use but the inability to overcome the problematic behaviors. The second dimension, namely dysregulation, is characterized by the anger or frustration when others or other activities hinder the online experience. Thus, disruption reflects a state in which online activities interfere with offline activities, yet online activities do not become the primary domain of their lives. Meanwhile, dysregulation reflects a state wherein online activities displace offline activities, and for these users the Internet becomes the central sphere in their lives. If healthy Internet use refers to using the Internet without cognitive discomfort or serious conflicts with other daily activities, such as spending time with friends and family (Davis, 2001), these two dimensions signify rather unhealthy or problematic use of the Internet.

![Fig. 1. The hypothesized model of Problematic Use of Mobile Phone (PUMP).](image)
Therefore, in the present study, PUMP was measured by modified items from Kim and Haridakis’ problematic Internet use scale (2009) asking participants how often (1 = Never, 5 = Always) they engaged in 16 behaviors indicative of problematic use (e.g., I tend to use my mobile phone longer than I would like to; I have tried to cut down on my mobile phone use, but failed; Prefer playing with mobile phone over interacting with family or friends; If I cannot use my mobile phone, I miss it so much that I am upset). An EFA with principal axis factoring extraction and promax rotation was conducted and items with a primary factor loading greater than .50 and with cross-loadings greater than .20 were retained. This process yielded two factors with eigenvalues greater than 1, which were similar to the factors extracted in the problematic Internet use study (Kim & Haridakis, 2009). Four items loaded on the primary factor (disruption) that explained 46% of the variance and four items loaded on the secondary factor (dysregulation) that explained 8% of the variance (see Table 2 for items). Items that loaded on disruption (M = 2.51, SD = 0.89, α = .82) and dysregulation (M = 1.84, SD = 0.83, α = .83) were averaged separately to create composite scores and the two dimensions were strongly correlated (r = .64). Items extracted from EFA were subjected to CFA and the single-factor model was compared to the two-factor model. The two-factor model had a significantly better fit than the one-factor model (Δχ² = 175.4, Δdf = 2), and the fit indices were acceptable, though below conventional standards, CFI = .95, TLI = .92, SRMR = .04, RMSEA = .10 (90% CI [.08, .13]). This result shows that the two dimensions (disruption and dysregulation) found in the problematic Internet use can be also applied to problematic mobile phone use.

4. Results

To test hypotheses, a path analysis was fitted using maximum likelihood estimation in Mplus7 (Muthén & Muthén, 1998-2012) for the model presented in Fig. 1. The model showed an excellent fit, χ² (2) = 2.30, p = .32, CFI = .99, TLI = .99, RMSEA = .02. Within the model, the positive association between depression and PUMP predicted in H1 was supported and the standardized path coefficient (β = .18, SE = .06, p < .001) was statistically significant. Also, our findings supported H2a, which predicted that depression is positively associated with alleviation motivation (β = .33, SE = .05, p < .001). However, H2b, which posited a positive association between depression and pass-time motivation, was not supported (β = .09, SE = .06, p = .11).

The next set of hypotheses predicted positive relationships between motivations for mobile phone use and time spent on communication activities via mobile phone. As expected, alleviation motivation was positively associated with communication activities (i.e., texting, email, and social media) via mobile phone (β = .14, SE = .06, p < .05). Therefore, H3a was supported. However, H3b, which posited a positive association between pass-time motivation and communication activities via mobile phone, was not supported (β = .11, SE = .06, p = .09).

Relationships posited between motivations for mobile phone use and PUMP (H4a and H4b) were examined next. As predicted in H4a, using mobile phone to alleviate negative mood was positively related to PUMP (β = .37, SE = .06, p < .001) as was using mobile phone as a way to pass time (β = .26, SE = .06, p < .001). Therefore, both H4a and H4b were supported.

H5 predicted that time spent on communication activities via mobile phone would be positively associated with PUMP. As predicted, those who spent more time interacting with others through texting, emails and social network sites reported higher levels of PUMP (β = .16, SE = .05, p < .01). Therefore, H5 was also supported. All the path coefficients are shown in the following Fig. 2.

