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Depression and emotion regulation predict objective smartphone use measured over one week

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ABSTRACT

Increasing use of smartphones is a notable and worldwide phenomenon, and investigating the potential role this use has on population health is a critical area of research. Prior studies have found psychopathology correlated with frequency of smartphone use. However, this research relied on cross-sectional data and solely utilized subjectively reported smartphone use. These methodological shortcomings should be overcome to understand a truer picture of the association between increased smartphone use and psychopathology. Utilizing an intensive repeated measures study design, we used a smartphone application (app) to monitor daily minutes of smartphone use over the course of one week among 68 college students. Using latent growth curve modeling, we found that lower depression severity predicted increased smartphone use over the week. Additionally, greater use of expressive suppression as an emotion regulation strategy predicted more baseline smartphone use, but less smartphone use during the week. These findings suggest that depression and expressive suppression of emotions accounted for significant variability in objectively measured smartphone use. Depression and emotion regulation are discussed in regard to corresponding patterns of smartphone usage. This paper contributes to knowledge of psychopathological correlates of smartphone use by repeated, objective smartphone use measurement.

1. Introduction

Smartphones are widely used across the world. Pew Research polling indicates that 72% of Americans own a smartphone, with a global average of 43% (Poushter, 2016). Associations have been revealed between increased smartphone use and specific types of psychopathology (Billieux, Maurage, Lopez-Fernandez, Kuss, & Griffiths, 2015). Yet, a limitation of research on smartphone use-psychopathology relationships is the reliance on self-reported smartphone use and cross-sectional study designs. Given the limitations with recalling and estimating smartphone use and the inherent limitations of cross-sectional studies to uncover potentially casual relationships, less is known regarding the true nature of these associations.

Smartphones offer productivity enhancement (e.g., calendar and email), information seeking (e.g., web browsing), social interaction (e.g., social media), diversion and relaxation, entertainment, monetary compensation (e.g., locating consumer deals), and personal status through use of an expensive phone (van Deursen, Bolle, Hegner, & Kommers, 2015). Smartphones provide enhanced productivity in the workplace (Leftheriotis & Giannakos, 2014; Wu, 2013) and in school (Godwin-Jones, 2011). However, problematic smartphone use (i.e., involving associated impairment) is related to significant risks to well-being. Smartphone use is associated with distracted driving and pedestrian walking (reviewed in Cazzulino, Burke, Muller, Arbogast, & Upperman, 2014), and musculoskeletal health problems such as neck discomfort (from staring down at a screen) and hand injury (İNal, Demİrcİ, ÇetİntÜrk, Akgönül, & Savaş, 2015; Xie, Szeto, Dai, & Madeleine, 2016).

Problematic smartphone use is generally considered to share features with other addictive disorders, including tolerance, craving, withdrawal, and functional impairment (Billieux et al., 2015). Problematic use is also associated with severity of depression and anxiety. The most well-supported mental health association with smartphone use frequency and problematic use is depression symptomatology, with bivariate and adjusted effect sizes typically between 0.30 and 0.50 (reviewed in Elhai, Dvorak, Levine, & Hall, 2017a). This finding has been demonstrated recently with college students (Demirci, Akgonul, & Akpinar, 2015; Smetaniuk, 2014), a heterogeneous sample recruited

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from universities and mailing lists (Harwood, Dooley, Scott, & Joiner, 2014), Amazon's Mechanical Turk internet labor market (Kim, Seo, & David, 2015), and working adults (Smetaniuk, 2014). The smartphone use-depression relationship is thought to exist because a) depressed individuals may use smartphones to cope with their negative emotion, and b) excessive smartphone use (in the absence of social activity) may trigger depressive symptoms (Elhai et al., 2017a).

One of the key buffers against psychopathology is emotion regulation (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Weiss, Sullivan, & Tull, 2015). Emotion regulation is the process in which individuals modulate their emotions in order to adapt to their environment. Adaptive regulation of emotions involves two distinct processes including higher levels of cognitive reappraisal and lower expressive suppression (Gross, 1998b). Cognitive reappraisal involves reinterpreting negative emotional stimuli in a non-emotional manner, while expressive suppression involves inhibiting negative emotion (Gross, 1998a). Problematic smartphone users may not adequately regulate their negative emotions, and may cope with these emotions through avoidance by using their smartphones. Thus, rather than using adaptive coping strategies to regulate emotion, such as problem-solving or social support, such individuals may use distraction, avoidance, and disengagement via their smartphones. Hoffner and Lee (2015) found in a survey study that expressive emotional suppression was associated with higher intensity of missing smartphone features involving entertainment and information content. And Elhai, Levine, Dvorak, and Hall (2016) found that maladaptive emotion regulation strategies mediated the relationship between problematic smartphone use and anxiety severity. Relatedly, alexithymia – involving difficulty in experiencing and identifying emotion – has demonstrated relations with problematic internet use (Baysan-Arslan, Cebeci, Kaya, & Canbal, 2016).

