ACIS 2021 Proceedings   Australasian (ACIS)

2021

Is Nomophobia an Early Indicator of Developing Problematic Smartphone Use?

Pramukh Nanjundaswamy Vasist
Indian Institute of Management Kozhikode, pramukhn02phdpt@iimk.ac.in

R Radhakrishna Pillai
Indian Institute of Management Kozhikode, krishna@iimk.ac.in

Follow this and additional works at: https://aisel.aisnet.org/acis2021

Is Nomophobia an early indicator of developing Problematic Smartphone Use?

Full research paper

Pramukh Nanjundaswamy Vasist
Information Systems Area
Indian Institute of Management Kozhikode
India
pramukhn02phdpt@iimk.ac.in

R Radhakrishna Pillai
Information Systems Area
Indian Institute of Management Kozhikode
India
krishna@iimk.ac.in

Abstract

Problematic smartphone use and nomophobia have been associated with several psychopathological conditions. However, little is known about the interconnectedness of these phenomena and conditions that influence them, despite previous studies discussing the mediating effects of variables such as boredom proneness, self-control, and attachment anxiety. We differentiate them as separate phenomena and investigate the role of emotional wellbeing and mindfulness in influencing them through a quantitative study with a sample of 282 participants. Statistical analysis shows that negative affective states indirectly influence problematic smartphone use through nomophobia while gender and occupation have an impact of nomophobia as well. Further, mindfulness has no bearing on problematic smartphone use or nomophobia. The study demonstrates subtle differences between two dark side phenomena and signifies the varying effects on them. It furthers the argument that dark side phenomena are interrelated and highlights the need to explore mitigation mechanisms beyond mindfulness to deal with these phenomena.

Keywords problematic smartphone use, nomophobia, mindfulness, emotional wellbeing, mobile addiction.

1 Introduction

Smartphone use is growing across the world. It is estimated that there are over 6 billion smartphone subscriptions worldwide with the numbers expected to rise further in the coming years (Ericsson 2021). However, this growth is accompanied by some worrying trends. Users are constantly glued to their phones, with the average smartphone user checking it 47 times per day and 85% checking it when interacting with family and friends (Turner 2018). Problematic Smartphone Use (PSU) refers to an individual's inability to regulate the use of a smartphone (Joel 2012). The problem is so intense that people experience a sense of fear when they are not able to access their phones. Nomophobia or no mobile phone phobia refers to this "fear of being out of mobile phone contact" (SecurEnvoy, 2012, para. 1). A study in India found 22 percent of study participants with severe signs of nomophobia while 60 percent of the participants showed moderate signs of the phenomenon (Farooqui et al. 2018).

These worrying smartphone usage trends have been associated with anxiety, depression, and a variety of mental health issues (Elhai et al. 2017). Yet, despite growing awareness of its harmful consequences, smartphone adoption continues to rise year after year. The reason could be due to a lack of knowledge on how PSU emanates in the first place and a lack of clarity on which combination of factors help alleviate such use, which in turn, can stem from several gaps in the existing literature. First, the mechanisms which lead people towards PSU are not yet clear from past studies (Horwood and Anglim 2019) with a lack of clarity on whether a particular factor is an antecedent or consequence of PSU (Busch and McCarthy 2021). This makes it difficult to identify users who are at a higher risk of engaging in PSU (Beranuy et al. 2009) so the tendency can be alleviated through appropriate measures. Second, among the studies that have examined PSU, only a handful have examined PSU and nomophobia in tandem although they may be comorbid in nature (Yildirim 2014).

An understanding of the risk factors that make a person more vulnerable to PSU can help researchers raise social awareness about the problem and suggest corrective measures, while practitioners can build effective techniques to encourage normative smartphone usage. An in-depth understanding of this phenomenon will be crucial towards improving the success rate of interventions to deal with PSU. The purpose of this study is to differentiate PSU and nomophobia by examining the influence of emotional wellbeing and mindfulness in dealing with these phenomena. In line with our research purpose, the Research Questions (RQ) of our study are as follows:

RQ1: How does emotional wellbeing varyingly influence PSU and nomophobia in individuals?

RQ2: How does mindfulness influence the interactions between emotional wellbeing and PSU and nomophobia?

2 Literature Review

2.1 Nomophobia and Problematic Smartphone Use

Nomophobia is defined as "the discomfort or anxiety caused by the non-availability of a Mobile Phone, Personal Computer or any other virtual communication device in individuals who use them habitually" (King et al., 2013, p.141). Tran (2016) argues that symptoms of nomophobia are only experienced when the individual is taken away from the smartphone and makes the case for nomophobia as closer to withdrawal than a phobia as the two are very similar in symptomatology and could not be manifested independently of one another. Problematic Smartphone Use (PSU) refers to "an inability to regulate one's use of the mobile phone, which eventually involves negative consequences in daily life" (Joel, 2012, p.1). PSU is linked to excessive use of smartphone which can have an adverse impact on psychological well-being and overall health (Samaha and Hawi 2016). Nomophobia has also been observed to negatively impact well-being (Tams et al. 2018).

Extant literature has used PSU interchangeably with nomophobia (Busch and McCarthy 2021). We challenge this basic premise which is concerning and seek to address it by treating these two constructs separately and studying their interactions. To elaborate on the differences between these constructs, nomophobia is caused by the lack of access to a mobile phone (King et al. 2013) while PSU relates to the inability to regulate mobile use and is characterized by compulsive checking and addictive traits (Chiu 2014). Hence, while nomophobia is observed in the absence of a mobile phone, PSU manifests when the mobile phone is in use. Nomophobia may at best be termed comorbidity alongside PSU and the colloquial use of the term 'addiction' obscures its actual meaning (Yildirim 2014).

