Till Logout Do Us Part? Comparison of Factors Predicting Excessive Social Network Sites Use and Addiction Between Singaporean Adolescents and Adults

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Abstract

This study applies the theory of planned behavior (TPB) to examine how factors in the TPB, along with personality traits (neuroticism and extraversion), need to belong, self-identity, and self-esteem relate to excessive social network sites (SNSs) use and SNSs addiction among Singaporean adolescents and adults. We conducted two nationally representative surveys of Singaporean adolescents (n = 4920) and adults (n = 1000). Results indicated that adolescents showed greater addiction to SNSs as compared to adults, and that there are key differences between how the antecedents relate to the two dependent variables. TPB variables were found to be associated with SNSs addiction only among adolescents. Neuroticism was a consistent antecedent of both excessive use and addiction in the two samples, while extraversion was related to the outcome variables only among adults. Self-identity has the strongest association with excessive use and addiction for both samples; self-esteem was negatively associated with the two dependent variables among adults. Implications for theory and practice were discussed.

Keywords: Theory of planned behaviour; social network sites; adolescents; adults; social media addiction; social network sites addiction

Till Logout Do Us Part? Comparison of Factors Predicting Excessive Social Network Sites Use and Addiction Between Singaporean Adolescents and Adults

With the proliferation of smartphones and improved Internet connectivity, the use of social network sites (SNSs) has become an essential part of people's daily life. SNSs are web-based applications (e.g., Facebook, Twitter, and Instagram), where individuals can interact with others in virtual communities, create public profiles, and share textual, audio or video messages (boyd & Ellison, 2008). SNSs are popular as they grant users a plethora of communication affordances, such as instant connection to others and easy access to a large variety of content (Cross, 2014). There are approximately 2.03 billion active SNSs users worldwide (Go-Globe, 2014), of which 52.2% comes from the Asia-Pacific region. In Southeast Asia alone, 26% of the population are active SNSs users (Go-Globe, 2014).

With widespread SNSs adoption, communication scholars are increasingly concerned with the rise of two related but distinct phenomenon — *SNSs excessive use* and *SNSs addiction* (Andreassen & Pallesen, 2014; Caplan, 2002). *SNSs excessive use* describes a situation where individuals spend more time than they expected on SNSs (Caplan, 2002). It is common for people to spend more time than they ought to in our highly connected society. However, if left unchecked, the habit could become a precursor to a more serious problem. The more serious manifestation of problematic media use — *SNSs addiction* — refers to a situation where individuals' preoccupation with SNSs, characterized by an inability to regulate their SNSs use, result in a significant negative impact on their daily lifestyle (Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Caplan, Williams, & Yee, 2009). While excessive SNSs use may be undesirable in certain contexts (e.g., spending too much time on SNSs may take time away from engaging in productive work), these negative effects are often short-term and inconsequential in the long run. SNSs addiction, on the other hand, may be antecedent to more serious problems such as unsound sleep (Andreassen et al., 2012),

poorer psychosocial and physical health, lower academic or work performances, or a decline in the quality of interpersonal relationships (Andreassen & Pallesen, 2014; Andreassen et al., 2012).

It is thus pertinent for research to identify factors that are associated with SNSs excessive use as well as SNSs addiction. Currently, there are three existing gaps in problematic SNSs use research. First, most studies on SNSs focus predominantly on its affordances for communication, such as impression management and formation (Haferkamp, Eimler, Papadakis, & Kruck, 2012; Van Der Heide, Angelo, & Schumaker, 2012). Not many have examined the darker side of SNSs use (Arcy, Gupta, Tarafdar, & Turel, 2014; Tarafdar, Gupta, & Turel, 2013), particularly in the context of unpacking why adolescents use SNSs excessively, and the reasons behind the formation of addictive tendencies toward SNSs use. Second, as research in excessive SNSs use and addiction burgeons, it is important to develop a holistic theoretical framework that synthesizes and accounts for different dimensions of antecedents of SNSs excessive use and addiction for a comprehensive overview.

Third, most existing studies on SNSs excessive use primarily used small samples of adolescents or college students (e.g., Pelling & White, 2009). To date, there are no known studies that have examined problematic SNSs use among adolescents at a national level. In addition, although there are empirical evidences that certain adult population may be more prone to exhibit excessive or addictive tendencies (e.g., Davenport, Bergman, Bergman, & Fearrington, 2014), very few have investigated this phenomenon among adults.

