

May 2021

## The five-factor model of personality and problematic smartphone use

Alexander K. Knack

Western Illinois University, alexander.k.knack@gmail.com

Colin R. Harbke

Western Illinois University, cr-harbke@wiu.edu

Follow this and additional works at: <https://scholar.utc.edu/mps>



Part of the [Psychology Commons](#)

---

### Recommended Citation

Knack, Alexander K. and Harbke, Colin R. (2021) "The five-factor model of personality and problematic smartphone use," *Modern Psychological Studies*: Vol. 26 : No. 1 , Article 9.

Available at: <https://scholar.utc.edu/mps/vol26/iss1/9>

This articles is brought to you for free and open access by the Journals, Magazines, and Newsletters at UTC Scholar. It has been accepted for inclusion in Modern Psychological Studies by an authorized editor of UTC Scholar. For more information, please contact [scholar@utc.edu](mailto:scholar@utc.edu).

### Abstract

Thirteen studies were reviewed to better understand how smartphone ownership and use relate to the five factors of personality (i.e., openness, conscientiousness, extraversion, agreeableness, neuroticism) overall and across three different age groups. Of the 10 studies used to compare problematic smartphone use across age groups, 2 (20%) included adolescent samples, 7 (70%) included young adult samples, and 3 (30%) included adult to older adult samples. Across all samples, problematic smartphone use correlated most strongly with neuroticism (positively) and conscientiousness (negatively). Relatively weaker and more inconsistent correlations with problematic smartphone use were found for openness, extraversion, and agreeableness. Future research should emphasize sampling adolescent and older adult populations, as well as measure the six facets of each personality factor to more thoroughly explore potential links between personality and problematic smartphone use.

### **The Five-Factor Model of Personality and Problematic Smartphone Use**

Smartphone ownership among adults has increased significantly since these devices started being produced. In 2011, 35% of U.S. adults owned a smartphone, with the number increasing to 81% as of February 2019 (Pew Research Center, 2019). A survey conducted in early 2019 showed that cellphone ownership (including both smart- and non-smartphones) was very high across all ages of adults, as it was 99% for both the 18 to 29 and 30 to 49-year-olds, 95% for 50 to 64-year-olds, and 91% for those 65 and older. When restricted to smartphones only, ownership statistics were highly similar, with 96% of those aged 18 to 29 years, 92% of those 30 to 49, 79% of those 50 to 64, and 53% of those aged 65 years or older owning smartphones. Although ownership data are less consistent, among U.S. teens (ages 13 to 17), 95% say they have access to a smartphone at home, and 45% describe their use of the Internet (through a computer or cellphone) as “almost constantly” (Anderson & Jiang, 2018).

Adult smartphone ownership also differs across income levels and education levels (Pew Research Center, 2019). Pew Research reported that the educational attainment groups of “less than high school graduate,” “high school graduate,” “some college,” and “college graduate,” smartphone ownership was at 66%, 72%, 85%, and 91%, respectively. Using the income brackets of “less than \$30,000,” “\$30,000–\$49,000,” “\$50,000–\$74,999,” and “\$75,000+,” smartphone ownership was at 71%, 78%, 90%, and 95%, respectively. Despite the differences seen in smartphone ownership across educational attainment and income levels, there was little difference across categories of these variables when measuring cellphone ownership, which included both smart- and non-smartphones. Specifically, cellphone ownership ranged from 92%

to 98% when looking at differences across education and from 95% to 100% when looking at differences across income levels (Pew Research Center, 2019).

The age at which individuals begin using smartphones or similar devices (e.g., iPod, iPad, or cellphone) can be very early in life, at times even beginning before the child is one year old. A recent study by Common Sense Media (Rideout, 2017) which compiled and compared data from 2011 to 2017 showed that the percent of 0 to 8-year-olds who have ever used a mobile device was 38% in 2011, 72% in 2013, and 84% in 2017. The 2011 iteration of Common Sense Media's survey further breaks down the data of 0 to 8-year-olds who have ever used a mobile device into 0 to 1-year-olds (10%), 2 to 4-year-olds (39%), and 5 to 8-year-olds (52%) (Rideout, 2011). In the 2013 edition, these numbers rose to 38% for children aged 1 year or younger, 80% for those 2 to 4 years of age, and 83% for 5 to 8-year-olds (Rideout, 2013).

Personal mobile device ownership among 0 to 8-year-olds has risen from 2011 to 2017 as well, according to Common Sense Media (Rideout, 2017). In 2017, 45% of 0 to 8-year-olds had their own mobile device (e.g., smartphone, tablet, handheld gaming device), which is up from 3% in 2011 and 12% in 2013 (Rideout, 2017). Personal smartphone ownership among 0 to 8-year-olds was 1% for children under 2 years old, 3% for 2 to 4-year-olds, and 7% for 5 to 8-year-olds in 2017.

### **Overall Smartphone Usage**

According to a 2015 Gallup poll regarding smartphone user habits and beliefs, 11% of owners check their phones every few minutes, 41% check a few times an hour, 20% check about once per hour, 24% check a few times per day, and 2% report checking their smartphones about once a day or less than once per day (Newport, 2015). The data were further broken down, showing the percentage of each age range that responded every few minutes and a few times an

hour. Twenty-two percent of the 18 to 29 age group, 12% of the 30 to 49 age group, 6% of the 50 to 64 age group, and 3% of the 65 and older age group responded that they checked their phones every few minutes (Newport, 2015). Fifty-one percent of the 18 to 29 age group, 47% of the 30 to 49 age group, 33% of the 50 to 64 age group, and 18% of the 65 and older age group reported that they checked their phones a few times an hour (Newport, 2015). Another Gallup article reported that 46% of U.S. smartphone users, aged 18 and older, agreed with the statement “I can’t imagine life without my smartphone” (Saad, 2015). Similarly, in a 2017 survey by YouGov of 13 to 17-year-olds, 38% of respondents indicated that “less than one day” was the longest period of time that they felt they could go without using a smartphone. Fifteen percent of respondents indicated that they could go up to one day without using a smartphone. In other words, over half of the respondents felt that they needed their phone on a daily or near-daily basis (YouGov, 2017).

### **Factors Related to Problematic or Abnormal Smartphone Use**

Some factors identified to be related to problematic smartphone use include nomophobia and the fear of missing out (FOMO) (Elhai et al., 2016; Wolniewicz et al., 2018). Nomophobia stands for no-mobile phone-phobia and is discomfort or anxiety due to being unable to use or access one’s mobile phone. Bragazzi and Del Puente (2014) presented a case for the inclusion of nomophobia in the DSM-V based on characteristics of addiction. These characteristics are included in Table 1.

Table 1.