Certain studies have shown that nomophobia and PSU are closely related theoretical constructs. Table 1 provides examples from extant literature which have discussed both these two constructs in tandem.

However, to the best of our knowledge, there is a lack of perspective on the effect of one over the other (Vezzoli et al. 2021). D'Arcy et al. (2014) argue that dark side phenomena may be interrelated and synergetic and recommend that researchers should go beyond studying these phenomena in isolation and focus on their interactions which we examine through this study.

Source	Key arguments
Yildirim 2014	Highlights nomophobia and PSU as comorbid states
Pivetta et al. 2019	Recommends investigation of nomophobia for a comprehensive assessment of PSU
Busch and McCarthy 2021	Highlights the interchangeable use of PSU and nomophobia in literature
Buctot et al. 2021	Discusses impact of nomophobia and mobile addiction on academic performance
Vezzoli et al. 2021	Compares mobile dependence scale for measuring PSU with nomophobia

Table 1: Select studies which discuss both PSU and nomophobia

2.2 Emotional Wellbeing

Emotional Wellbeing (EWB) is defined as "a composite of positive affect and negative affect that ebbs and flows and has a momentary character reflecting a person's emotional status quo at any given time" (Eid & Larsen, 2008, p.259). Positive affect relates to feelings of happiness, enthusiasm, contentment, and excitement (Clark et al. 1989) while Negative affect refers to the tendency to experience states such as anger, fear, sadness and guilt (Watson and Clark 1984). Poor EWB can render a person vulnerable to a variety of pathological illnesses while factors related to EWB of an individual are among the primary reasons which explain smartphone use (Busch and McCarthy 2021). A summary is provided in table 2.

Source	Key arguments
Hong et al. 2012	Discusses the relationship between mobile addiction, anxiety, and self-esteem
Argumosa-Villar et al. 2017	Highlights self-esteem and emotional stability as predictors of nomophobia
Elhai et al. 2017	Highlights links between depression, anxiety, and PSU
Gezgin et al. 2018	Discusses the relationship between nomophobia and loneliness
Kim and Koh 2018	Highlights the tendency of low self-esteem to lead to smartphone addiction
Tams et al. 2018	Focuses on the influence of nomophobia on stress
Elhai et al. 2019	Discusses the relationship between PSU, anger, and worry
Kara et al. 2021	Analyses the relationship between anxiety, loneliness, smartphone use and nomophobia
Kuscu et al. 2021	Discusses the relationship between depression, hyperactivity, anxiety, and nomophobia

Table 2: Select studies which discuss various EWB states in the context of PSU and nomophobia

Research has shown that these factors of emotional distress do not occur in isolation but are comorbid in nature (Palgi et al. 2020). This comorbidity makes it important to holistically measure EWB as a construct and its effects on smartphone use. Furthermore, while there have been potential explanations for how PSU may affect wellbeing, it is crucial to consider that poor wellbeing may have led to PSU in the first place (Horwood and Anglim 2019).

2.3 Mindfulness

Mindfulness is defined as an individual's continuous evaluation and fine tuning of expectations based on new experiences and appreciation of subtleties alongside identification of novel aspects which improve foresight (Langer 1989). Mindfulness has attracted much interest in the domain of technology use, and it has been shown to increase user awareness of the environment in which the technology is being used, as well as help people avoid becoming addicted to it (Thatcher et al. 2018). Mindfulness has been studied both as an antecedent (Lan et al. 2018) and as a consequence of PSU in the form of reduced mindfulness (Volkmer and Lermer 2019). Researchers have also studied Mindfulness as a moderator (Arpaci 2019) and mediator (Elhai et al. 2018a) in the context of smartphone use. Table 3 summarizes select studies in this context. To the best of our knowledge, however, there has been limited research towards exploring the effectiveness of mindfulness in reducing the risk of developing PSU in individuals with poor EWB or nomophobia.

Source	Key arguments
Arpaci et al. 2017	Discusses mindfulness as a mediator in the context of nomophobia
Şakiroğlu et al. 2017	Explores levels of mindfulness awareness as a mediator in the context of nomophobia
Elhai et al. 2018a	Discusses mindfulness as a mediator in reducing PSU severity
Lan et al. 2018	Discusses influence of mindfulness interventions in reducing mobile addiction
Arpaci 2019	Highlights the moderating role of mindfulness in the context of mobile addiction
Volkmer and Lermer 2019	Reports low mindfulness scores in individuals with high mobile phone use
Arpaci and Gundogan 2020	Highlights a negative relationship between nomophobia and mindfulness

Table 3: Select studies which discuss mindfulness in the context of PSU and nomophobia

2.4 Summary

This review of literature reveals four major gaps. First, despite subtle differences at the construct level, prior literature has used the concepts of PSU and nomophobia interchangeably with a lack of studies on the interaction between them. Second, while recent research has focused on how PSU impacts EWB in individuals, it may be possible that poor EWB could make individuals more prone to nomophobia and PSU and thereby merits further research. Third, while factors associated with EWB and mindfulness have been studied separately in the context of both PSU and nomophobia, their interactions with these constructs in a combined state has not been explored to the best of our knowledge. Lastly, given the severe negative consequences associated with PSU, there is a warranted urge to regulate mobile use. However, the success of interventions requires further research.

