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Non-social features of smartphone use are most related to depression, anxiety and problematic smartphone use

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ABSTRACT

Little is known about the mechanisms of smartphone features that are used in sealing relationships between psychopathology and problematic smartphone use. Our purpose was to investigate two specific smartphone usage types – process use and social use – for associations with depression and anxiety; and in accounting for relationships between anxiety/depression and problematic smartphone use. Social smartphone usage involves social feature engagement (e.g., social networking, messaging), while process usage involves non-social feature engagement (e.g., news consumption, entertainment, relaxation). 308 participants from Amazon's Mechanical Turk internet labor market answered questionnaires about their depression and anxiety symptoms, and problematic smartphone use along with process and social smartphone use dimensions. Statistically adjusting for age and sex, we discovered the association between anxiety symptoms was stronger with process versus social smartphone use. Depression symptom severity was negatively associated with greater social smartphone use. Process smartphone use was more strongly associated with problematic smartphone use. Finally, process smartphone use accounted for relationships between anxiety severity and problematic smartphone use.

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1. Introduction

Smartphone use is prevalent across the world. A recent study showed that 72% of Americans own a smartphone, and worldwide ownership averaged 43% (Poushter, 2016, February 22). Smartphone use benefits society by aiding productivity in the workplace (Leftheriotis & Giannakos, 2014; Wu, 2013) and in school (Godwin-Jones, 2011). However, many individuals engage in “problematic smartphone use,” which involves excessive use accompanied by symptoms resembling substance-related dependence, withdrawal when not using their phones, and associated functional impairment (Billieux, Maurage, Lopez-Fernandez, Kuss, & Griffiths, 2015). An important question, therefore, is: What are the antecedents to problematic smartphone use? In the present paper, we examine the role of different types of smartphone use as antecedents to

problematic smartphone use.

Depression, and to a lesser extent, anxiety, are related to problematic smartphone use. Consistent support has been found for depression severity (Demirci, Akgonul, & Akpinar, 2015; Smetaniuk, 2014) and anxiety severity (Demirci et al., 2015; Elhai, Levine, Dvorak, & Hall, 2016; Harwood, Dooley, Scott, & Joiner, 2014; Kim, Lee, & Choi, 2015). However, these papers did not simultaneously examine psychopathology, types of smartphone usage and problematic smartphone use in their models. These studies mostly involved student participants, using cross-sectional designs, and standardized measures of problematic smartphone use (reviewed in Elhai, Dvorak, Levine, & Hall, 2017). Other important pathways to problematic smartphone use include impulsivity, extraversion, and excessive reassurance seeking (Billieux et al., 2015). One previous study examined differential associations between types of smartphone use (social vs. non-social) with problematic smartphone use (Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014), with another study integrating mental health variables into their model (van Deursen, Bolle, Hegner, & Kommers, 2015). However, our study is

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novel because of our distinction between social and non-social patterns of smartphone use *and* our inclusion of the more mainstream and prevalent psychopathology constructs of depression and anxiety.

Several mechanisms account for the association between mental health symptoms and problematic smartphone use. Kim, Seo, and David (2015) found that smartphone use aimed at alleviating negative emotion mediated the relationship between depression severity and problematic use. Elhai et al. (2016) discovered that behavioral activation mediated relations between depression and problematic smartphone use. Another important mechanism is habitual use of a smartphone. Oulasvirta and colleagues demonstrated that increased habit formation of checking one's phone for message notifications led to increased problematic smartphone use (Oulasvirta, Rattenbury, Ma, & Raita, 2012). Furthermore, van Deursen et al. (2015) discovered that habitual smartphone use mediated relations between self-regulation and problematic smartphone use. Thus, increases in smartphone use frequency may serve as a mechanism accounting for relations between poor mental health and problematic smartphone use.

The frequency of smartphone use can involve a variety of uses and features. Smartphone technology, and internet technology in general, can be characterized by uses such as productivity enhancement (e.g., reminders and email), information seeking (e.g., web surfing, browsing the news), and social information and relationships (e.g., social media, messaging). Additional uses include diversion and relaxation (music), entertainment (e.g., gaming, movies), monetary compensation (e.g., locating consumer deals) and personal status (Dhir, Chen, & Nieminen, 2015; Song, Larose, Eastin, & Lin, 2004; van Deursen et al., 2015).