Therefore, the overall motivation of this research seeks to contribute to existing communication literature by using an extended theory of planned behavior (TPB) to examine the potential antecedents of SNSs excessive use and addiction. To do so, this study seeks to partially address some of these gaps by using an extended TPB. First, we aim to use TPB to

understand how attitude, subjective norms, and perceived behavioral control (PBC)[1] relate to SNSs excessive use and addiction. Second, we propose extension to the TPB by including factors such as (a) personality traits (e.g., neuroticism and extraversion), (b) individuals' *need to belong*, and (c) self-identity and self-esteem, as additional factors that may explain why individuals develop SNSs excessive use and addiction. Third, we aim to test our proposed framework with a nationally representative sample of Singaporean adolescents and adults, and compare if the factors associated with our two outcome variables differ between the two groups.

1. Existing theoretical frameworks examining SNSs excessive use and addiction

To date, scholars examining problematic SNSs use predominantly adopt one of the four following theoretical paradigms in research. They are: (a) the cognitive-behavioral model; (b) the social skill model; (c) the social cognitive model; and (d) the TPB model (Baker & White, 2010; Griffiths, Kuss, & Demetrovics, 2014; Lee, Ho, & Lwin, 2017a; Turel & Serenko, 2012).

Scholars who adopt the cognitive-behavioral model examine SNSs excessive use and addiction through the lenses of maladaptive cognitions and behaviors (Caplan, 2003; Davis, 2001). These maladaptive cognitions that influence the development of problematic SNSs use could be in the form of psychosocial issues such as depression and loneliness. These psychosocial stressors may drive individuals to seek out SNSs as they provide a sense of relief for these problems (Griffiths, 2013). The second theoretical paradigm — social skill model — focuses on how individuals with deficits in social interactions prefer to use Internet platforms such as SNSs for communication in which over time, they may develop an unhealthy dependence on SNSs as a substitute for offline interaction (Caplan, 2005). As SNSs allow users to engage in communication in an asynchronous manner, individuals are

[1] We use the acronym PBC throughout this manuscript to refer to perceived behavioral control, which is defined as the amount of control individuals believe they have in executing certain behaviors (Baker & White, 2010).

able to take time to craft their replies, share only edited information of themselves (e.g., selfies) that put them in the best light (Ho, Lee, & Liao, 2016). The third theoretical paradigm is known as the social cognitive model, which postulates that addiction is a function of deficiency in one's self-regulatory functions and the degree of automaticity in individuals' media use (LaRose, Lin, & Eastin, 2003; Lee, Ho, & Lwin, 2017b). Last but not least, scholars have built upon the original TPB framework and used modified versions of it to understand how the three TPB and additional factors relate to SNSs use intention and behavior (Baker & White, 2010; Pelling & White, 2009).

While each of these theoretical frameworks have their own merits in extending our understanding of problematic SNSs use, studies have suggested that there are additional core areas beyond the scope of the four theoretical paradigms that may account for why individuals use SNSs excessively or be addicted (Lee et al., 2017a). Based on our review, we found three specific areas that should be given more attention.

The first area is in understanding how personality traits are associated with excessive SNSs use and addiction. Existing literature have suggested that individuals with certain personality traits (e.g., neuroticism and extraversion) are more likely to use SNSs excessively or develop SNSs addiction as compared to others (Caci, Cardaci, Tabacchi, & Scrima, 2014; Muller et al., 2016; Orchard, Fullwood, Galbraith, & Morris, 2014; Wilson, Fornasier, & White, 2010). Second, as SNSs offer instant and unfettered access to their friends, individuals may turn to SNSs to derive their sense of belonging (Ho, Lee, & Liao, 2016; Lee et al., 2017a). Thus, *need to belong* may be a key contributor of SNSs excessive use and addiction as the need to be accepted by communities is an intrinsic human need (Davis, 2012; Santrock, 2008). Last but not least, as a key feature of SNSs is allowing individuals to engage in different forms of self-presentation (Seidman, 2013), research has suggested that this may appeal to the different dimensions of *self*, such as self-identity and self-esteem (Lee et al.,

2017b; Pelling & White, 2009). Thus, individuals may be attracted to indulge in SNSs use to derive their sense of self-identity (Lee et al., 2017b; Pelling & White, 2009). In addition, people with lower self-esteem tend to use SNSs to boost their positive perception of themselves (Pelling & White, 2009; Yao, He, Ko, & Pang, 2014).

