Problematic Smartphone Use Influences the Relationship between Experiential Avoidance and Anxiety

Julia Y. Gorday & Joseph R. Bardeen

Department of Psychological Sciences, Auburn University

Author Note

Correspondence concerning this article should be addressed to Joseph R. Bardeen, Department of Psychological Sciences, Auburn University, 226 Thach Hall, Auburn, AL 36849-5214. Voice: 334-844-6647, E-mail: jbardeen@auburn.edu.
Abstract

Experiential avoidance, an unwillingness to stay in contact with unwanted inner experiences (e.g., emotions, thoughts, bodily sensations), has been implicated in the development and maintenance of anxiety. Individuals with high levels of experiential avoidance are more likely to employ maladaptive coping strategies (i.e., avoidance behaviors), which exacerbates emotional distress and anxious arousal. As smartphone ownership has become increasingly common in recent years, problematic smartphone use has been suggested to serve as a “safety behavior” in situations in which the individual believes that they might experience emotional discomfort. That is, individuals experiencing emotional distress and/or anxious arousal may over-engage in the use of technology to relieve emotional distress. As such, the purpose of the present study was to examine problematic smartphone use as a moderator of the relationship between experiential avoidance and anxiety. Adult participants \((N = 294)\) recruited through Amazon’s MTurk, an online labor market, completed an online battery of self-reported measures. Results indicated that the relationship between experiential avoidance and anxiety became significantly stronger as problematic smartphone use increased, thereby suggesting that problematic smartphone use may exacerbate the effect of experiential avoidance on anxiety. These findings are a first step toward the development of risk profiles that incorporate experiential avoidance and problematic smartphone use. Such risk profiles may be beneficial for early identification and intervention for individuals at high risk for the development of anxiety.

Keywords: Problematic smartphone use, experiential avoidance, anxiety, smartphone addiction, safety behavior
Problematic Smartphone Use Influences the Relationship between Experiential Avoidance and Anxiety

Anxiety is one of the most prevalent classes of psychiatric problems in the developed world. Given the sizeable emotional, social, and economic burden associated with anxiety, it is important to identify risk and resilience factors for this psychological problem. Experiential avoidance (EA)—an unwillingness to stay in contact with unwanted inner experiences (e.g., emotions, thoughts, bodily sensations)—is one such risk factor. EA and the maladaptive coping strategies associated with EA are maintained through negative reinforcement. Specifically, avoidance of unwanted internal experiences may alleviate short-term emotional distress, but has been found to exacerbate emotional distress and subsequent anxiety pathology in the long-term.

A strong association between EA and anxiety and related symptoms has been observed in both clinical and non-clinical samples. While the majority of studies examining the link between EA and anxiety have been cross-sectional, there are longitudinal studies that have provided evidence of temporal precedence. For example, EA predicted increases in anxiety at both 1- and 2-year follow-up assessment sessions in a sample of community adults. Similarly, Spinhoven and colleagues found that EA predicted anxiety- and fear-related disorders up to two years later (e.g., generalized anxiety disorder, social anxiety disorder).

Problematic smartphone use (PSU)—the excessive use of a smartphone despite negative functional consequences (e.g., daily life impairments and symptoms resembling those of behavioral addictions)—is an individual difference factor that may influence the degree to which EA contributes to anxiety. A growing literature has found that many smartphone users engage in PSU. PSU is associated with a number of safety and health concerns (e.g., texting while...
driving and sleep disturbances) and various forms of psychopathology, such as anxiety and depression.19–21

Theories that focus on the relationship between technology use and psychopathology suggest that smartphone use may serve as a “safety behavior.”20,22,23 That is, individuals experiencing negative emotions and/or anxious arousal may over-engage with their smartphone to relieve emotional distress. While the habitual use of technology to alleviate emotional distress may work in the short-term, it likely maintains and exacerbates emotional distress over time by failing to provide the opportunity for new learning. For example, the individual fails to learn that (a) it is not only acceptable, but important to occasionally experience emotional discomfort, (b) they can tolerate such emotional discomfort, and (c) predicted catastrophic outcomes do not occur when they do not use technology to avoid emotional discomfort.

Experimental studies have provided support of the temporal relationship between PSU and anxiety.24,25 For example, Cheever and colleagues conducted a study in which undergraduate students, grouped by frequency of smartphone use (i.e., low daily users, moderate daily users, and high daily users), were either separated from, or retained, their smartphones during the study.24 State anxiety was assessed at three separate time points including 10, 35, and 60 minutes after smartphone separation or retention. As predicted, only moderate and high daily smartphone users who had been separated from their smartphones reported experiencing significant increases in state anxiety over the course of the study.

As described, individuals with high levels of EA tend to be unwilling to stay in contact with their unwanted inner experiences (e.g., emotions, thoughts).8 PSU may be a method used to alleviate emotional distress in the short-term, but may exacerbate it over prolonged periods. As such, the excessive use of a smartphone despite negative functional consequences (i.e., PSU)
may be particularly problematic among those with relatively higher levels of EA. Among these individuals, PSU may increase the likelihood of developing clinically significant anxiety. As such, the purpose of the present study was to examine PSU as a moderator of the relationship between EA and anxiety.