*Comparison of Suggested Symptomology for Problematic Smartphone Use*

Bragazzi & Del Puente (2014)	Lin et al. (2016)	Tran (2016)
Regularly using a phone, spending significant time on it, having multiple devices, carrying a charger.	Recurrent failure to resist the impulse to use the smartphone <sup>A</sup> .	The individual has possession of their smartphone at all times.
Feeling anxious and/or nervous when thinking about losing one's device, not being able to use it (e.g., dead battery or no network connection), and trying to avoid using it in improper places or situations.	Withdrawal: as manifested by dysphoria, anxiety and/or irritability after a period without smartphone use <sup>A</sup> .	Loss or separation of smartphone (i.e., physical or loss of battery power) causes at least 5 of: intense fear or anxiety, depression, trembling, perspiration, tachycardia/increased blood pressure, feelings of loneliness, or panic attacks and receiving the phone stops symptoms.
Checking the screen of the phone to see if there are messages or calls (Ringxiety).	Smartphone use for a period longer than intended <sup>A</sup> .	Preoccupation with a smartphone (e.g., checking even if there is no audible ring or vibration).
Keeping the phone on 24 hours a day or sleeping with it in bed.	Persistent desire and/or unsuccessful attempts to quit or reduce smartphone use <sup>A</sup> .	Individuals using their smartphone for more than seven hours a day.
Preferring to use a technological medium for interactions in lieu of potentially stressful face-to-face social situations.	Excessive time spent on using or quitting the smartphone use <sup>A</sup> .	The individual is physically asocial and prefers to use their smartphone.
To build up debts or expenses due to phone use.	Continued excessive smartphone use despite knowledge of having a persistent or recurrent physical or psychological problem resulting from smartphone overuse <sup>A</sup> .	Attenuation of possible smartphone loss by having backup batteries, charging cords, and charging in inappropriate settings (e.g., classroom, family meetings, social meetings).
	Excessive smartphone use resulting in persistent or recurrent physical or psychological problem <sup>B</sup> .	Using smartphones to relieve negative moods (e.g., socially stressful situations, guilt, anxious situations)
	Smartphone use in a physically hazardous situation (e.g., smartphone use while driving or crossing the street) or having other negative impacts on daily life <sup>B</sup> .	Need to be positively evaluated through social media or texting.
	Smartphone use resulting in impairment of social relationships, school achievement, or job performance <sup>B</sup> .	Nomophobia is a symptom of smartphone addiction rather than its own disorder and refers to the panic attacks of smartphone separation.
	Excessive smartphone use causes significant subjective distress or is time-consuming <sup>B</sup> .	
	Exclusion Criteria: these types of behavior found in smartphone addiction are not accounted for by OCD or bipolar I disorder <sup>C</sup> .	

*Note.* Superscripts denote differing symptom categories from Lin et al. (2016).

Bragazzi and Del Puente also remarked on a similar term, “ringxiety,” termed by Laramie to describe a user feeling or hearing an illusory phone vibration or ring (i.e., phantom vibration), prompting them to check the phone. Ringxiety is related to the third characteristic of nomophobia, “checking the screen of the phone to see if there are messages or calls.” The fear of missing out (FOMO) is the feeling that one is going to miss out on some experience or event. This feeling is apprehension or anxiety, which provokes the urge to be connected. While FOMO is not specifically identified by Bragazzi and Del Puente, it is related to their identified characteristics of always being on the phone, carrying a charger, feeling anxious or nervous when not being able to use it, checking the phone for messages, calls, or notifications, and always keeping the phone on or sleeping with the phone.

Although not currently identified in the DSM, smartphone addiction has been addressed in the scientific literature. Lin et al. (2016) suggested three criteria categories for a diagnosis of smartphone addiction. Criteria A is described as “maladaptive pattern of smartphone use, leading to clinically significant impairment or distress, occurring at any time within the same 3-month period,” (p. 6). In this group, there must be at least three symptoms present. Criteria B is about functional impairment, requiring that at least two of the four symptoms be present. Criteria C is exclusion criteria, in which these types of behavior found in smartphone addiction are not explained by obsessive-compulsive disorder or bipolar I disorder.

Table 2.

*Comparison of Suggested Symptomology with Griffiths' Addiction Criteria, Loss of Control, and Loss Prevention*

	Nomophobia Bragazzi & Del Puente (2014)	Smartphone Addiction Lin et al. (2016)	Smartphone Addiction Tran (2016)
Saliency	Regularly using a phone, spending significant time on it, having at least one or multiple devices, always carrying a charger. Checking the screen of the phone to see if there are messages or calls (Ringxiety).  Keeping the phone on 24 hours a day or sleeping with it in bed. Feeling anxious and/or nervous when thinking about losing one's device, not being able to use it (e.g., dead battery or no network connection), and trying to avoid using it in improper places or situations.	Smartphone use for a period longer than intended <sup>A</sup> .  Excessive time spent on using or quitting the smartphone use <sup>A</sup> .	The individual has possession of their smartphone at all times.  Constant preoccupation with a smartphone such as checking notifications or texts even if there is no audible ring or vibration. Individuals using their smartphone for more than seven hours a day. The individual is physically asocial and prefers to use their smartphone.
Mood Modification	Having few face-to-face interactions with others that may lead to stress or anxiety and instead preferring to use a technological medium for interactions.		Using smartphones to relieve negative moods (e.g., being in socially stressful situations, guilt, anxious situations).  Need to be positively evaluated through social media or texting.
Tolerance		Recurrent failure to resist the impulse to use the smartphone <sup>A</sup> . Smartphone use for a period longer than intended <sup>A</sup> . Excessive time spent on using or quitting the smartphone use <sup>A</sup> .	Individuals using their smartphone for more than seven hours a day.