For this research, we postulate that the TPB is the most suitable theoretical framework — in comparison to the other three — to test our hypotheses. This is because TPB is a highly robust theory that has consistently demonstrated that three factors — attitude, subjective norms, and PBC — are related to various forms of SNSs behaviors (Kim, 2011; Lin & Lu, 2011). Considering that behaviors are formed by consciously formed intentions, it is important to consider how the three factors ultimately relate to excessive SNSs use and addiction (LaRose, 2010).

In addition, research has demonstrated that previous modified versions of TPB that incorporated some of these factors (e.g., personality) have explained a significant amount of variance in excessive SNSs use and addiction — past variants of modified TPB have explained between 45% and 58% of the variance in SNSs use and addiction (Baker & White, 2010; Pelling & White, 2009).

2. Theoretical framework — theory of planned behavior

TPB is a social-psychological model for studying antecedents of human intentions and behavior (Ajzen, 1991). TPB assumes that individuals' intention to carry out a behavior is the most proximal determinant of actual behavior. The theory postulates that there are three key antecedents of intention — attitude, subjective norms, and PBC (Ajzen, 1991). Attitude refers to people's positive or negative assessment of engaging in a behavior. If people exhibit positive attitude toward a behavior, it is likely that they would have higher behavioral intention. Subjective norms refer to the perceived prevalence of a behavior and individuals' perceptions of the general social expectations to perform (or not to perform) the behavior.

PBC refers to people's judgment of their ability to engage or disengage in certain behaviors.

Drawing from existing SNSs and Internet addiction literature, there are reasons to postulate that attitude and subjective norms are potential antecedents of SNSs excessive use and addiction. First, studies have shown that attitude and subjective norms are positively related with individuals' intention to engage in high levels of SNSs use (Baker & White, 2010; Pelling & White, 2009). Individuals who hold a favorable attitude toward SNSs may use SNSs more than they expect to. SNSs have multiple features that are deemed attractive to users. For instance, SNSs appeal to people's ego-centric nature as it allows for self-presentation and social surveillance, facilitates instant and constant connectivity with others, and promotes mood-modification and enjoyment (Courtois, All, & Vanwynsberghe, 2012; Kuss & Griffiths, 2011; Sundar & Limperos, 2013). Over time, the positive attitude toward SNSs, due to its ability to meet these gratifications, may weaken self-regulatory functions, which is associated with the development of addiction.

Apart from attitude — which is a state of internal psychological evaluation of SNSs — how an individual perceives the prevalence of SNSs use may also be associated with excessive use and addiction. Human behaviors are often guided by perception of the popularity of a behavior (Lapinski & Rimal, 2005). When one's own social group propagates using SNSs, individuals are likely to mirror the behavior — past research has shown that interpersonal influence are associated with individuals' continuous intention of using SNSs (Kim, 2011). Moreover, the perception that one is engaging in a media behavior that is simultaneously used by significant people in their lives as well as the larger population cements media enjoyment (Denham, 2004). This may dull self-regulation functions, resulting in the development of addictive tendencies (Lee & LaRose, 2007).

PBC is defined as the perceived ease or difficultly in performing a behavior (Pelling & White, 2009). Individuals with high PBC are efficacious in navigating SNSs platforms, while

those with low PBC are not confident of using SNSs effectively. PBC can be considered as an antecedent as the perceived confidence in using a technology may encourage or discourage its adoption in daily lives (Lee & Chang, 2011). SNSs provide a variety of functions such as posting videos, pictures, tweets, comments, and games. Users who are overwhelmed by the SNS functions are less likely to spend time on it and less likely to develop additive tendencies. However, users who are adept at navigating SNSs may tend to spend more time on it as they discover new functions and keep themselves updated on new extensions to SNSs — past research has shown that efficacy in navigating the Internet is associated with higher time spent on it (LaRose et al., 2003).