As an additional analysis, indirect effects of depression on PUMP through motivations and time spent on communication activities via mobile phones were examined (see Table 3). While the indirect

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**Table 2**

<table>
<thead>
<tr>
<th>Factor loadings</th>
<th>Disruption</th>
<th>Dysregulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would be more productive without using my mobile phone so much</td>
<td>.83</td>
<td>-.10</td>
</tr>
<tr>
<td>Using my mobile phone longer than I intended</td>
<td>.79</td>
<td>-.02</td>
</tr>
<tr>
<td>Would enjoy more hobbies if I used my mobile phone less</td>
<td>.64</td>
<td>.11</td>
</tr>
<tr>
<td>Lose track of time when I am doing one thing or another on my mobile phone</td>
<td>.54</td>
<td>.20</td>
</tr>
<tr>
<td>Snap, yell, or act annoyed if others bother me when I am using my mobile phone</td>
<td>-.15</td>
<td>.92</td>
</tr>
<tr>
<td>If I cannot use my mobile phone, I miss it so much that I am upset</td>
<td>.04</td>
<td>.71</td>
</tr>
<tr>
<td>Others complain about the amount of time I spend with my mobile phone</td>
<td>.22</td>
<td>.58</td>
</tr>
<tr>
<td>Prefer playing with my mobile phone to interaction with friends and family</td>
<td>.14</td>
<td>.55</td>
</tr>
</tbody>
</table>

*Note. *p < .05, ”p < .01, ””p < .001. Dotted arrows denote paths that are not statistically significant. Model fit: χ² (2) = 2.30, p = .32, CFI = .99, TLI = .99, RMSEA = .02.

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![Fig. 2](image-url). The hypothesized model of Problematic Use of Mobile Phone (PUMP), standardized coefficients (SE). Note: *p < .05, ”p < .01, ””p < .001. Dotted arrows denote paths that are not statistically significant. Model fit: χ² (2) = 2.30, p = .32, CFI = .99, TLI = .99, RMSEA = .02.
effect through alleviation motivation was significant ($\beta = .12, SE = .03, p < .001$), the indirect effect through pass-time motivation was not significant ($\beta = .02, SE = .02, p = .13$). Further, for both of these paths, the time spent on communication activities via mobile phone was added as an additional mediator and indirect effects were examined. Neither was significant, though Depression $\rightarrow$ Alleviation motivation $\rightarrow$ Communication activities via mobile phone $\rightarrow$ PUMP path ($\beta = .01, SE = .004, p = .06$) was tending toward significance. The indirect effect of Depression $\rightarrow$ Alleviation $\rightarrow$ Communication activities via mobile phone ($\beta = .06, SE = .02, p = .02$) also turned out to be significant.

In the last step, we examined whether there is a difference in the hypothesized path model contingent on the amount of time spent on FtF communication—the moderating effect of FtF communication (RQ1). Low and high FtF communication groups were created through a median split and participants in the first group reported less than 180 min of FtF communication per day, while participants in the second group reported 195–1200 min on FtF communication per day. To compare these two groups, a multi-group analysis was conducted. In this analysis, each causal path was constrained equally across the two groups at a time, and a model with each constrained path was contrasted against the fully unconstrained model. If the $\chi^2$ value of a model with any constrained path became significantly worse than that of the fully unconstrained model, the coefficient of the constrained path was identified as significantly different between the two groups (Kline, 1998).