1.1. Theory

An important question is: Which variables account for increased smartphone use by some people? A relevant theory is from the mass communications field – Uses and Gratifications Theory (UGT) (Blumler, 1979; Blumler & Katz, 1974). UGT assumes that people are very active in their choice of which media and technology they consume, distinguishing it from other mass communication theories (West & Turner, 2007). Central to UGT is the tenant that individuals have specific gratifications that they want met, and these gratifications are met by using particular types of media (Blumler, 1979). Furthermore, individual differences drive these specific gratification needs (Blumler, 1979).

Numerous studies have used UGT to conceptualize and test individual differences that may explain increased smartphone use. Among these studies, support has been for such variables as female gender (Grellhesl & Punyanunt-Carter, 2012), internal locus of control and behavioral activation (Park, Kim, Shon, & Shim, 2013), reward seeking and poor academic performance (Dhir, Chen, & Nieminen, 2015). Extending this research, we would expect increased smartphone use related to increased levels of specific types of psychopathology, such as depression symptoms and maladaptive emotion regulation skills. In fact, recently anxiety severity was related to increased smartphone use (Elhai, Levine, Dvorak, & Hall, 2017b); and anxiety is highly correlated with depression (Lamers et al., 2011).

1.2. Aims

In the present study, we examined smartphone use over the course of one week by employing an intensive repeated measures research design that enabled direct tests of associations between depression severity and emotion regulation. We sampled young adult college students, a population with nearly a 100% prevalence of smartphone ownership (Poushter, 2016). This study offers two critical advancements in the science of understanding the factors and correlates involved in increased and problematic smartphone use. First, we conducted a repeated measurement study, while the relevant literature has almost exclusively relied on cross-sectional designs (Billieux et al., 2015). Second, we utilized objective measurement of cell-phone use, which is unique in this literature. Previous studies relied on self-report, which may not be reliable and accurate to assess smartphones usage. Understanding smartphone use patterns over the course of a week, as a function of psychopathology, could be beneficial in psychological treatment planning of more adaptive, in-person behavioral and social activities with patients (Dimidjian, Barrera, Martell, Munoz, & Lewinsohn, 2011).

This study is also important in understanding how research participants respond to behavioral observation – in this case, via monitored smartphone use. Thus, findings may inform research on the Hawthorne Effect in studying psychological constructs, including psychopathology (Chiesa & Hobbs, 2008; McCambridge, Witton, & Elbourne, 2014), in the context of technological monitoring. This issue is important, as there is a growing use of technology in psychological and psychiatric treatment to monitor symptoms and treatment outcomes (Hollis et al., 2015). Gaining knowledge on how individuals with psychopathology respond to technological monitoring of their behaviors and emotions is therefore an important part of understanding and measuring treatment outcomes.

1.3. Hypotheses

We posed the following hypotheses.

Hypothesis 1. Baseline depression severity (i.e., measured initially) will be positively associated with objectively measured baseline smartphone use frequency, and maintained smartphone use over the week of monitoring.

This hypothesis is based on prior cross-sectional research demonstrating positive associations between depression severity and both smartphone use frequency and problematic use (most recently in Demirci et al., 2015; Harwood et al., 2014; Kim et al., 2015; Smetaniuk, 2014). Furthermore, with participants aware that their smartphone use is being monitored over the week (especially heavy users), there should be pressure to downwardly adjust their smartphone use behavior during the week (Jiang & Leung, 2011). In fact, perceived social norms drive technology use (Cheung & Lee, 2010), including time spent on smartphone use (Derks, van Duin, Tims, & Bakker, 2015). However, we expected that people with greater depression symptoms would not exhibit decreased usage due to self-regulatory deficits associated with depression (Baumeister & Heaterton, 1996).

Hypothesis 2. Maladaptive emotion regulation will be positively associated with objectively measured baseline smartphone use frequency, and maintained usage over the week.

Specifically, expressive emotional suppression should be positively related, and cognitive reappraisal should be negatively related, with baseline and repeated smartphone use measurements. This hypothesis is based on prior cross-sectional research supporting maladaptive emotion regulation in association with increased smartphone use (Elhai et al., 2016; Hoffner & Lee, 2015). Furthermore, knowing that participants' smartphone use is being monitored should create pressure to decrease use over the week, based on the effect of social norms on smartphone use (Derks et al., 2015), but this inhibition in use should be easier for adaptive emotion regulators. This is because, unlike maladaptive emotion regulators, adaptive regulators are likely not already pre-occupied with repairing negative mood (which would otherwise interfere with response inhibition) (Tice & Bratslavsky, 2000) and thus should be better at inhibiting behavior (Joormann & Gotlib, 2010), such as smartphone usage.

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