While individuals with high PBC may be spending excessive time on SNSs, they may not necessarily develop addictive tendencies. An individual with high PBC has a high volition in performing or refraining from engaging in a behavior (Ajzen & Madden, 1986). In online gaming addiction, individuals with little inhibitory control are those with unhealthy dependence on online games (Lu & Wang, 2008). Thus, gamers who are confident of their ability to decide whether or not to play are less likely to develop addiction. Furthermore, in the original conceptualization, PBC is assumed to be a strong predictor of activities that are goal-directed in nature. In the context of addictive tendencies, an individual with an addiction exhibits traits such as compulsivity, excessive preoccupation, as well as withdrawal symptoms (Andreassen et al., 2012). This suggests a diminished conscious ability in behavioral control (LaRose et al., 2003). Hence, those who perceive that they are able to control their behavior (e.g., start or stop SNSs usage at their will) are less likely to develop addiction, as supported by previous research (Lu & Wang, 2008). We postulate:

H1. *Attitude is positively associated with SNSs (a) excessive use and (b) addiction.*

H2. *Subjective norms are positively associated with SNSs (a) excessive use and (b) addiction.*

H3. *PBC is (a) positively associated with excessive use and (b) negatively associated with SNSs addiction*.

2.1. Personality traits

In addition to the factors in the TPB, previous studies have shown that personality traits may be associated with SNSs excessive use and addiction (Amichai-hamburger & Vinitzky, 2010; Hughes, Rowe, Batey, & Lee, 2012; Jenkins-Guarnieri, Wright, & Hudiburgh, 2012). The five-factor personality model (Özguven & Mucan, 2013) identifies five distinct personality traits which are known as *neuroticism*, *extraversion*, *agreeableness*, *conscientiousness*, and *openness*. Among the five personality traits, neuroticism and extraversion were found to be significantly associated with problematic Internet use (Caci et al., 2014; Ross et al., 2009; Yan, Li, & Sui, 2014). Thus, only these two traits are studied in our proposed model.

Neuroticism refers to individuals' level of emotional stability and adjustment, in which those with high neuroticism are less likely to keep their emotions in check and are extremely sensitive with a propensity to worry (Hughes et al., 2012). Research on Internet addiction has shown that individuals with high neuroticism react more strongly to stimuli and thus would be more engaged when using the Internet (Yan et al., 2014). SNSs provide a constant stream of video and audio stimuli, in addition to the steady flow of informational updates from networks. Thus, highly neurotic individuals may spend too much time on SNSs due to the gratifications derived from SNSs.

Individuals with high neuroticism may be more likely to develop SNSs addiction as well. Individuals with high neuroticism may turn to SNSs to alleviate their dysphoric moods, and depend on SNSs as a surrogate for communication (LaRose, Kim, & Peng, 2010). In Internet addiction research, scholars have argued that psychosocial problems may predispose individuals to develop preference for online communication (Caplan & High, 2012; Caplan,

2007). Online interaction provides individuals with a safer and more comfortable platform to interact, as there are less chances for them to receive strong negative reactions, in comparison to face-to-face communication (Caplan, 2005). The dependence on SNSs for mood modification and social connection may result in a diminished self-regulatory control (LaRose et al., 2010), escalating to addiction.

Like neuroticism, we argue that extraversion is another important antecedent of SNSs excessive use and addiction. *Extraversion* refers to individuals' depth and intensity of interpersonal interactions — those with high extraversion are outgoing, talkative and sociable while those with low extraversion are shy and introverted (Hughes et al., 2012). Being outgoing by nature, extroverts may use SNSs as an extension of their offline, interpersonal communication; on SNSs they continue to use SNSs to keep in touch with their networks (Zywica & Danowski, 2008). Past research on personality traits and SNSs have found that extroverted individuals have a bigger online social network, join more Facebook groups and spend longer sessions on SNSs (Caci et al., 2014; Ross et al., 2009). As SNSs satisfies extroverts' need for social enhancement and need for socialization, they may develop a risk of overdependence on SNSs to meet their social needs, thus developing addictive tendencies over time (Andreassen & Pallesen, 2014; Kuss & Griffiths, 2011). Thus, we postulate:

H4. *Neuroticism is positively associated with SNSs (a) excessive use and (b) addiction*.

H5. *Extraversion is positively associated with SNSs (a) excessive use and (b) addiction*.