Table 2 (Continued)

	Nomophobia Bragazzi & Del Puente (2014)	Smartphone Addiction Lin et al. (2016)	Smartphone Addiction Tran (2016)
Conflict	To build up debts or expenses due to phone use.	<p>Recurrent failure to resist the impulse to use the smartphone<sup>A</sup>.</p> <p>Persistent desire and/or unsuccessful attempts to quit or reduce smartphone use<sup>A</sup>.</p> <p>Continued excessive use despite knowledge of having a persistent or recurrent physical or psychological problem from overuse<sup>A</sup>.</p> <p>Excessive smartphone use resulting in persistent or recurrent physical or psychological problem<sup>B</sup>.</p> <p>Smartphone use in a physically hazardous situation or having other negative impacts on daily life<sup>B</sup>.</p> <p>Smartphone use resulting in impairment of social relationships, school achievement, or job performance<sup>B</sup>.</p> <p>Excessive use causes significant distress or is time-consuming<sup>B</sup>.</p>	<p>The individual is physically asocial and prefers to use their smartphone.</p> <p>Attenuation of possible smartphone loss by having backup batteries, chargers, or charging in inappropriate settings.</p>
Relapse		<p>Persistent desire and/or unsuccessful attempts to quit or reduce smartphone use<sup>A</sup>.</p> <p>Excessive time spent on using or quitting the smartphone use<sup>A</sup>.</p>	

Table 2 (Continued)

	Nomophobia Bragazzi & Del Puente (2014)	Smartphone Addiction Lin et al. (2016)	Smartphone Addiction Tran (2016)
Withdrawal symptoms	<p>Feeling anxious and/or nervous when thinking about losing one's device, not being able to use it (e.g., dead battery or no network connection), and trying to avoid using it in improper places or situations.</p> <p>Checking the screen of the phone to see if there are messages or calls (Ringxiety).</p>	<p>Withdrawal: as manifested by dysphoria, anxiety and/or irritability after a period without smartphone use<sup>A</sup>.</p>	<p>Loss or separation from smartphone causes at least 5 of: intense fear or anxiety, depression, trembling, perspiration, tachycardia, increased blood pressure, feelings of loneliness, or panic attacks and receiving the phone stops symptoms.</p>
Loss Prevention (of smartphone or access to smartphone)/Prevention of FOMO	<p>Regularly using a phone, spending significant time on it, having at least one or multiple devices, always carrying a charger.</p> <p>Keeping the phone on 24 hours a day or sleeping with it in bed.</p>	<p>Smartphone use in a physically hazardous situation (e.g., smartphone use while driving or crossing the street) or having other negative impacts on daily life<sup>B</sup>.</p>	<p>The individual has possession of their smartphone at all times.</p> <p>Constant preoccupation with a smartphone such as checking notifications or texts even if there is no audible ring or vibration.</p> <p>Individuals using their smartphone for more than seven hours a day.</p> <p>Attenuation of possible smartphone loss by having backup batteries, charging cords, and charging in inappropriate settings (e.g., classroom, family meetings, social meetings).</p>

Table 2 (Continued)

	Nomophobia Bragazzi & Del Puente (2014)	Smartphone Addiction Lin et al. (2016)	Smartphone Addiction Tran (2016)
Loss of Control (of smartphone use)	Regularly using a phone, spending significant time on it, having one or multiple devices, always carrying a charger.	Recurrent failure to resist the impulse to use the smartphone <sup>A</sup> .	Individuals using their smartphone for more than seven hours a day.
	Checking the screen of the phone to see if there are messages or calls (Ringxiety).	Smartphone use for a period longer than intended <sup>A</sup> .	
	To build up debts or expenses due to phone use.	Persistent desire and/or unsuccessful attempts to quit or reduce smartphone use <sup>A</sup> .	
		Excessive time spent on using or quitting the smartphone use <sup>A</sup> .	
		Continued excessive use despite knowledge of having a persistent or recurrent physical or psychological problem resulting from overuse <sup>A</sup> .	
		Excessive use resulting in persistent or recurrent physical or psychological problem <sup>B</sup> .	
		Use in a physically hazardous situation or having other negative impacts on daily life <sup>B</sup> .	
		Use resulting in impairment of social relationships, school achievement, or job performance <sup>B</sup> .	
		Excessive use causes significant distress or is time-consuming <sup>B</sup> .	

*Note.* Superscripts denote differing criteria categories from Lin et al. (2016).

Tran (2016) also suggested criteria for smartphone addiction disorder that covered similar items to both Bragazzi and Del Puente (2014) and Lin et al. (2016). One important distinction was that Tran conceptualized nomophobia as a symptom of smartphone addiction disorder rather than as being a separate, independent diagnosis. Table 2 compares the various diagnostic criteria put forth by Bragazzi and Del Puente, Lin et al., and Tran across Griffiths' (2005) behavioral addiction criteria (i.e., salience, mood modification, tolerance withdrawal symptoms, conflict, relapse), as well as "loss of control" and "loss prevention."

After evaluating characteristics typically associated with other addictions, Panova and Carbonell (2018) argued that, despite similarities, "smartphone addiction" was not a true addiction and that the term "problematic use" was more apt for the behavior being studied. Panova and Carbonell explained how they disagreed that a smartphone can be addictive, as they argued that the smartphone is more of a tool, not the specific source of pleasure. An analogy they provided to illustrate this idea is that the smartphone serves as a tool to engage in behavior similarly to how a drug user may use a needle to engage in drug use. Panova and Carbonell also noted that other possible addictions such as Internet addiction or gaming addiction should not be confused for smartphone addiction due to the smartphone being the device used to facilitate the behavior.

Because of the high degree of overlap in the underlying symptomology of these various concepts related to smartphone overuse or misuse (e.g., FOMO, ringxiety), the term "problematic use" will be used in the present paper to refer to all variations of problematic use (e.g., smartphone addiction, problematic mobile phone use, smartphone use disorder) collectively.

### **Personality Correlates of Problematic Smartphone Use**

The five-factor model of personality was developed by Robert McCrae and Paul Costa in the 1980's using factor analysis. In this model, the five personality factors include extraversion, neuroticism, openness, agreeableness, and conscientiousness. To measure these five factors, the NEO Personality Inventory (NEO-PI) was developed. Revisions of this measure have been made over the years, its most recent being the NEO-PI-3. Building upon earlier personality models (e.g., Eysenck), McCrae and Costa identified six facets for each factor that further identify related qualities within that factor. These five factors have been tested and consistently found in a number of different countries across the world (Schultz & Schultz, 2017, p. 232).

#### **Neuroticism**

Neuroticism is an individual's emotional reactivity to events and situations. Those with higher neuroticism tend to experience more negative feelings and have a higher chance of developing anxiety and depression. Some descriptors of those with higher levels of neuroticism could be described as "worried, insecure, nervous, or highly strung," (Schultz & Schultz, 2017, Table 8.5). The facets of neuroticism include anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability (Costa & McCrae, 1995).

Of the 10 articles reviewed that include neuroticism and problematic smartphone use, 8 (80%) showed a positive relationship and 2 (20%) showed no relationship. Three additional studies were reviewed covering neuroticism and regular smartphone use, 2 (66%) showed a positive relationship and 1 (33%) showed no relationship. Specifically, the reviewed studies linked neuroticism to phone use (Butt & Phillips, 2008), problematic smartphone use (Augner & Hacker, 2011; Horwood & Anglim, 2018; Pearson & Hussain, 2015), mobile phone addictive

tendencies (Ehrenberg et al., 2008), Internet addiction (Andreassen et al., 2013; Wang et al., 2015), social networking addiction (Wang et al., 2015), social media use (Correa et al., 2009), habitual smartphone use (Horwood & Anglim, 2018), entertainment use of smartphones (Horwood & Anglim, 2018), higher Internet Addiction Test scores (Lachmann et al., 2017), higher Smartphone Addiction Scale scores (Lachmann et al., 2017), and smartphone addictive behavior (Zhitomirsky-Geffet & Blau, 2016).