3 Theoretical Model

In the current study, we leverage Interaction of Person-Affect-Cognition-Execution (I-PACE) model to answer our research questions. I-PACE is a comprehensive theoretical framework which explains processes that contribute to the development and maintenance of dysfunctional use of internet applications (Brand et al. 2016) and mobile devices (Peng et al. 2020). We use I-PACE to explain that individuals with poor EWB are characterized by anxiety and depression which leads to the affective aspect of experiencing fear when separated from their smartphone. As a coping style to deal with this separation, there is an increased tendency to stay glued to the smartphone to constantly seek reassurance. Such behaviour leads to gratification while it also leads to the development of PSU in the individual.

4 Hypotheses Development

Addressing the gaps in literature, we draw from the I-PACE theoretical perspective to develop our research hypotheses. Several studies have noted the relationship of anxiety, loneliness, depression, self-esteem, and emotional stability with nomophobia and PSU tendencies in individuals (Elhai et al. 2017; Tams et al. 2018) while there is a lack of studies which have holistically examined affective states despite the comorbid nature of factors which affect EWB. We examine this with the overarching construct of EWB and posit that:

- H1: Positive affect will have a negative relationship with nomophobia

- H2: Positive affect will have a negative relationship with PSU

- H3: Negative affect will have a positive relationship with nomophobia

- H4: Negative affect will have a positive relationship with PSU

Prior research lacks studies linking PSU and nomophobia. Yildirim (2014) notes that nomophobia could lead to addiction towards the smartphone due to a constant desire to be with it and use it. We leverage this to posit that:

- H5: Nomophobia will have a positive relationship with PSU

Being more mindful and nonjudgmental has been predominantly linked to better wellbeing and quality of life in general (Whitehead et al. 2019) with mindfulness associated with improved subjective wellbeing (Hanley et al. 2015). Hence, we posit that:

- H6: Positive affect will have a positive relationship with mindfulness

- H7: Negative affect will have a negative relationship with mindfulness

Prior literature on nomophobia and mindfulness has shown the two to be negatively correlated (Arpaci et al. 2019; Şakiroğlu et al. 2017). Further, extant literature has discussed the mediating effect of mindfulness on the relationship between nomophobia and other constructs (Şakiroğlu et al. 2017) while mindfulness has been discussed as an antecedent to problematic smartphone use as well (Elhai et al. 2018b; Volkmer and Lermer 2019). On this basis, we posit that:

- H8: Nomophobia will have a negative relationship with mindfulness

- H9: Mindfulness will have a negative relationship with PSU

- H5a: Mindfulness will mediate the relationship between nomophobia and PSU

Low emotional wellbeing is characterized by high levels of anxiety and individuals with anxiety have been shown to demonstrate nomophobia behaviours (Kara et al. 2021) which may lead them to constantly use it and develop addictive tendencies (Yildirim 2014). Hence, we posit that:

- H2a: Nomophobia will mediate the relationship between positive affect and PSU

- H4a: Nomophobia will mediate the relationship between negative affect and PSU

Prior literature finds mindfulness associated with improved subjective wellbeing (Hanley et al. 2015) while high mindfulness is associated with reduced PSU severity (Elhai et al. 2018a). Hence, we posit that:

- H2b: Mindfulness will mediate the relationship between positive affect and PSU

- H4b: Mindfulness will mediate the relationship between negative affect and PSU

5   Research Method

The research model was empirically evaluated using data collected through a cross-sectional electronic questionnaire. Participants were recruited through the snowball sampling method. Due to the snowballing procedure, responder rate for the survey could not be calculated. In this section, we first discuss the sample characteristics and then describe of scales used to measure the constructs discussed in our study. We then analyse the data and discuss the results of analysis.

5.1   Sample and Procedures

The electronic survey was launched on Google forms on 17th June 2021 and kept open for responses till 2nd July 2021. The survey was aimed at smartphone users across varied sociodemographic groups and a total of 282 responses were received from respondents in India. Our choice of location was influenced by the fact that India is one of the fastest-digitizing emerging nations (Kaka et al. 2019) and has the world's second-largest smartphone market (Newzoo 2020). It is recommended that the sample size is at least five times the total parameters that are to be estimated by the model (Bagozzi and Yi 1988) Our model comprises of 38 parameters to be estimated and hence, the sample size of 282 respondents is adequate for the purpose of our current study.

We conducted our work in accordance with ethical guidelines recommended by the American Psychological Association. We minimized researcher bias by using established scales for the purpose of data collection. The data was collected anonymously, and detailed statistical analysis of the sample data has been provided in our article. Among the respondents, 63.5% were male while 36.5% respondents were females. 30.9% respondents were in the age group of 21-30 years while 32.3% were in the age group of 31-40 years with 14.5% in the age group of 41-50 years, 20.2% in the bracket of 51-60 years, 0.7% below 20 years and 1.4% above 61 years of age. 7.1% of the respondents were students while 83.3% were either self-employed or employed for wages. 6% were homemakers while the rest were retired.

Nomophobia experienced due to loss of connectivity or the smartphone itself may in fact be a withdrawal symptom (Tran 2016). Hence, we leveraged the withdrawal section of the Smartphone Addiction Inventory (SPAI) by Lin et al. (2014) comprising 6 items with reliability with Cronbach Alpha of 0.81 to measure nomophobia. PSU was measured using the 6-item Smartphone Application-Based Addiction Scale (SABAS) by Csibi et al. (2016). The scale has good reliability with a Cronbach Alpha of 0.81. EWB was measured using a short version of the Positive and Negative Affect Schedule (PANAS) scale (Thompson 2007) with 5 items each for positive and negative affective states with adequate reliability of 0.78 and 0.76 respectively. We measured mindfulness using a 5-item short version of Mindful Attention Awareness Scale (MAAS) developed by Van Dam et al. (2010) with an internally validity of 0.88. Age, gender, and occupation of participants were added as control variables.