2.2. Need to belong

Apart from personality traits, we propose to include *need to belong* as an antecedent of SNSs excessive use and addiction. Need to belong is an intrinsic motivation within people to want to form and maintain interpersonal relationships which are enduring, positive and meaningful in nature (Baumeister & Leary, 1995). The need to belong can be fulfilled partially by using SNSs platforms (Gangadharbatla, 2008). SNSs platforms provide

individuals opportunities to maintain relationship with their family, friends, and peers without depending on time and physical space. They also give them an opportunity to freely express their opinion and to gain approval from others. Greenwood and Long (2009) argue that individuals with high *need to belong* feel isolated when they are not in touch with their social family, friends, and peers. Accessing SNSs more intensely becomes a substitute for coping with their loneliness. Hence, individuals with such higher need to belong may spend more time on SNSs and develop addictive tendencies (Gangadharbatla, 2008; Ledbetter et al., 2011; Pelling & White, 2009). Thus, we postulate the following hypothesis:

H6. *Need to belong is positively associated with SNSs (a) excessive use and (b) addiction*.

2.3. Self-identity and self-esteem

In addition to personality traits as well as need to belong, this study examines self-identity and self-esteem as antecedent of SNSs excessive use and addiction, based on empirical evidence from past research (Andreassen & Pallesen, 2014; Pelling & White, 2009). Self-identity is defined as the degree to which engaging in a behavior is essential to an individuals' self-concept (Stryker, 1987). An individual's identity is a combination of his/her personality based on experiences (Clancy & Dollinger, 1993; Erikson, 1963). Self-identity can be expressed through interactions. Individuals seeking some stability in understanding their own identity or seeking identity formation are likely to look towards SNSs as they: (a) provide an engaging platform for identity exploration, (b) allow individuals to freely express themselves, (c) provide a platform to interact with their friends, (d) allow them to join social groups to acquire group identities, and (e) control how they want others to perceive them (Graham, 2014). These SNSs characteristics may induce users with dependence on SNSs, thus encouraging engagement in excessive SNSs use (Aladwani, 2014; Pelling & White, 2009). Users who feel a strong membership to online community as part of their identity

show a higher level of gratification in SNSs participation (Zhang, Tang, & Leung, 2011). Over time, the dependence on SNSs for identity formation may be associated with the development of addictive tendencies as their self-identity and SNSs use become inextricable.

Self-esteem refers to people's evaluation of themselves which can be positive or negative in nature (Coppersmith, 1967; Vogel, Rose, Roberts, & Eckles, 2014). In other words, it can also be referred to as the extent to which individuals perceive themselves as valuable and proficient. Currently, the link between self-esteem and SNSs excessive use and addiction are at best inconclusive based on existing literature.

On one hand, it may be plausible to postulate that self-esteem is negatively associated with SNSs excessive use and addiction; existing research has identified low self-esteem as a risk factor for Internet-related addiction (Weinstein & Lejoyeux, 2010). Moreover, self-esteem has been shown to be negatively associated with deficient self-regulation and the development of media habit (Davies & Hemingway, 2014). Put simply, individuals with high self-esteem are more likely to maintain self-control over their media use and thus less likely to develop addiction. Similar findings have been found in the context of SNSs use. Mehdizadeh (2010) found that self-esteem is negatively associated with greater SNSs activity — those with lower self-esteem were found to have spent more time on SNSs and have more SNSs logins. Moreover, individuals with lower self-esteem — who are insecure and socially anxious — may tend to rely on SNSs as a preferred medium for communication (Andreassen & Pallesen, 2014).

On the other hand, there are findings from research that suggest that individuals with higher self-esteem scores may use SNSs excessively (e.g., for purposes such as social enhancement) or develop addictive tendencies (Barker, 2009; Zhang et al., 2011; Zywica & Danowski, 2008). This is because confident individuals are more likely to want to use SNSs — research has shown that individuals with high self-esteem are more likely to use SNSs to

display attractiveness (Kapidzic, 2013). At the same time, some studies did not find association between self-esteem and SNSs use, as well as SNSs addiction (Baker & White, 2010; Skues, Williams, & Wise, 2012; Wilson et al., 2010). Due to the mixed findings, we postulate the following research question:

H7. *Self-identity is positively associated with SNSs (a) excessive use and (b) addiction*.