Because of the tendency of those high in neuroticism to experience a range of negative feelings, they may be more likely to use smartphones excessively as a means of soothing or coping. For example, neuroticism in the form of self-consciousness may cause an individual to attend to the amount of “likes” they receive on a post to reassure themselves that others think positively of them. Another example of how neuroticism and problematic smartphone use could be linked is through the fear of missing out (FOMO), which could encourage the individual to obsessively check social media applications on their phone.

Horwood and Anglim (2018) found that all six of the facets of neuroticism were significantly positively related to problematic smartphone use. Four of the six (i.e., anxiety, angry hostility, impulsiveness, and vulnerability) were also positively significantly related to habitual use. Further, all six of the facets were also significantly positively related to entertainment use, which suggests that those high in neuroticism may use their smartphones to play games or watch videos as a means of escapism. This high prevalence of links between problematic use and all the facets of neuroticism helps explain the consistency with which neuroticism is found to be related to problematic smartphone use.

## Conscientiousness

Conscientiousness is a general description of an individual's level of diligence and ability to be purposeful in their decisions and actions. Conscientious individuals can be described as "careful, reliable, hardworking, and organized," (Schultz & Schultz, 2017, Table 8.5). The six facets of conscientiousness are competence, order, dutifulness, achievement striving, self-discipline, and deliberation (Costa & McCrae, 1995).

Of the 10 studies examining conscientiousness and problematic smartphone use, 7 (70%) showed significant negative relationships and 3 (30%) showed no relationship. Two further studies were reviewed including conscientiousness and regular use, of which one showed a negative relationship and the other showed a positive relationship. Studies have shown conscientiousness to be negatively related to problematic Internet use (Andreassen et al., 2013; Buckner et al., 2012; Wang et al., 2015), problematic text messaging (Buckner et al., 2012; Montag et al., 2014), gaming addiction (Wang et al., 2015), problematic smartphone use (Horwood & Anglim, 2018; Zhitomirsky-Geffet & Blau, 2016), entertainment use (Horwood & Anglim, 2018), habitual use (Horwood & Anglim, 2018), problematic social network site use (Andreassen et al., 2013; Wilson et al., 2010), Smartphone Addiction Scale scores (Lachmann et al., 2017), and Internet Addiction Test scores (Lachmann et al., 2017).

Because those who are high in conscientiousness tend to be more aware of what they are doing and how they spend their time, the fairly consistent pattern of a negative relationship with problematic smartphone use is logical. That is, those who are conscientious may be more likely to identify that they are spending or wasting too much time on their smartphone, particularly when there are other obligations that need to be fulfilled. In Horwood and Anglim's study (2018), all six conscientiousness facets were significantly negatively related to problematic

smartphone use. Further, dutifulness, self-discipline, and deliberation were significantly negatively related to habitual smartphone use. The number of facets linked with smartphone use further explains the consistency with which conscientiousness is shown to be predictive in studies on problematic smartphone use.

### **Extraversion**

Extraversion is described as an individual being outwardly focused, that is, the individual's energy is being directed towards the outside world and other people. Some descriptors for extraversion are "sociable, talkative, fun-loving, and affectionate," (Schultz & Schultz, 2017, Table 8.5). Facets of extraversion include warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotions (Costa & McCrae, 1995).

Of the 10 studies examining extraversion and problematic smartphone use, 5 (50%) showed extraversion to be positively related, 3 (30%) showed no relation, 1 (10%) showed a negative relationship, and 1 (10%) showed a relationship to regular use but not problematic use. Three further studies examined extraversion and general smartphone use, all finding a positive relationship with extraversion. Studies have shown that extraversion is positively related to higher levels of mobile phone use (Butt & Phillips, 2008; Ehrenberg et al., 2008; Montag et al., 2014), social network use (Correa et al., 2009; Horwood & Anglim, 2018) problematic phone use (Andreassen et al., 2013; Augner & Hacker, 2011), and social network addiction (Andreassen et al., 2013; Wang et al., 2015; Wilson et al., 2010) and negatively related to Internet Addiction Test scores (Lachmann et al., 2017).

In general, the tendency for individuals high in extraversion to be social and seek out these types of situations would explain the positive relationship with smartphone use. The relationship with problematic use is less consistent, despite it being logical that this predilection



to general use could also translate to problematic use. The inconsistent relationship between extraversion and problematic smartphone use suggests that while extraversion can manifest as problematic use among some people, it is on more of a case-by-case basis rather than a constant pattern. For example, this could be due to the number of local friends and family an individual has versus the number of those that they communicate with exclusively online.

Horwood and Anglim (2018) studied the facets of the five factors in relation to problematic, habitual, entertainment, and social smartphone use. Of the facets of extraversion, only excitement seeking was significantly positively related to problematic smartphone use, activity was significantly negatively related, and the rest had no significant relationship. Gregariousness and excitement seeking were both significantly positively related to habitual use. Five of the six facets (i.e., warmth, gregariousness, assertiveness, excitement seeking, and positive emotions) showed a significant positive relationship to social smartphone use. Relationships between problematic smartphone use and only a few extraversion facets may explain why extraversion as a factor is inconsistent in the literature, while being more consistently predictive in studies regarding non-problematic use.

### **Agreeableness**

Agreeableness describes an individual's interactions with others in adherence to social norms for politeness, friendliness, and courtesy. Agreeable individuals can be described as "good-natured, softhearted, trusting, and courteous," (Schultz & Schultz, 2017, Table 8.5). The facets of agreeableness are trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness (Costa & McCrae, 1995).

Of the 10 studies reviewed examining agreeableness and problematic smartphone use, 5 (50%) were found to show significant negative relationships and 5 (50%) were found to show no

relationship. Two further studies reviewed agreeableness and general smartphone use, one showed a negative relationship and the other showed no relationship. Specifically, across these studies agreeableness was linked to phone use (Butt & Phillips, 2008; Ehrenberg et al., 2008), problematic smartphone use (Andreassen et al., 2013; Horwood & Anglim, 2018; Zhitomirsky-Geffet & Blau, 2016), Internet addiction (Andreassen et al., 2013), Smartphone Addiction Scale scores (Lachmann et al., 2017), and Internet Addiction Scale scores (Lachmann et al., 2017).