6   Findings / Results

We used Structural Equation Modelling (SEM) for the purpose of our current study due to its advantage in analysing all paths simultaneously (Chin and Marcoulides 1998). We first assessed fit of measurement model through Confirmatory Factor Analysis (CFA) using AMOS 23.0.0. We applied bootstrapping of 1000 repetitions to test the model's fit. Sample size of two hundred and fifty or more is considered appropriate for the purpose of estimation (Nevitt and Hancock 2004). We evaluated model fit using the ratio of Chi-square statistic to degrees of freedom, goodness-of-fit index (GFI), normalized fit index (NFI), TLI, adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), and RMSEA. Standardized residuals of absolute values less than 2.5 are desired while values greater than 4.0

represent a high degree of model related error (Hair et al. 2019). Hence, in arriving at model fit, we looked for the standardized residuals and accordingly removed items which resulted in poor model fit. Since our measurement model met the criteria of good fit (CMIN/DF = 1.761, CFI = 0.965, TLI = 0.953, PCFI = 0.711, PGFI = 0.604, RMSEA = 0.052) we went ahead and conducted the tests for reliability, convergent and discriminant validity. The measures are displayed in Table 4.

	M	SD	CR	AVE	MSV	PA	NA	NMP	PSU	MNF
PA	3.651	0.711	0.829	0.552	.140	-				
NA	2.576	0.815	0.704	0.544	.088	-0.104*	-			
NMP	2.413	0.930	0.809	0.588	.343	-0.093	.120**	-		
PSU	3.147	1.090	0.711	0.554	.343	-0.093	.200***	.586***	-	
MNF	4.001	1.179	0.839	0.635	.140	.374***	-.297***	-.121**	-.159***	-

Note. N = 282; *** p < 0.01; ** p < 0.05; * p < 0.10; M: Mean; SD: Standard Deviation; CR: Composite reliability; AVE: Average Variance Extracted; MSV: Maximum Shared Variance; PA: Positive Affect; NA: Negative Affect; NMP: Nomophobia; PSU: Problematic Smartphone Use; MNF: Mindfulness

Table 4: Inter construct correlations

In line with criteria for convergent validity suggested by Fornell & Larcker (1981), factor loadings should be greater than 0.7, CR should be greater than 0.7 and AVE should be greater than 0.5. The measures in Table 1 satisfy these criteria. Further, AVE is greater than MSV for all constructs which goes on to establish discriminant validity. In summary, these tests validate the adequacy of scales used in our study.

Correlational values below the threshold of 0.8 indicates that the concerns for multicollinearity are minimal (Gujarati et al. 2012). This is satisfied for all constructs. Further, in line with Hair et al. (2019), we conducted a test for multicollinearity to measure the Variance Inflation Factor (VIF). The VIF results included values in the range of 1.019 to 1.571 which is less than the threshold of 10 (Belsley et al. 2005) and the more stringent threshold of 4. Hence, any concerns for multicollinearity in the model appear to be minimal. We then checked for the presence of Common Method Bias (CMB) by using Harman's single factor test. Our analysis yielded a single factor showing 27.592 percent of variance which is less than 50 percent thereby suggesting the absence of any common method bias.
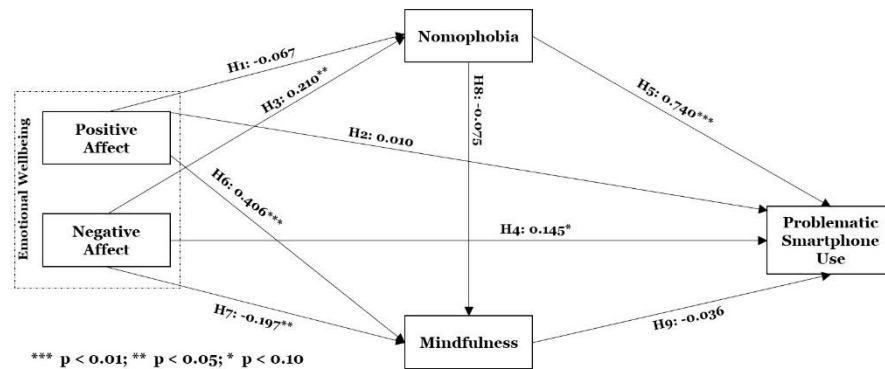

Figure 1: Path diagram of the hypothesized model

We then proceeded to find support for our hypotheses by analysing the structural model. The results are summarized in Table 5 and Figure 1.

Path	γ	S.E	Z	P	Conclusion
H1	-0.067	0.088	-0.962	0.336	fail
H2	0.010	0.108	0.139	0.890	fail
H3	0.210	0.069	2.474	0.013	pass
H4	0.145	0.077	1.900	0.057	fail
H5	0.740	0.123	7.385	***	pass
H6	0.406	0.149	5.353	***	pass
H7	-0.197	0.103	-2.409	0.016	pass
H8	-0.075	0.108	-1.076	0.282	fail
H9	-0.036	0.058	-0.501	0.617	fail

Note. γ: Standardized factor loading; S.E: Standard Error; Z value is obtained by dividing non-standardized factor loading by S.E

Table 5: Hypotheses tests' results

The results indicate that negative affect has a significant impact on nomophobia (γ=0.210; Z=2.474), nomophobia has a significant impact on PSU (γ=0.740; Z=7.385) and both positive (γ=0.406; Z=5.353) and negative affect (γ=-0.197; Z=-2.409) have a significant impact on mindfulness. Further, we noted that Gender had a positive and significant relationship with nomophobia (γ=0.240; Z=3.567, p<0.001)

while occupation has a negative and significant relationship with nomophobia (γ=-0.142; Z=-2.226, p=0.026).