RQ1. *How is self-esteem associated with SNSs (a) excessive use and (a) addiction?*

3. Context of study — adolescents vs. adults in Singapore

Apart from examining how the proposed antecedents relate to SNSs excessive use and addiction, another important objective of this study is to compare how these antecedents and the two dependent variables differ between adolescents and adults in Singapore. Singapore has a high SNSs penetration rate among its population, where 74% of the population reported regular SNSs use (Rock Publicity, 2012). The average amount of time that Singaporeans spend on SNSs is 2 h 12 min per day, which is more than the world's average of 1 h 46 min (Go-Globe, 2015). Adolescents, who are early in their developmental stage, are often the subject of researchers' concern when it comes to excessive media use or media addiction (Griffiths et al., 2014). As compared to adults, younger people tend to show more favorable views of technology, to succumb to peer pressure and use media excessively in order to fit in, to depend on SNSs to build their self-esteem and identity, and to have lower executive functions (Davis, 2013; Pelling & White, 2009; Prencipe et al., 2011; Yu, Kim, & Hay, 2013). Moreover, SNSs offer a lot of opportunities for social connection — the need to forge friendships is an important developmental goal of adolescents (Santrock, 2008).

While there are legitimate reasons to examine SNSs excessive use and addiction among adolescents, it is also necessary to conduct similar research among adults. Adults are not immune to internet-related addiction and their use do not differ much in their motivations for SNSs use (Alhabash, Park, Kononova, Chiang, & Wise, 2012; Balakrishnan & Shamim,

2013; Quin~ones-García & Korak-Kakabadse, 2014). In other words, addiction is not an adolescent-only phenomenon. A survey conducted in Singapore in 2012 showed that among Internet users in Singapore, 31% were between the ages of 15 and 24, while 69% of users were older than 25 years old (Rock Publicity, 2012). Moreover, more adults are using SNSs (Wiederhold, 2012), and may demonstrate impulsivity and lack of control (Scheres, Tontsch, Thoeny, & Sumiya, 2014). We postulate the following research questions to understand how antecedents of SNSs excessive use and addiction differ (if any) between the two groups:

RQ2. *How do adolescents and adults differ in terms of their SNSs (a) excessive use and (b) addiction?*

RQ3. *How do the antecedents and their relations to SNSs (a) excessive use and (b) addiction differ between adolescents and adults?*

4. Method

We conducted two separate nationally representative surveys of adolescents (aged 13 to 18) and adults (ages 19 to 50) in Singapore. The adolescent sample consists of secondary and junior college students who filled out a self-administered pen-and-paper questionnaire, which we recruited using multi-stage cluster sampling and simple random sampling respectively. The adult participants were recruited through a door-to-door household survey using stratified random sampling.

The multi-stage cluster sampling of younger adolescents in secondary schools (typically grade 7e10) was conducted in two stages. First, we identified the four education planning zones — North, South, East, and West — as designated by the Singapore Ministry of Education (2014) as *clusters*. From each of the four clusters, two secondary schools (primary sampling unit) were randomly selected and invited to participate in our study. After the school management consented to participate, we invited all the students (secondary sampling unit) to take part in our study. From the four clusters, eight secondary schools

agreed to participate in our study out of the 48 randomly selected schools. In total, 4793 students were invited from these eight secondary schools and eventually 3753 students completed the survey. The overall response rate for the secondary schools participation (primary sampling unit) in the study was 16.7%, and the response rate for students participation (secondary sampling unit) was 78.3%, computed using Foy's (1989) formulation[2].

To recruit older adolescents from junior colleges (equivalent of students in grade 11 – 12 in the U.S.), we used simple random sampling method for participation selection. From the sampling frame consisting of all junior colleges, we assigned an arbitrary number to a list of all the junior colleges in Singapore. We then used a random number generator to select the junior colleges and then invited the selected college. We reapplied the above steps for replacing the college in the case of a rejection. Out of the nine colleges invited, only one college agreed to take part in our study. From this junior college, 1300 students were invited to take part in the survey and eventually 1167 completed the survey. The overall response rate of junior colleges participation was 11.1%. The response rate for junior college students' participation was 89.8%.

The total sample size of the adolescent sample, including both secondary and junior college students, was 4920 students. Our sample comprised 50.6% females and 49.4% males with age ranging from 13 to 21 years (*M* 14.41, *SD* 2.72). Our sample ethnic proportions were Chinese (79.69%), Malays (11.63%), Indians (4.25%), and others (4.43%).