**Method**

**Participants and Procedure**

Adult participants who were fluent in English and between the ages of 18 and 64 were recruited via Amazon’s Mechanical Turk (MTurk). MTurk, an online labor market, is a reliable source of high quality data with a participant pool that is more diverse than student and other Internet samples.\textsuperscript{26–28} To ensure the quality of the data, only MTurk users with at least a 95% approval rating from requesters and who had completed 50 intelligence tasks in the past were eligible to participate. When accessing the MTurk portal, only eligible participants were able to see the recruitment advertisement and opt to participate in the study. To identify responses that were generated by “bots” (i.e., computer programs that complete online forms automatically),\textsuperscript{29} participants were asked to provide text responses to open-ended questions. Participants that were identified as bots (n = 78) were excluded from further analysis. Additionally, 17 participants who reported that they did not have regular access to a smartphone were removed from the sample. The final sample (N = 294; 52.7% female) had an average age of 37.05 (SD = 10.27, range = 21-64). Sample characteristics are presented in Table 1.

Study procedures were approved by the local institutional review board. Participants completed the study using Qualtrics, a secure online survey platform. Self-report measures were presented in random order. Following completion of self-report measures, participants were debriefed and compensated for their time.
Measures

**Brief Experiential Avoidance Questionnaire (BEAQ).** The BEAQ is a 15-item short form of the 62-item Multidimensional EA Questionnaire (MEAQ). The BEAQ includes items that assess behavioral avoidance, distress aversion, distress endurance, suppression, procrastination, and repression/denial. Participants rate the extent to which they agree with each item on a 6-point scale (1 = strongly agree to 6 = strongly disagree), with higher scores indicating higher levels of EA. The BEAQ has demonstrated adequate psychometric properties in past research. Internal consistency for the BEAQ in the present study was adequate ($\alpha = .89$, $M = 50.48$, $SD = 14.39$).

**Depression Anxiety Stress Scales (DASS-21).** The DASS-21 Anxiety Scale is composed of seven items (e.g., “I felt scared without any good reason”) that are rated on 4-point scale (0 = Did not apply to me at all to 3 = Applied to me very much, or most of the time). Participants rate items based on the degree to which they applied to them over the past week. The DASS-21 has shown adequate psychometric properties in previous studies. Internal consistency of the DASS-21 Anxiety scale in the present study was adequate ($\alpha = .92$, $M = 4.87$, $SD = 5.53$).

**Smartphone Addiction Scale-Short Version (SAS-SV).** The SAS-SV was used in the present study to assess PSU. The SAS-SV is composed of 10 items that are rated on a 6-point scale (1 = Strongly disagree to 6 = Strongly agree). Participants rate each item based on the extent to which the item described their smartphone use. Item scores on the SAS-SV are summed, with higher total scores being indicative of PSU. Consistent with common conceptualizations of PSU, which suggest that differences in PSU reflect differences in degree, the total SAS-SV scores were used in a dimensional fashion in the present study. The SAS-
SV has demonstrated adequate psychometric properties in previous research.\textsuperscript{35,39,40} Internal consistency in the present study for the SAS-SV was adequate ($\alpha = .93, M = 25.08, SD = 12.65$).

**Data Analytic Plan**

Regression analysis was used to test the proposed moderation effect. Both the predictor (i.e., BEAQ total) and moderator variable (i.e., SAS total) were mean centered and entered into the first step of the model.\textsuperscript{41} An interaction term was calculated as the product of the centered predictor and moderator variables and entered into the second step of the model. Significant interaction effects were explored using a simple slopes analysis.\textsuperscript{41} Simple slopes analysis tests the effects of the predictor variable (EA) on the outcome variable (anxiety) at high (+1SD) and low (−1SD) values of the moderator variable (PSU). As is standard practice, $p < .05$ was used as the threshold of significance for all analyses.\textsuperscript{42,43}

**Results**

In the first step of the regression model (see Table 2), EA ($p < .001$) and PSU ($p < .001$) were significantly associated with DASS-21 Anxiety. In the second step of the model, the interaction term (EA by PSU) was significantly associated with DASS-21 Anxiety ($p = .02$). Simple slopes analysis showed that the positive association between EA and DASS-21 Anxiety was significantly stronger at higher ($\beta = .48, p < .001$), versus lower ($\beta = .29, p < .001$), levels of PSU (see Figure 1). The interaction effect was small in size (Cohen’s $f^2 = .02$).\textsuperscript{41,44}

**Discussion**

These results suggest that engaging in PSU may exacerbate anxiety among those who have higher levels of EA. Moreover, individuals with this specific profile (i.e., high EA and high PSU) may have an elevated risk of developing anxiety. If individuals with this risk profile are able to be identified early on, possibly through institution-wide screenings (e.g., academic
testing), intervention options can be made available before anxiety pathology develops or is exacerbated. A number of researchers have proposed educational curriculum as one form of early intervention aimed at targeting PSU.45–48 Turel and colleagues found that instructional videos presented to a sample of undergraduate students was efficacious in improving participants views on internet use reduction.49 Similarly, behavioral reinforcement strategies for reducing smartphone use may be important to consider for individuals with this risk profile, as employing restricted smartphone use improves sleep, reduces anxiety, and improves overall well-being.50 Furthermore, behavioral interventions aimed at reducing PSU could incorporate components targeting EA to facilitate engagement with new learning and maximize treatment effectiveness for anxiety symptom reduction.