Horwood and Anglim (2018) found that two of the six facets of agreeableness were significantly negatively related to problematic smartphone use (i.e., straightforwardness, compliance). These findings may provide insight as to the source of the relationship between agreeableness and problematic smartphone use. That is, these facets appear to be reflective of an “easygoing” personality. Individuals with this quality may tend to be calmer, more stable, and show lower levels of neuroticism. While there are more factors outside of the five-factor model that may influence the factors within it, together, these characteristics of an easygoing personality could direct an individual to not feel the need to check for notifications, likes, or other indications of social interaction. Additionally, the fact that there were few facets found to be related to problematic smartphone use could help explain the inconsistency with which agreeableness appears in studies about this topic.

### **Openness**

Openness, or openness to experience, describes the degree to which an individual is actively seeking or accepting of new experiences, views, or ideas. Those with higher levels of openness can be described as “original, independent, creative, or daring,” (Schultz & Schultz, 2017, Table 8.5). The six facets of openness are fantasy, aesthetics, feelings, actions, ideas, and values (Costa & McCrae, 1995).

Of the 10 articles reviewed that included openness and problematic smartphone use, 5 (50%) showed significant negative relationships to problematic smartphone use. Openness has been found to be negatively related to gaming addiction (Wang et al., 2015), problematic smartphone use (Andreassen et al., 2013; Horwood & Anglim, 2018; Pearson & Hussain, 2015), entertainment use (Horwood & Anglim, 2018), Facebook addiction (Andreassen et al., 2013), Smartphone Addiction Scale scores (Lachmann et al., 2017), and positively related to social media use (Correa et al., 2009).

Those higher on openness may be more likely to engage in new activities rather than maintaining a habitual pattern of activities on their phones. Or, more specifically, more close-minded individuals may tend to engage only in a few activities that they know to be enjoyable or perhaps “safe” in that engaging in these activities has familiar or predictable outcomes. Results from Horwood and Anglim (2018) may support these explanations, as they showed the openness facets of actions and ideas to be significantly negatively related to problematic smartphone use. The relationship of only two facets of openness with problematic smartphone use could explain the inconsistency of finding relationships between openness and problematic smartphone use.

### **Youth and Adolescent Personality Correlates of Problematic Use**

In the reviewed articles, only two contained data for youths or adolescents (Wang et al., 2015; Zhitomirsky-Geffet & Blau, 2016). Wang et al. showed that neuroticism and extraversion were positively related to problematic smartphone use, conscientiousness and openness showed a negative relationship, and agreeableness showed no relationship. Zhitomirsky-Geffet and Blau (2016) conducted a cross-generational analysis and found that for this age group, neuroticism was positively related to problematic smartphone use and agreeableness was not significantly related. However, agreeableness was significantly negatively related when examining the total

sample (i.e., Gen X, Gen Y, and Gen Z). Zhitomirsky-Geffet and Blau did not provide data for extraversion, openness, or conscientiousness across generations. Overall, youths or adolescents who engage in problematic smartphone use are more likely to be higher in neuroticism than those who do not. These individuals may also be higher in extraversion and lower in conscientiousness and openness. Agreeableness appears unlikely to be a factor in smartphone use among the youth or adolescents.

### **Young Adult Personality Correlates of Problematic Use**

The bulk of the data reviewed included young adults and problematic smartphone use (Andreassen et al., 2013; Augner & Hacker, 2011; Ehrenberg et al., 2008; Horwood & Anglim, 2018; Lachmann et al., 2017; Wilson et al., 2010; Zhitomirsky-Geffet & Blau, 2016).

Neuroticism was found to be significantly positively related to problematic smartphone use in six of the seven studies (Andreassen et al., 2013; Augner & Hacker, 2011; Ehrenberg et al., 2008; Horwood & Anglim, 2018; Lachmann et al., 2017; Zhitomirsky-Geffet & Blau, 2016).

Conscientiousness was excluded from two studies; of the remaining five studies, four of them found conscientiousness to be significantly negatively related to problematic smartphone use (Andreassen et al., 2013; Horwood & Anglim, 2018; Lachmann et al., 2017; Wilson et al., 2010) and one found no relationship (Ehrenberg et al., 2008).

Agreeableness was excluded from one study. Four of the remaining six studies found agreeableness to be significantly negatively related to problematic smartphone use (Andreassen et al., 2013; Ehrenberg et al., 2008; Horwood & Anglim, 2018; Lachmann et al., 2017), while the other two found no relationship (Wilson et al., 2010; Zhitomirsky-Geffet & Blau, 2016).

Extraversion was excluded from one study. Four of the six studies found extraversion to be significantly positively related to problematic smartphone use (Andreassen et al., 2013;

Augner & Hacker, 2011; Ehrenberg et al., 2008; Wilson et al., 2010). One study found extraversion to be significantly negatively related to problematic smartphone use (Lachmann et al., 2017). The final study found no relationship between extraversion and problematic smartphone use (Horwood & Anglim, 2018).

Openness was excluded from two of the seven studies. Three of the remaining studies found openness to be significantly negatively related to problematic smartphone use (Andreassen et al., 2013; Horwood & Anglim, 2018; Lachmann et al., 2017). The other two studies found no significant relationship between openness and problematic smartphone use (Ehrenberg et al., 2008; Wilson et al., 2010).

Based upon the reviewed data, a young adult who engages in problematic smartphone use is likely to have high neuroticism, lower agreeableness and conscientiousness, and possibly also slightly lower levels of openness than young adults who do not engage in problematic use. Extraversion level may be predictive of how such an individual problematically uses their smartphone (e.g., social network site use or use of solitary activities).

### **Adult and Older Adult Personality Correlates of Problematic Use**

Three articles discussed problematic smartphone use among adults or older adults (Buckner et al., 2012; Pearson & Hussain, 2015; Zhitomirsky-Geffet & Blau, 2016).

Neuroticism was found to be positively related to problematic smartphone use in one of the three studies (Pearson & Hussain, 2015) and not significantly related in the other two (Buckner et al., 2012; Zhitomirsky-Geffet & Blau, 2016).

Extraversion was excluded from one study and was found to be not related to problematic smartphone use in the other two (Buckner et al., 2012; Pearson & Hussain, 2015).

Agreeableness was found not to be related to problematic smartphone use in all three of the studies (Buckner et al., 2012; Pearson & Hussain, 2015; Zhitomirsky-Geffet & Blau, 2016).

Conscientiousness was excluded from one study, found to be significantly negatively related to problematic smartphone use in one (Buckner et al., 2012), and found to be not significantly related in the last (Pearson & Hussain, 2015).

Openness was excluded from one study, found to be significantly negatively related to problematic smartphone use in one (Pearson & Hussain, 2015), and found to be not significantly related in the third study (Buckner et al., 2012).