The mediating effects of mindfulness and nomophobia were analysed using the coefficient multiplication and bootstrapping methods (MacKinnon et al. 2002) which has been leveraged in prior studies (Wang et al. 2019). When |Z| is greater than 1.96 and zero is not contained within the 95 percent confidence interval, the test results are regarded as significant at the 5 percent level. Based on the findings, the total effect of negative affect on PSU is significant, the direct effect is insignificant and the indirect effect through nomophobia is significant. Therefore, H4a is supported as nomophobia mediates the relationship between negative affect and PSU. The remaining indirect effects are insignificant and hence, H2a, H2b, H4b and H5a are not supported. The mediation results are shown in Table 6.

Path	Effect type	Point estimate	Coefficient multiplication method		Bootstrapping method				Conclusion
			S.E	Z	Correction deviation (95% C.I)		Percentile (95% C.I)		
H2a	Total effects	-0.085	0.139	-0.612	-0.248	0.108	-0.236	0.117	insignificant
	Direct effects	0.015	0.117	0.128	-0.129	0.164	-0.138	0.159	insignificant
	Indirect effect	-0.077	0.100	-0.77	-0.278	0.107	-0.259	0.119	insignificant
H4a	Total effects	0.309	0.109	2.835	0.140	0.494	0.088	0.461	significant
	Direct effects	0.146	0.093	1.570	0.005	0.339	-0.031	0.311	insignificant
	Indirect effect	0.156	0.072	2.167	0.033	0.322	0.019	0.301	significant
H2b	Total effects	-0.085	0.139	-0.612	-0.248	0.108	-0.236	0.117	insignificant
	Direct effects	0.015	0.117	0.128	-0.129	0.164	-0.138	0.159	insignificant
	Indirect effect	-0.023	0.061	-0.377	-0.156	0.091	-0.156	0.091	insignificant
H4b	Total effects	0.309	0.109	2.835	0.140	0.494	0.088	0.461	significant
	Direct effects	0.146	0.093	1.570	0.005	0.339	-0.031	0.311	insignificant
	Indirect effect	0.007	0.028	0.25	-0.026	0.103	-0.043	0.080	insignificant
H5a	Total effects	0.911	0.144	6.326	0.598	0.859	0.615	0.874	significant
	Direct effects	0.907	0.143	6.343	0.588	0.853	0.608	0.871	significant
	Indirect effect	0.003	0.015	0.200	-0.011	0.074	-0.025	0.034	insignificant

Note. C.I: Confidence Interval; S.E: Standard Error

Table 6: Results of mediating effects

7 Discussion

Findings from the study showed that the direct impact of negative affective states on nomophobia was significant while its direct impact on PSU was nonsignificant at the 5 percent level of significance. However, nomophobia mediated the relationship between negative affect and PSU. We also noted a strong and significant relationship between nomophobia and PSU. Extant literature identifies a variety of negative affective states such as anxiety, depression, loneliness, and anger as antecedents of both PSU and Nomophobia. Certain recent studies have argued that nomophobia and PSU may be significantly related (Vezzoli et al. 2021). While our study validates this relationship, it integrates the diverse set of antecedents and goes further in introducing a new perspective on the varying influence of negative affective state of an individual on the level of nomophobia and PSU demonstrated by the person. This helps us demonstrate the subtle differences in the two constructs. In doing so, it establishes the effect of nomophobia over PSU which is largely unexplored in extant literature on the topic. Also, it furthers the argument that dark side phenomena may be interrelated and synergetic in nature (D'Arcy et al. 2014) by differentiating the two constructs which have been largely used interchangeably with mobile addiction in literature.

Some findings of our study contradicted extant literature on positive affective states and mindfulness in the context of PSU and nomophobia. While prior studies have shown significant negative relationship between positive affective states and mobile addiction and nomophobia (Argumosa-Villar et al. 2017; Kim and Koh 2018), we did not observe any such significant relationship. This may be attributed to the fact that unlike negative emotions, positive affective states generally elicit less reactivity (Cacioppo et al. 2000) with varied physiological responses to different positive affective states such as happiness or self-esteem. Further, we found a significant positive relationship between gender and nomophobia indicating higher severity among men. The verdict remains divided as certain studies observe females exhibiting higher nomophobia (Moreno-Guerrero et al. 2020) while some have noted higher prevalence in men (Dongre et al. 2017). We also noted a significant negative relationship between occupation and nomophobia indicative of higher nomophobia tendency among working professionals. Employees are often encouraged to use cell phones at work and are expected to answer to calls and emails from colleagues and clients, increasing their usage intensity by allowing them to complete tasks at any time and from any location (Wang and Suh 2018) potentially leading to a higher nomophobia tendency than non-working individuals.

In contrast to prior research, we did not find any significant role of mindfulness through most of our study. This finding underlines the need to look for mitigation mechanisms beyond mindfulness in reducing symptoms associated with PSU and nomophobia. This may be attributed to the fact that while most prior studies involving positive affective states and mindfulness in the context of PSU and nomophobia have engaged college students or adolescents, our study included individuals across different occupational classes specifically in India. These demographic variations may require further investigation in future research.

Our study has several contributions. We were able to distinguish between two dark side phenomena which have largely been used interchangeably in the literature on mobile addiction (Busch and McCarthy 2021). The identification of a link between nomophobia and PSU provides the motivation for researchers to investigate the subtle differences and variations among similar phenomena. Mindfulness is becoming increasingly popular in the workplace, thanks to practices like guided meditation and mindfulness applications. Although mindfulness related benefits seem exciting at the outset, our study suggests that the siloed application of mindfulness techniques may not yield the desired results in managing the ill-effects of smartphone devices and highlights the need to explore mitigation mechanisms beyond mindfulness in reducing symptoms associated with PSU and nomophobia.