Table 3

<table>
<thead>
<tr>
<th></th>
<th>All participants</th>
<th>Low FtF</th>
<th>High FtF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct effect</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression $\rightarrow$ PUMP</td>
<td>.18 (.06)**</td>
<td>.15 (.07)**</td>
<td>.22 (.08)**</td>
</tr>
<tr>
<td><strong>Indirect effect</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression $\rightarrow$ Alleviation $\rightarrow$ PUMP</td>
<td>.12 (.03)**</td>
<td>.10 (.04)**</td>
<td>.13 (.04)**</td>
</tr>
<tr>
<td>Depression $\rightarrow$ Pass-time $\rightarrow$ PUMP</td>
<td>.02 (.02)</td>
<td>.02 (.03)</td>
<td>.02 (.02)</td>
</tr>
<tr>
<td>Depression $\rightarrow$ Alleviation $\rightarrow$ Comm activities $\rightarrow$ PUMP</td>
<td>.01 (.004)</td>
<td>.01 (.008)</td>
<td>.01 (.01)</td>
</tr>
<tr>
<td>Depression $\rightarrow$ Pass-time $\rightarrow$ Comm activities $\rightarrow$ PUMP</td>
<td>.002 (.001)</td>
<td>.002 (.003)</td>
<td>.001 (.002)</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01, ***p < .001. Note: Numbers in table are standardized coefficients (SE).

The unconstrained model showed a good fit, $\chi^2 (6) = 4.75, p = .58$, CFI = 1.000, TLI = 1.015, RMSEA = .000. From the multi-group analysis, the path from Communication activities via mobile phone to PUMP ("a" in Fig. 3) turned out to be the only significantly different path between low ($\beta = .25, SE = .06, p < .001$) and high ($\beta = .14, SE = .06, n.s.$) FtF communication conditions, $\Delta \chi^2 (1) = 4.29, p = .04$. Path coefficients of both of the path models of low and high FtF communication groups are shown in Fig. 3. Further, to examine indirect paths, effect decomposition was computed separately for low and high-FtF communication groups (see Table 3).

5. Discussion

The current study investigated the association between depression and PUMP through two different motivations for mobile phone use—alleviation motivation and pass-time motivation—and time spent on communication activities via mobile phone. The hypothesized path model was based on the poor-get-poorer perspective, and we examined whether this model can be extended to unhealthy mobile phone use. Depressed people may rely on mobile phone as a temporary remedy to relieve their negative emotion (i.e., through alleviation motivation), which leads to more time spent on communication via mobile phone. However, reliance on mobile phone as an emotional antidote without actually dealing with the source of depression is neither healthy nor constructive. The lack of self-regulation and capacity to moderate the undue reliance on mobile phone among those who are depressed may lead to a cascading dependency on mobile phone, in essence supporting the poor-get-poorer perspective.

In addition to the direct effect of depression on PUMP, the indirect effect of depression on PUMP through alleviation motivation turned out to be significant. However, the effect of depression was not mediated by pass-time motivation. This finding suggests that PUMP is fueled in part by the purposeful or deliberate use of mobile phone to relieve or alleviate negative feelings, whereas habitual or ritualistic use to pass time is not strongly associated with PUMP.

Further, in keeping with findings on problematic Internet use (Kim & Haridakis, 2009), disruption and dysregulation also emerged as significant dimensions of PUMP. In essence, mobile phone users may experience two types of conflicts and discomfort. One manifestation of the PUMP is the awareness of the disruptive aspect of mobile phone use in everyday life, but the inability on the
part of the user to rectify the problem by limiting mobile phone use. Another manifestation, which we have called dysregulation, is a more intense loss of self-regulation of mobile phone use, leading to negative emotions, such as irritation, frustration or even anger when mobile phone use is interrupted by other activities. Given that dysregulation is composed of more intense behavioral indicators of PUMP than disruption, it is possible to speculate that there is a progression in PUMP from disruption to dysregulation (Charlton & Danforth, 2007). It is also possible that these two dimensions are distinct and simultaneous forms that act in tandem as suggested by Caplan (2002). At this time, based only on this study, it is a bit early to conclude which of the two perspectives is correct and further investigation is needed.

A corollary and key contribution of this study is the examination of the moderating effect of FtF communication on the mechanism linking depression, mobile phone use motivations, time spent on communication activities via mobile phone, and PUMP. For both low and high FtF communication groups, there appears to be a direct link between depression and PUMP. Likewise, the indirect path between depression and PUMP through alleviation motivation is unaffected by time spent on FtF communication. However, the direct path from time spent on communication activities via mobile phone to PUMP was significantly different between low- and high-FtF communication groups.