For the adult or older adult age group, there does not seem to be enough consistent data to attempt to identify five-factor personality traits of an adult or older adult who engages in problematic smartphone use.

Table 3.

*Relationships between FFM and Problematic Smartphone Use Across Age Groups*

Age Group	Study	Neuroticism	Conscientiousness	Extraversion	Agreeableness	Openness
Youth/Adolescent ( <i>M</i> age 12 – 17)	Wang et al. (2015)	+	-	+	<i>ns</i>	-
	Zhitomirsky-Geffet & Blau (2016)	+	n/a	n/a	<i>ns</i>	n/a
Young Adult ( <i>M</i> age 18 – 27)	Andreassen et al. (2013)	+	-	+	-	-
	Augner & Hacker (2011)	+	n/a	+	n/a	n/a
	Ehrenberg et al. (2008)	+	<i>ns</i>	+	-	<i>ns</i>
	Horwood & Anglim (2018)	+	-	<i>ns</i>	-	-
	Lachmann et al. (2017)	+	-	-	-	-
	Wilson, Fornasier, & White (2010)	<i>ns</i>	-	+	<i>ns</i>	<i>ns</i>
	Zhitomirsky-Geffet & Blau (2016)	+	n/a	n/a	<i>ns</i>	n/a
Adult/Older Adult ( <i>M</i> age 28 +)	Buckner, Castille, & Sheets (2012)	<i>ns</i>	-	<i>ns</i>	<i>ns</i>	<i>ns</i>
	Pearson & Hussain (2015)	+	<i>ns</i>	<i>ns</i>	<i>ns</i>	-
	Zhitomirsky-Geffet & Blau (2016)	<i>ns</i>	n/a	n/a	<i>ns</i>	n/a

*Note.* “+” denotes a significant positive relationship found; “-” denotes a significant negative relationship found; “n/a” denotes the personality factor was excluded from the study or final analysis; “*ns*” denotes a non-significant relationship

### **Personality Correlates of Problematic Use Across Age Groups**

As shown in Table 3, the consistency with which neuroticism predicted smartphone use across the age groups may suggest that the aspects of neuroticism responsible for problematic smartphone use do not change with maturation and experiences. It could also be argued that the range of negative emotions one can feel across the lifespan can contribute to problematic smartphone use. This latter explanation is supported by Horwood and Anglim's (2018) findings that all six facets of neuroticism (i.e., anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability) were positively related to problematic smartphone use.

An explanation for the relevance of agreeableness may have to do with the circumstances of the lives of each of these groups. That is, young adults are in the age range of most college students, and this developmental stage is associated with more freedom in choosing one's activities and preferences. Those with lower levels of agreeableness may be less likely to engage in activities to satisfy others' wishes and in doing so rely on the smartphone to keep them occupied. Youths and adolescents and older adults may have more structured lives and find less time to engage in smartphone use to a problematic degree. Youths and adolescents typically experience a more structured school environment than young adults, as attendance is mandatory, and surrounded by people that have more authority to tell them what they are supposed to be doing or administer consequences for inaction. Older adults are in the age range of having a full-time job and a family to take care of, which may keep adults and older adults busier and reduce opportunity for problematic smartphone use.

### **Discussion**

The goal of the present study was to explore potential patterns between the five-factor personality traits and problematic smartphone use, and then further examine these trends across



age groups. Across all age groups, the factors of neuroticism, conscientiousness, and openness were most consistently related to problematic smartphone use. These three factors also were consistent in the direction of their relationship with problematic smartphone use (i.e., neuroticism was positively related, conscientiousness and openness were both negatively related). In contrast, the traits of extraversion and agreeableness were less consistent across ages. Extraversion was related to problematic smartphone use among youth and adolescents and young adults but unrelated to problematic smartphone use among older adults. Agreeableness was negatively related to problematic smartphone use among the young adult group, but unrelated to problematic use among the other age groups.

Overall, personality correlates were most evident and consistent among the young adult samples. Among the few studies that explored personality and problematic smartphone use among older adults, only rarely were any significant relationships reported. Among adolescent samples, however, there were more significant links, but there were only two studies with adolescent samples that were available for review.

### **Future Research**

Based on the reviewed research, there are multiple areas where further research is needed. First, there are few studies examining problematic smartphone use and personality among youths and adolescents. This age group is important to further research to assist in examining change across the lifespan, as well as identifying potential predispositions to or early markers of future problematic smartphone use. Second, there is a need for more studies in this area that focus specifically on older adult populations. While many of the reviewed studies did include a minority of participants who represented the older adult population, the mean age for

samples was frequently skewed by much larger proportions of participants from the young adult age group.

As a handful of the reviewed studies excluded one or more of the traits (e.g., Augner & Hacker, 2011; Zhitomirsky-Geffet & Blau, 2016), more evidence that is based on a full examination of all five personality traits would be helpful for all age groups. Another area that may provide additional clarity into this topic is the exploration of the relationships of the facets underlying each personality trait with problematic smartphone use; at present, only one of the reviewed studies (i.e., Horwood & Anglim, 2018) examined the facets in addition to the five factors.

A final area for future research is to establish a universally agreed-upon definition for and method of measuring problematic smartphone use. The disparate terminology encumbers efforts to aggregate findings regarding problematic smartphone use from different fields or research programs, as was attempted herein. There is also potential for confusion in the literature due to the variety of terms that have been used to describe a similar behavior (e.g., "problematic smartphone use," "smartphone addiction," "mobile phone addiction," "problematic mobile phone use") and assorted symptoms underneath those umbrella terms (e.g., FOMO, ringxiety, phantom vibrations). Of course, not all variables are able to be studied every time, but a more uniform definition would reduce variability across studies and likely lead to a clearer picture of personality correlates of problematic smartphone use. Additionally, because the smartphone is only one of many tools that can be used to access the Internet, it may be informative to assess both problematic smartphone use and Internet addiction simultaneously in order to more accurately differentiate and identify the two behaviors.

## **Implications**

Clinical relevance of problematic smartphone use in recent years has been a point of contention. Despite calls for nomophobia to be included in the DSM (Bragazzi & Del Puente, 2014) and symptoms of smartphone addiction having been identified (Lin et al., 2016), an official diagnostic criterion for a clinical form of problematic smartphone use has not yet been introduced into the DSM. Contrasting viewpoints on the clinical nature of smartphone addiction question if it truly qualifies as an addiction (Panova & Carbonell, 2018) in the first place, and second to that, if it falls under the category of behavioral addictions (Bilieux et al., 2015).