8 Limitations and Avenues for Future Research

Several limitations and opportunities for future research should be noted. First, the sample recruited for the study was nonrandomized in nature due to the snowball sampling approach employed for the study. Second, data was collected during the COVID pandemic, and all participants were from India, therefore generalizability of results must be considered with caution. Third, due to the cross-sectional nature of the study undertaken, we cannot make causal inferences around the observed findings. Future research must explore these findings through a longitudinal design.

9 Conclusion

Smartphones are a modern-day invention which has swept across society, and they are so present that new dark side phenomena such as PSU and nomophobia are presented and discussed in research. Our undue reliance on these phones has affected not only our personal lives, but also our psychological health. As information systems research delves deep into dark side phenomena, our paper contributes towards a synergistic view through an empirical validation of a potential link between these dark side phenomena. This study ushers in greater clarity on these constructs and helps practitioners address them suitably and progress towards greater satisfaction and meaningfulness in life.

10 References

Argumosa-Villar, L., Boada-Grau, J., and Vigil-Colet, A. 2017. "Exploratory Investigation of Theoretical Predictors of Nomophobia Using the Mobile Phone Involvement Questionnaire (MPIQ)," *Journal of Adolescence* (56), pp. 127–135.

Arpaci, I. 2019. "Relationships Between Early Maladaptive Schemas and Smartphone Addiction: The Moderating Role of Mindfulness," *International Journal of Mental Health and Addiction*.

Arpaci, I., Baloğlu, M., and Kesici, Ş. 2019. "A Multi-Group Analysis of the Effects of Individual Differences in Mindfulness on Nomophobia," *Information Development* (35:2), SAGE Publications Ltd, pp. 333–341.

Arpaci, I., Baloğlu, M., Kozan, H. İ. Ö., and Kesici, Ş. 2017. "Individual Differences in the Relationship Between Attachment and Nomophobia Among College Students: The Mediating Role of Mindfulness," *Journal of Medical Internet Research* (19:12), p. e8847.

Arpaci, I., and Gundogan, S. 2020. "Mediating Role of Psychological Resilience in the Relationship between Mindfulness and Nomophobia," *British Journal of Guidance & Counselling* (0:0), Routledge, pp. 1–9.

Bagozzi, R. P., and Yi, Y. 1988. "On the Evaluation of Structural Equation Models," *Journal of the Academy of Marketing Science* (16:1), pp. 74–94.

Belsley, D. A., Kuh, E., and Welsch, R. E. 2005. Regression Diagnostics: Identifying Influential Data and Sources of Collinearity, John Wiley & Sons.

Beranuy, M., Oberst, U., Carbonell, X., and Chamarro, A. 2009. "Problematic Internet and Mobile Phone Use and Clinical Symptoms in College Students: The Role of Emotional Intelligence," *Computers in Human Behaviour* (25:5), Including the Special Issue: Design Patterns for Augmenting E-Learning Experiences, pp. 1182–1187.

Brand, M., Young, K. S., Laier, C., Wölfling, K., and Potenza, M. N. 2016. "Integrating Psychological and Neurobiological Considerations Regarding the Development and Maintenance of Specific Internet-Use Disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) Model," *Neuroscience & Biobehavioral Reviews* (71), pp. 252–266.

Buctot, D. B., Kim, N., and Kim, S.-H. 2021. "Personal Profiles, Family Environment, Patterns of Smartphone Use, Nomophobia, and Smartphone Addiction across Low, Average, and High Perceived Academic Performance Levels among High School Students in the Philippines," *International Journal of Environmental Research and Public Health* (18:10), Multidisciplinary Digital Publishing Institute, p. 5219.

Busch, P. A., and McCarthy, S. 2021. "Antecedents and Consequences of Problematic Smartphone Use: A Systematic Literature Review of an Emerging Research Area," *Computers in Human Behaviour* (114), p. 106414.

Cacioppo, J., Berntson, G., Larsen, J., Poehlmann, K., and Ito, T. 2000. "The Psychophysiology of Emotion," in The Handbook of Emotion, pp. 173–191.

Chin, W., and Marcoulides, G. 1998. "The Partial Least Squares Approach to Structural Equation Modeling," *Modern Methods for Business Research* (8).

Chiu, S.-I. 2014. "The Relationship between Life Stress and Smartphone Addiction on Taiwanese University Student: A Mediation Model of Learning Self-Efficacy and Social Self-Efficacy," *Computers in Human Behaviour* (34), pp. 49–57.

Clark, L. A., Watson, D., and Leeka, J. 1989. "Diurnal Variation in the Positive Affects," *Motivation and Emotion* (13:3), pp. 205–234.

Csibi, S., Demetrovics, Z., and Szabó, A. 2016. "[Development and psychometric validation of the Brief Smartphone Addiction Scale (BSAS) with school children]," Psychiatria Hungarica: A Magyar Pszichiatriai Tarsasag Tudomanyos Folyoirata (31:1), pp. 71–77.

D'Arcy, J., Gupta, A., Tarafdar, M., and Turel, O. 2014. "Reflecting on the 'Dark Side' of Information Technology Use," Communications of the Association for Information Systems (35), pp. 109–118.

Dongre, A. S., Inamdar, I. F., and Gattani, P. L. 2017. Nomophobia: A Study to Evaluate Mobile Phone Dependence and Impact of Cell Phone on Health, (8:11), p. 6.