In short, those who spend relatively less time on FtF communication may mainly rely on communication activities via mobile phone to alleviate negative feelings and may become trapped by PUMP, whereas those who spend more time on FtF communication to alleviate boredom or negative feelings tend to be less likely to be trapped by PUMP although they use mobile phone. In other words, FtF communication seems to act as a buffer or antidote in the negative spiral from depression to engaging in excessive communication activities via mobile phone that eventually turns into PUMP. Communication via mobile phone may not confer the same benefit as FtF communication because the former cannot match the undistracted and focused interaction that FtF offers, which in turn translates to better emotional and social support.

This finding is in line with Pea et al.’s study (2012) and confirms the power and the value of FtF communication in moderating unhealthy indulgence in communicating via mobile phone. Although we have argued that FtF could be an antidote to the vicious cycle between depression and PUMP, it is important to acknowledge that the heavy reliance on communication activities via mobile phone may be because of the lack of FtF interactions in one’s life. Heavy use of mobile phone communication in this case might not be a choice, but a compulsive and desperate attempt to fill the void of loneliness and lack of human interactions of companionship (Ezeo & Toda, 2013).

In the interest of future research, it is also important to recognize the limitations of the current study. The most significant limitation stems from the cross-sectional nature of the data, which limits our ability to test causality claims between depression and PUMP. While the current study tested the hypothesized model posting that psychological problems (depression) could lead to PUMP, another group of studies have shown reverse causality, that is PUMP leading to negative effects on psychological well-being, such as depression or loneliness (e.g., Moody, 2001; Whang, Lee, & Chang, 2003). Furthermore, a few studies even showed that there might be a bidirectional relationship between psychological well-being and problematic Internet use, as found through a longitudinal investigation (van den Eijnden, Meerkerk, Vermulst, Spijkerman, & Engels, 2008) as well as a cross-sectional study (Kim et al., 2009). Given that the association between psychological problems and PUMP can be circular, readers should be cautious in interpreting our claims and the hypothesized model in the current study should be subjected to rigorous examination with longitudinal data in future research. In addition, the need for a valid and reliable PUMP measure should be emphasized. Among the handful of PUMP scales that have been published, no consensus has emerged. As a result, most published works used their own scales, which produces an issue of replicating results (Billieux, 2012 for the same argument). Given that most of these measures are drawn from substance use or Internet addiction literatures, it is important to further clarify if there are any unique features of PUMP that are different from problematic use of Internet, and they should be added to the PUMP scale.

To conclude, the present study found that those who are already suffering from depression have a higher chance of unhealthy use of mobile phone. With limited social resources and support, depressed people do not have many choices but mobile phone to alleviate their negative states. Though temporary, communication activities via mobile phone can alleviate these negative states, but this may lead to a cascading effect that may not be helpful in the long run. As predicted by the poor-get-poorer perspective, psychologically unhealthy people seem to exchange one hardship (depression) for another (PUMP), yet we also found that FtF communication could buffer them from this misstep. In that sense, findings of this study, though containing some limitations, shed light on the importance of satisfying and meaningful connection with others through FtF interaction in promoting psychological well-being and healthy use of mobile phones. Thus, our efforts to help the depressed should be focused on inviting people into real social networks embracing much of FtF communication rather than relying solely on mediated alternatives like online communities or social network sites.

While the poor-get-poorer paradigm emphasizes the maladaptive use of mobile phone, it should be noted that the mobile phone offers opportunities for functional and adaptive behaviors that help the strengthening of social ties (Park & Lee, 2012). Under this paradigm, the poor gets richer and the mobile phone contributes to improvements in social well-being. In theorizing problematic mobile phone use, Billieux (2012) highlighted four pathways, impulsive, relationship maintenance, extraversion and cyber addiction that include both functional and dysfunctional outcomes. Within these pathways, lies the paradigm of the rich-get-richer, as well. For example, extraverts and those with high self-esteem have been found to benefit from features of mobile phone (Bianchi & Phillips, 2005). Therefore, future studies should pay attention to how individuals’ diverse personality or demographic characteristics would lead to either functional benefits or dysfunctional problems of mobile phone.

References