Panova and Carbonell (2018) recommend that clinicians step away from the idea of addiction and instead use a term like “problematic use.” Panova and Carbonell also suggested that this problematic use “...be studied in its sociocultural context with an increased focus on its compensatory functions, motivation, and gratifications” (p. 252). Because it appears that there is not enough evidence for a classification of addiction, problematic smartphone use as clinically relevant may primarily lie in the extent to which it is interfering with the user’s daily life tasks and obligations.

## **Lifestyle Versus Addiction**

In the examination of differences across age groups, the contemporary widespread use of smartphones being a relatively recent occurrence was taken into consideration. As such, different generations (i.e., age groups) have experienced various levels of smartphone integration at differing points in the lifespan. Thus, it is difficult to identify one age group as being at more risk for problematic use than other groups because use patterns --including “problematic” patterns-- may also reflect differences in generational lifestyle preferences. A potential alternative to identifying the most susceptible age group could be examining risk within each age group. More

specifically, assessing an individual for problematic smartphone use may be better accomplished by comparing an individual to their peers that grew up with similar exposure to and use of the same mobile technology, as opposed to creating a catch-all assessment meant to evaluate all age groups.

### **Conclusions**

Across all age groups, personality markers for those most at risk for engaging in problematic smartphone use appear to be those high in neuroticism and low in conscientiousness, with low openness being slightly less consistent than the former traits. It was inferred that such a person possessing these traits may use their smartphone in a manner that leads them to highly repetitive use and, subsequently, to addictive or problematic tendencies. Due to the minimal data on the youngest and oldest age groups in these studies, it is difficult to conceive of a prototypical problematic smartphone user in either of these groups. However, one may be able to consider a typical problematic user for the young adult group.

In addition to the characteristics of neuroticism and conscientiousness previously mentioned, the two traits as a pair have also been shown to correlate in the same directions (i.e., positively with neuroticism, negatively with conscientiousness) with a host of psychopathologies (e.g., disordered eating, Elfhag & Morey, 2008; depressive disorders, Bienvenu et al., 2004; Kotov et al., 2010; anxiety disorders, Bienvenu et al., 2004, & Kotov et al., 2010; poor sleep, Duggan et al., 2014; ADHD symptoms, Nigg et al., 2002). As such, use of a smartphone to such a degree that it interferes with a person's daily functioning (i.e., problematic use) may be a newer expression of psychopathology among people who already have such tendencies.

Problematic smartphone use has been an increasingly relevant issue with the development of the smartphone and similar devices and the proliferation of ownership and use

across all ages. Because of the wide variety of individual and environmental differences that influence one's use and virtually endless ways to use smartphones and similar technological tools, it is difficult to quickly develop clinical addiction criteria, specifically when comparing it to past models that are predominantly substance based. Further research into how personality relates to general and problematic smartphone use and how these relationships contrast with those from other currently accepted addictions may help to officially categorize this type of behavior.

## References

- Anderson, M., & Jiang, J. (2018, November 30). Teens, social media & technology 2018. Retrieved from <https://www.pewresearch.org/internet/2018/05/31/teens-social-media-technology-2018/>.
- Andreassen, C. S., Griffiths, M. D., Gjertsen, S. R., Krossbakken, E., Kvam, S., & Pallesen, S. (2013). The relationships between behavioral addictions and the five-factor model of personality. *Journal of Behavioral Addictions, 2*(2), 90–99. doi: 10.1556/jba.2.2013.003
- Augner, C., & Hacker, G. W. (2011). Associations between problematic mobile phone use and psychological parameters in young adults. *International Journal of Public Health, 57*(2), 437-441. doi:10.1007/s00038-011-0234-z
- Bienvenu, O. J., Samuels, J. F., Costa, P. T., Reti, I. M., Eaton, W. W., & Nestadt, G. (2004). Anxiety and depressive disorders and the five-factor model of personality: A higher- and lower-order personality trait investigation in a community sample. *Depression and Anxiety, 20*(2), 92–97. doi: 10.1002/da.20026
- Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D. J., & Griffiths, M. D. (2015). Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. *Current Addiction Reports, 2*(2), 156–162. doi: 10.1007/s40429-015-0054-y
- Bragazzi, N. L., & Del Puente, G. (2014). A proposal for including nomophobia in the new DSM-V. *Psychology research and behavior management, 7*, 155–160. doi:10.2147/PRBM.S41386

- Buckner, J. E., Castille, C. M., & Sheets, T. L. (2012). The five factor model of personality and employees' excessive use of technology. *Computers in Human Behavior*, 28(5), 1947–1953. doi: 10.1016/j.chb.2012.05.014
- Butt, S., & Phillips, J. G. (2008). Personality and self reported mobile phone use. *Computers in Human Behavior*, 24(2), 346-360. doi:10.1016/j.chb.2007.01.019
- Correa, T., Hinsley, A. W., & Zúñiga, H. G. D. (2010). Who interacts on the web?: The intersection of users' personality and social media use. *Computers in Human Behavior*, 26(2), 247–253. doi: 10.1016/j.chb.2009.09.003
- Costa, P. T., Jr., & McCrae, R. R. (1995). Domains and facets: Hierarchical personality assessment using the revised NEO personality inventory. *Journal of Personality Assessment*, 64(1), 21–50. doi: 10.1207/s15327752jpa6401\_2
- Duggan, K. A., Friedman, H. S., Mcdevitt, E. A., & Mednick, S. C. (2014). Personality and healthy sleep: The importance of conscientiousness and neuroticism. *PLoS ONE*, 9(3). doi: 10.1371/journal.pone.0090628
- Ehrenberg, A., Juckes, S., White, K. M., & Walsh, S. P. (2008). Personality and self-esteem as predictors of young people's technology use. *CyberPsychology & Behavior*, 11(6), 739-741. doi:10.1089/cpb.2008.0030
- Elfhag, K., & Morey, L. C. (2008). Personality traits and eating behavior in the obese: Poor self-control in emotional and external eating but personality assets in restrained eating. *Eating Behaviors*, 9(3), 285–293. doi: 10.1016/j.eatbeh.2007.10.003
- Elhai, J. D., Levine, J. C., Dvorak, R. D., & Hall, B. J. (2016). Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use. *Computers in Human Behavior*, 63, 509–516. doi: 10.1016/j.chb.2016.05.079