Eid, M., and Larsen, R. J. 2008. *The Science of Subjective Well-Being*, Guilford Press.

Elhai, J. D., Levine, J. C., Dvorak, R. D., and Hall, B. J. 2017. "Non-Social Features of Smartphone Use Are Most Related to Depression, Anxiety and Problematic Smartphone Use," *Computers in Human Behaviour* (69), pp. 75–82.

Elhai, J. D., Levine, J. C., O'Brien, K. D., and Armour, C. 2018a. "Distress Tolerance and Mindfulness Mediate Relations between Depression and Anxiety Sensitivity with Problematic Smartphone Use," *Computers in Human Behaviour* (84), pp. 477–484.

Elhai, J. D., Rozgonjuk, D., Yildirim, C., Alghraibeh, A. M., and Alafnan, A. A. 2019. "Worry and Anger Are Associated with Latent Classes of Problematic Smartphone Use Severity among College Students," *Journal of Affective Disorders* (246), pp. 209–216.

Elhai, J. D., Vasquez, J. K., Lustgarten, S. D., Levine, J. C., and Hall, B. J. 2018b. "Proneness to Boredom Mediates Relationships Between Problematic Smartphone Use with Depression and Anxiety Severity," *Social Science Computer Review* (36:6), SAGE Publications Inc, pp. 707–720.

Ericsson. 2021. Ericsson Mobility Report. (ericsson.com/4a03c2/assets/local/mobility-report/documents/2021/june-2021-ericsson-mobility-report.pdf, accessed October 7, 2021).

Farooqui, I. A., Pore, P., and Gothankar, J. 2018. "Nomophobia: An Emerging Issue in Medical Institutions?," *Journal of Mental Health* (27:5), Routledge, pp. 438–441.

Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), SAGE Publications Inc, pp. 39–50.

Gezgin, D. M., Hamutoglu, N. B., Sezen-Gultekin, G., and Ayas, T. 2018. "The Relationship between Nomophobia and Loneliness among Turkish Adolescents," *International Journal of Research in Education and Science* (4:2), International Journal of Research in Education and Science, pp. 358–374.

Gujarati, D. N., Porter, D. C., and Gunasekar, S. 2012. *Basic Econometrics*, Tata McGraw-Hill Education.

Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. 2019. *Multivariate Data Analysis*, Cengage Learning, EMEA.

Hanley, A., Warner, A., and Garland, E. L. 2015. "Associations Between Mindfulness, Psychological Well-Being, and Subjective Well-Being with Respect to Contemplative Practice," *Journal of Happiness Studies* (16:6), pp. 1423–1436.

Hong, F.-Y., Chiu, S.-I., and Huang, D.-H. 2012. "A Model of the Relationship between Psychological Characteristics, Mobile Phone Addiction and Use of Mobile Phones by Taiwanese University Female Students," *Computers in Human Behaviour* (28:6), pp. 2152–2159.

Horwood, S., and Anglim, J. 2019. "Problematic Smartphone Usage and Subjective and Psychological Well-Being," *Computers in Human Behaviour* (97), pp. 44–50.

Joel, B. 2012. "Problematic Use of the Mobile Phone: A Literature Review and a Pathways Model," Current Psychiatry Reviews (8:4), pp. 299–307.

Kaka, N., Madgavkar, A., Kshirsagar, A., Gupta, R., Manyika, J., Bahl, K., and Gupta, S. 2019. Digital India - Technology to Transform a Connected Nation, McKinsey Global Institute.

Kara, M., Baytemir, K., and Inceman-Kara, F. 2021. "Duration of Daily Smartphone Usage as an Antecedent of Nomophobia: Exploring Multiple Mediation of Loneliness and Anxiety," *Behaviour & Information Technology* (40:1), Taylor & Francis, pp. 85–98.

Kim, E., and Koh, E. 2018. "Avoidant Attachment and Smartphone Addiction in College Students: The Mediating Effects of Anxiety and Self-Esteem," *Computers in Human Behaviour* (84), pp. 264–271.

King, A. L. S., Valença, A. M., Silva, A. C. O., Baczynski, T., Carvalho, M. R., and Nardi, A. E. 2013. "Nomophobia: Dependency on Virtual Environments or Social Phobia?" *Computers in Human Behaviour* (29:1), Including Special Section Youth, Internet, and Wellbeing, pp. 140–144.

Kuscu, T. D., Gumustas, F., Arman, A. R., and Goksu, M. 2021. "The Relationship between Nomophobia and Psychiatric Symptoms in Adolescents," *International Journal of Psychiatry in Clinical Practice* (25:1), Taylor & Francis, pp. 56–61.

Lan, Y., Ding, J.-E., Li, W., Li, J., Zhang, Y., Liu, M., and Fu, H. 2018. "A Pilot Study of a Group Mindfulness-Based Cognitive-Behavioural Intervention for Smartphone Addiction among University Students," *Journal of Behavioural Addictions* (7:4), Akadémiai Kiadó, pp. 1171–1176.

Langer, E. J. 1989. Mindfulness, Reading, Mass.: Addison-Wesley Pub. Co.

Lin, Y.-H., Chang, L.-R., Lee, Y.-H., Tseng, H.-W., Kuo, T. B. J., and Chen, S.-H. 2014. "Development and Validation of the Smartphone Addiction Inventory (SPAI)," PLOS ONE (9:6), Public Library of Science, p. e98312.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., and Sheets, V. 2002. "A Comparison of Methods to Test Mediation and Other Intervening Variable Effects," *Psychological Methods* (7:1), US: American Psychological Association, pp. 83–104.