Of note, some people consider PSU a behavioral addiction, and thus, opt to use the term “smartphone addiction” rather than PSU. While individuals who engage in PSU may exhibit behaviors commonly observed in other behavioral addictions (e.g., continued use despite causing impairment in daily life), some have argued that it may not be appropriate to consider the excessive behaviors that comprise PSU as a construct of psychopathology in the typical behavioral addictions sense.51,52 Instead, rather than being a behavioral addiction, PSU may serve as a safety behavior that alleviates distress in the short-term, but ultimately drives and exacerbates anxiety and other forms of emotional distress over longer periods of time.20 Importantly, PSU is associated with maladaptive behaviors and negative outcomes, and thus, should continue to be examined in relation to psychopathology to better understand the role that it plays in the development and maintenance of psychological problems.

This study is not without limitations. The cross-sectional study design precludes temporal inferences. While theory suggests that the relations between PSU and anxiety are bidirectional
and mutually reinforcing, the role that PSU might play in the development of anxiety over time has received relatively little empirical attention. It will be important to assess EA, PSU, and anxiety at multiple time points in future research to confirm temporal hypotheses and provide further support for this theory.

Although the DASS-21 Anxiety Scale score was used in a manner consistent with a dimensional model of anxiety, the present findings may not generalize to clinical samples. Replication of the results using a psychometrically supported clinical interview will be important for ensuring the generalizability of the findings for those with clinically significant anxiety. It is also worth noting that the frequency of smartphone use was not assessed in the present study. According to theory, increased frequency and habitual use of one’s smartphone may serve as a risk factor for the development of PSU. As such, it may be important to include a measure of frequency of smartphone use in this line of research in the future to better understand the relations among smartphone frequency of use, PSU, EA, and anxiety.

Two additional points are worth considering. First, although the limitations of retrospective power analysis have been well documented, providing such information may be helpful for informing future research in this area. Based on data from the present study, power analysis indicates power of 0.63 with our sample size of 294 and alpha set at .05. As such, we recommend using a larger sample in future research to ensure that the results of the present study replicate. Based on the results of this study, a sample size of 434 participants would increase power to 0.80 to detect the interaction effect of primary interest when alpha is set at .05. Second, while our significant interaction effect was relatively small, the variance in anxiety symptoms accounted for by this effect is well within the range considered meaningful in Monte Carlo studies (i.e., at least 1%).
To our knowledge, the present study is the first to provide evidence that PSU potentiates the effect of EA on anxiety. These findings provide an important first step in the identification of risk profiles for individuals that may be at higher risk for developing anxiety. If early screening procedures are established, those individuals at risk for developing anxiety can be identified and provided treatment options before symptoms worsen. The development of an early screening procedure and treatment designed for individuals with high levels of EA and PSU may be helpful in reducing anxiety pathology.
Acknowledgments

None.

Author Contribution

J.Y.G. was responsible for the study conceptualization, data analysis and interpretation, and manuscript preparation. J. R.B. was involved with study conceptualization, data collection, and manuscript preparation.

Author Disclosure Statement

No competing financial interests exist.

Funding Information

None.
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### Table 1

Sample Descriptive Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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<td>Gender (% female)</td>
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<tr>
<td>Race</td>
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<tr>
<td>% White/European American</td>
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<tr>
<td>% Black/African American</td>
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<td>% American Indian/Alaska Native</td>
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<tr>
<td>% Other</td>
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<tr>
<td>Ethnicity</td>
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<tr>
<td>% Hispanic/Latino</td>
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<tr>
<td>Age (years)</td>
<td>37.05 (10.27, 21-64)</td>
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</table>

*Note. N = 294. Values are reported as means along with standard deviation and range in parentheses, unless otherwise indicated.*
Table 2

Hierarchical linear regression with anxiety symptoms as the outcome variable.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Anxiety (DASS-21 - Anxiety)</th>
<th>S1</th>
<th>S2</th>
<th>Delta R²</th>
<th>β</th>
<th>β</th>
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<tr>
<td>EA</td>
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<td>PSU</td>
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<td>Step 2 (S2)</td>
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<td>EA x PSU</td>
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</table>

Note. N = 294. Bolded values significant at p < .05 (two-tailed, alpha-corrected). EA = Experiential Avoidance; PSU = Problematic Smartphone Use.
Figure 1

Moderating effect of problematic Smartphone use on the relationship between experiential avoidance and anxiety

![Graph showing the relationship between experiential avoidance and anxiety with problematic Smartphone use as a moderator.](image)