- Griffiths, M. (2005). A ‘components’ model of addiction within a biopsychosocial framework. *Journal of Substance Use, 10*(4), 191–197. doi: 10.1080/14659890500114359
- Horwood, S., & Anglim, J. (2018). Personality and problematic smartphone use: A facet-level analysis using the five factor model and HEXACO frameworks. *Computers in Human Behavior, 85*, 349–359. doi: 10.1016/j.chb.2018.04.013
- Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking “big” personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin, 136*(5), 768–821. doi: 10.1037/a0020327
- Kuss, D. J., & Griffiths, M. D. (2011). Online social networking and addiction—A review of the psychological literature. *International Journal of Environmental Research and Public Health, 8*(9), 3528–3552. doi:10.3390/ijerph8093528
- Lachmann, B., Duke, É., Sariyska, R., & Montag, C. (2019). Who’s addicted to the smartphone and/or the Internet? *Psychology of Popular Media Culture, 8*(3), 182–189. doi: 10.1037/ppm0000172
- Lin, Y.-H., Chiang, C.-L., Lin, P.-H., Chang, L.-R., Ko, C.-H., Lee, Y.-H., & Lin, S.-H. (2016). Proposed diagnostic criteria for smartphone addiction. *Plos One, 11*(11). doi: 10.1371/journal.pone.0163010
- Montag, C., Błaszczewicz, K., Lachmann, B., Andone, I., Sariyska, R., Trendafilov, B., ... Markowitz, A. (2014). Correlating personality and actual phone usage. *Journal of Individual Differences, 35*(3), 158–165. doi: 10.1027/1614-0001/a000139
- Newport, F. (2015, July 9). Most U.S. smartphone owners check phone at least hourly. Retrieved from <https://news.gallup.com/poll/184046/smartphone-owners-check-phone-least-hourly.aspx>.



- Nigg, J. T., John, O. P., Blaskey, L. G., Huang-Pollock, C. L., Willicut, E. G., Hinshaw, S. P., & Pennington, B. (2002). Big five dimensions and ADHD symptoms: Links between personality traits and clinical symptoms. *Journal of Personality and Social Psychology*, 83(2), 451–469. doi: 10.1037//0022-3514.83.2.451
- Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction?. *Journal of behavioral addictions*, 7(2), 252–259. doi:10.1556/2006.7.2018.49
- Pearson, C., & Hussain, Z. (2015). Smartphone use, addiction, narcissism, and personality. *International Journal of Cyber Behavior, Psychology and Learning*, 5(1), 17–32. doi: 10.4018/ijcbpl.2015010102
- Pew Research Center. Demographics of mobile device ownership and adoption in the United States. (2019, June 12). Retrieved from <https://www.pewresearch.org/internet/fact-sheet/mobile/>.
- Rideout, V. (2011). *Zero to eight: Children's media use in America*. San Francisco, CA: Common Sense Media. Available: <https://www.commonsensemedia.org/file/zerotoeightfinal2011pdf-0>
- Rideout, V. (2013). *Zero to eight: Children's media use in America 2013*. San Francisco, CA: Common Sense Media. Available: <https://www.commonsensemedia.org/file/zero-to-eight-2013pdf-0>
- Rideout, V. (2017). *The Common Sense census: Media use by kids age zero to eight*. San Francisco, CA: Common Sense Media. Available: [https://www.commonsensemedia.org/sites/default/files/uploads/research/csm\\_zerotoeight\\_fullreport\\_release\\_2.pdf](https://www.commonsensemedia.org/sites/default/files/uploads/research/csm_zerotoeight_fullreport_release_2.pdf)

- Saad, L. (2015, July 13). Nearly half of smartphone users can't imagine life without it. Retrieved from <https://news.gallup.com/poll/184085/nearly-half-smartphone-users-imagine-life-without.aspx>.
- Schultz, D. P., & Schultz, S. E. (2017). *Theories of personality* (11th ed.). Boston, MA: Cengage Learning.
- Tran, D. (2016). Classifying nomophobia as smart-phone addiction disorder. *UC Merced Undergraduate Research Journal*, 9(1). Retrieved from <https://escholarship.org/uc/item/0pq332g4>
- Wang, C., Ho, R. T., Chan, C. L., & Tse, S. (2015). Exploring personality characteristics of Chinese adolescents with internet-related addictive behaviors: Trait differences for gaming addiction and social networking addiction. *Addictive Behaviors*, 42, 32-35. doi:10.1016/j.addbeh.2014.10.039
- Wilson, K., Fornasier, S., & White, K. M. (2010). Psychological predictors of young adults use of social networking sites. *Cyberpsychology, Behavior, and Social Networking*, 13(2), 173–177. doi: 10.1089/cyber.2009.0094
- Wolniewicz, C. A., Tiarniyu, M. F., Weeks, J. W., & Elhai, J. D. (2018). Problematic smartphone use and relations with negative affect, fear of missing out, and fear of negative and positive evaluation. *Psychiatry Research*, 262, 618–623. doi: 10.1016/j.psychres.2017.09.058
- YouGov (2017). *Teen data*. New York: YouGov. Available: [https://d25d2506sfb94s.cloudfront.net/cumulus\\_uploads/document/7frb5srg6x/Copy%20of%20Results%20for%20YouGov%20NY%20%28teens%29%20103%2005.25.2017.pdf](https://d25d2506sfb94s.cloudfront.net/cumulus_uploads/document/7frb5srg6x/Copy%20of%20Results%20for%20YouGov%20NY%20%28teens%29%20103%2005.25.2017.pdf)

Zhitomirsky-Geffet, M., & Blau, M. (2016). Cross-generational analysis of predictive factors of addictive behavior in smartphone usage. *Computers in Human Behavior*, *64*, 682–693. doi:

10.1016/j.chb.2016.07.061

## Appendix

## Griffiths' Behavioral Addiction Criteria (2005)

1. Salience: "...when the particular activity becomes the most important activity in the person's life and dominates their thinking (preoccupations and cognitive distortions), feelings (cravings) and behavior (deterioration of socialized behavior)."
2. Mood modification: "...the subjective experience that people report as a consequence of engaging in the particular activity (i.e. they experience an arousing 'buzz' or a 'high' or paradoxically a tranquillizing and/or distressing feel of 'escape' or 'numbing')."
3. Tolerance: "...the process whereby increasing amounts of the particular activity are required to achieve the former effects."
4. Withdrawal symptoms: "...the unpleasant feeling states and/or physical effects which occur when the particular activity is discontinued or suddenly reduced. Such withdrawal effects may be psychological (e.g. extreme moodiness and irritability) or more physiological (e.g. nausea, sweats, headaches, insomnia and other stress-related reactions)."
5. Conflict: "...conflicts between the addict and those around them (interpersonal conflict) or form within the individual themselves (intrapsychic conflict) which are concerned with the particular activity. Continual choosing of short-term pleasure and relief leads to disregard of adverse consequences and long-term damage which in turn increases the apparent need for the addictive activity as a coping strategy."
6. Relapse: "...tendency for repeated reversions to earlier patterns of the particular activity to recur and for even the most extreme patterns typical of the height of the addiction to be quickly restored after many years of abstinence or control."