Moreno-Guerrero, A.-J., Aznar-Díaz, I., Cáceres-Reche, P., and Rodríguez-García, A.-M. 2020. "Do Age, Gender and Poor Diet Influence the Higher Prevalence of Nomophobia among Young People?" *International Journal of Environmental Research and Public Health* (17:10), Multidisciplinary Digital Publishing Institute, p. 3697.

Nevitt, J., and Hancock, G. R. 2004. "Evaluating Small Sample Approaches for Model Test Statistics in Structural Equation Modeling," *Multivariate Behavioural Research* (39:3), US: Lawrence Erlbaum, pp. 439–478.

Newzoo. 2020. "Top Countries/Markets by Smartphone Penetration & Users," Newzoo. (newzoo.com/insights/rankings/top-countries-by-smartphone-penetration-and-users, accessed October 7, 2021).

Palgi, Y., Shrira, A., Ring, L., Bodner, E., Avidor, S., Bergman, Y., Cohen-Fridel, S., Keisari, S., and Hoffman, Y. 2020. "The Loneliness Pandemic: Loneliness and Other Concomitants of Depression, Anxiety and Their Comorbidity during the COVID-19 Outbreak," *Journal of Affective Disorders (275), pp. 109–111.*

Peng, S., Zhou, B., Wang, X., Zhang, H., and Hu, X. 2020. "Does High Teacher Autonomy Support Reduce Smartphone Use Disorder in Chinese Adolescents? A Moderated Mediation Model," *Addictive Behaviours* (105), p. 106319.

Pivetta, E., Harkin, L., Billieux, J., Kanjo, E., and Kuss, D. J. 2019. "Problematic Smartphone Use: An Empirically Validated Model," *Computers in Human Behaviour* (100), pp. 105–117.

Şakiroğlu, M., Gülada, G., Uğurcan, S., Kara, N., and Gandur, T. 2017. "The Mediator Effect of Mindfulness Awareness on The Relationship Between Nomophobia and Academic University Adjustment Levels in College Students," *Psycho-Educational Research Reviews*, pp. 69-79-69–79.

Samaha, M., and Hawi, N. S. 2016. "Relationships among Smartphone Addiction, Stress, Academic Performance, and Satisfaction with Life," *Computers in Human Behaviour* (57), pp. 321–325.

SecurEnvoy. 2012. "66% of the Population Suffer from Nomophobia," SecurEnvoy, February 16. (securenvoy.com/blog/66-population-suffer-nomophobia-fear-being-without-their-phone-2, accessed July 24, 2021).

Tams, S., Legoux, R., and Léger, P.-M. 2018. "Smartphone Withdrawal Creates Stress: A Moderated Mediation Model of Nomophobia, Social Threat, and Phone Withdrawal Context," *Computers in Human Behaviour* (81), pp. 1–9.

Thatcher, J., Wright, R., Sun, H., Zagenczyk, T., and Klein, R. 2018. "Mindfulness in Information Technology Use: Definitions, Distinctions, and a New Measure," *MIS Quarterly: Management Information Systems* (42), pp. 831–847.

Thompson, E. R. 2007. "Development and Validation of an Internationally Reliable Short-Form of the Positive and Negative Affect Schedule (PANAS)," *Journal of Cross-Cultural Psychology* (38:2), SAGE Publications Inc, pp. 227–242.

Tran, D. 2016. "Classifying Nomophobia as Smart-Phone Addiction Disorder," *UC Merced Undergraduate Research Journal* (9:1).

Turner, A. 2018. "50+ Smartphone Addiction Statistics & Cell Phone Usage (2021)," Bankymycell, June 4. (bankmycell.com/blog/smartphone-addiction, accessed June 4, 2021).

Van Dam, N. T., Earleywine, M., and Borders, A. 2010. "Measuring Mindfulness? An Item Response Theory Analysis of the Mindful Attention Awareness Scale," *Personality and Individual Differences* (49:7), pp. 805–810.

Vezzoli, M., Colombo, A., Marano, A., Zoccatelli, G., and Zogmaister, C. 2021. "Test for Mobile Phone Dependence: Psychometric Properties and Confirmatory Factor Analysis," *Current Psychology*.

Volkmer, S. A., and Lermer, E. 2019. "Unhappy and Addicted to Your Phone? – Higher Mobile Phone Use Is Associated with Lower Well-Being," *Computers in Human Behaviour* (93), pp. 210–218.

Wang, G., and Suh, A. 2018. "Disorder or Driver? The Effects of Nomophobia on Work-Related Outcomes in Organizations," in Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems, CHI '18, New York, NY, USA: Association for Computing Machinery, April 19, pp. 1–12.

Wang, Y., Jin, L., and Mao, H. 2019. "Farmer Cooperatives' Intention to Adopt Agricultural Information Technology—Mediating Effects of Attitude," *Information Systems Frontiers* (21:3), pp. 565–580.

Watson, D., and Clark, L. A. 1984. "Negative Affectivity: The Disposition to Experience Aversive Emotional States," *Psychological Bulletin* (96:3), US: American Psychological Association, pp. 465–490.

Whitehead, R., Bates, G., Elphinstone, B., Yang, Y., and Murray, G. 2019. "Nonattachment Mediates the Relationship Between Mindfulness and Psychological Well-Being, Subjective Well-Being, and Depression, Anxiety and Stress," *Journal of Happiness Studies* (20:7), pp. 2141–2158.

Yildirim, C. 2014. "Exploring the Dimensions of Nomophobia: Developing and Validating a Questionnaire Using Mixed Methods Research," Graduate Theses and Dissertations.