Technology feature use has distinguished between process and social use (Song et al., 2004), and this categorization has subsequently been applied to smartphone usage (van Deursen et al., 2015). Social usage is defined as engaging in smartphone use for social purposes, such as social networking, messaging, phone calls and maintaining social relationships. Social usage is a somewhat diverse category of use, because phone calls, for example, are quite different and more limited in the breadth of interaction compared to a session of interacting on social media with many friends, such as via Facebook. In contrast, process usage is defined as engaging in smartphone use for news consumption, entertainment, relaxation, and other primarily non-social purposes.

The few empirical studies examining associations between process vs. social smartphone use in predicting problematic smartphone use have found discrepant results. Using a representative Dutch internet panel, van Deursen et al. (2015) found that process use of a smartphone, but not social use, was related to problematic smartphone use. However, with a sample of school-aged adolescents, another study discovered that social smartphone use was more prevalent than process use among problematic smartphone users (Lopez-Fernandez et al., 2014), a finding typical in the internet addiction literature (Chou & Hsiao, 2000; Yang & Tung, 2007). Thus it is unclear whether process or social smartphone use is more related to problematic smartphone use.

Only one study has examined mental health variables in relation to process or social smartphone use. van Deursen et al. (2015) discovered that social stress was more strongly associated with process usage compared to social smartphone usage. This finding supports theory on social avoidance (Kashdan, 2007) as well as the role of safety behavior (Powers, Smits, & Telch, 2004; Rachman, Radomsky, & Shafran, 2008), whereby social stress may lead to experiential avoidance and safety behavior - in this case, the avoidance of social/process smartphone use. The authors also found that emotional intelligence related more to social use than to process smartphone use (van Deursen et al., 2015). Coupled with

findings presented above, these results suggest that mental health variables may be related to specific types of smartphone use, which in turn may relate to problematic smartphone use.

1.1. Aims

Our overall purpose was to investigate process and social types of smartphone use for associations with psychopathology, and in accounting for relationships between psychopathology and problematic smartphone use. We had several specific aims in this study. First, we examined the role of depression and anxiety symptom severity in relation to process and social smartphone use. Second, we tested process and social use as predictors of problematic smartphone use. Finally, we explored the extent to which process and social smartphone use mediated relations between both depression and anxiety with problematic smartphone use.

2. Background and hypotheses

2.1. Theory

Uses and Gratifications Theory (UGT) (Blumler & Katz, 1974; Blumler, 1979) helps understand background characteristics and individual differences motivating people to choose using particular types of mass media. UGT was used previously to examine internet addiction (Kim & Haridakis, 2009). Park and colleagues explored psychological variables accounting for problematic smartphone use, finding that perceived control in social relationships was significantly associated with increased use (Park, Kim, Shon, & Shim, 2013). Thus UGT can explain how people with certain types of psychological and/or demographic characteristics may be drawn to increasingly use specific types of smartphone features.

UGT does not explain, however, the phenomenon of why some people's increased smartphone use frequency leads to addiction/problematic use (Oulasvirta et al., 2012; van Deursen et al., 2015), while others use smartphones productively. The "Rich get richer, poor get poorer" model, or "Matthew Effect" (Merton, 1968) is relevant in this regard (Perc, 2014). This model generally explains how people with accumulated resources have an easier time further accruing such resources, while those starting with few resources often end up in a vicious cycle of trying but failing to accrue resources. The "rich get richer" model has been used to illustrate how people with extensive social capital can use the internet to boost further social networks, while those starting with less social capital find it increasingly difficult to use technology to meaningfully increase these resources (Kraut et al., 2002). Thus, in conjunction with UGT, the "rich get richer" model can explain why people without psychopathology can flourish with technology, such as using a smartphone to boost work and social productivity, while people with psychopathology can engage in problematic smartphone use.

2.2. Model

Fig. 1 demonstrates our research model, consisting of anxiety and depression scores as predictor variables, process and social smartphone use variables as mediating variables, and problematic smartphone use as the dependent variable. Our model builds on the structural model from Kim, Seo et al. (2015), by adding anxiety as a predictor, more clearly delineating between social and process use as mediators, and adding demographic covariates. We also build upon van Deursen et al. (2015), by adding psychopathology predictors of process and social smartphone use. We modeled the covarying effects of age and sex, as younger individuals (Demirci et al., 2015; van Deursen et al., 2015) and women (Jeong, Kim,

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