To recruit Singaporean adults, we first stratified Singapore into five regions (Central, East, North-East, North, and West) as designated by the Urban Redevelopment Authority of Singapore (2015). Next, using purchased residential address listing from the Singapore

[2] Response rate calculation for schools (primary sampling unit) = $\frac{\text{Total no. of participating schools}}{\text{Total no. of schools invited}} \times 100\%$

Response rate calculation for students (secondary sampling unit) = $\frac{\text{Total no. of participating students}}{\text{Total no. of students invited}} \times 100\%$

Department of Statistics for each of the regions as a sampling frame, we randomly selected a residential address. Interviewers approached the selected household for the survey and if the members of the household declined to participate or if no suitable participant were found, the interviewer proceeded to the next randomly selected address in that region.

To ensure randomization within household, the "Next Birthday Method" was adopted as it ensures an equal probability of selection of all household members (Gaziano, 2005). In this method, the interviewer asked to speak to the adult member of the household who will have the next birthday. In total, we approached 2639 adults and eventually 1000 of them completed the survey. The overall response rate was 43% calculated based on the American Association for Public Opinion Research (AAPOR) formula 3[3]. The adult sample comprised 52% females and 48% males. The ethnic proportions of our sample were as follow — Chinese (71%), Malays (13%), Indians (12%), and Others (4%), which were similar to the national census conducted in 2010 (Department of Statistics Singapore, 2010).

4.1. Informed consent

Approval was obtained from the Institutional Review Board (IRB) before data collection. For recruitment of adolescents, we also obtained approval from the Ministry of Education and informed consent from the school management team, parents as well as the students. For adults, we administered the survey after obtaining informed consent from the participants themselves. Participants were told that the survey would take approximately 30 min and that there were no foreseeable risks or harm. Participants were told that they could exit the study at any point in time with no penalty.

4.2. Measures

Attitude was measured by asking participants to rate on a seven-point Likert scale ("1" = "Strongly Disagree," "7" = "Strongly Agree") on how agreeable they were with the

[3] AAPOR formula 3 is taken from the American Association for Public Opinion Research (2015).

following statements: (a) “It is good to check SNSs regularly;” (b) “It is valuable to check SNSs regularly;” and (c) “It is enjoyable to check SNSs regularly.” The items were adapted from Ajzen (2006). We averaged the three items in each sample to form composite indices, with higher scores indicating more favorable attitude (Adolescent: $M = 4.73$, $SD = 1.25$, Cronbach’s $\alpha = 0.83$; Adult: $M = 4.84$, $SD = 1.36$, Cronbach’s $\alpha = 0.91$).

Subjective norms were measured by asking participants on a seven-point Likert scale (“1” = “Strongly Disagree,” “7” = “Strongly Agree”) on how agreeable they were with the following statements: (a) “Most people who are important to me check SNSs regularly;” (b) “Many people like me check SNSs regularly;” (c) “The people whose opinions I value check SNSs regularly;” (d) “Most people who are important to me think that I should check SNSs regularly;” and (e) “It is expected of me that I check SNSs regularly.” The measures were adapted from Ajzen (2006). We averaged the five items in each sample to create the composite indices, with higher scores indicating higher subjective norms (Adolescent: $M = 4.40$, $SD = 1.23$, Cronbach’s $\alpha = 0.83$; Adult: $M = 4.72$, SD 1.32, Cronbach’s α 0.89).

Perceived Behavioral Control (PBC) was measured by asking participants to indicate on a seven-point Likert scale (“1” = “Strongly Disagree,” “7” = “Strongly Agree”) the extent to which they were agreeable with the following statements: (a) “It is possible for me to check SNSs regularly;” (b) “It is easy for me to check SNSs regularly;” (c) “If I wanted to, I could check SNSs regularly;” and (d) “It is mostly up to me whether or not I check SNSs regularly.” The measures were adapted from Ajzen (2006). We averaged the four items in each sample to create the composite indices, with higher scores indicating higher PBC (Adolescent: $M = 5.48$, $SD = 1.25$, Cronbach’s $\alpha = 0.87$; Adult: $M = 5.77$, $SD = 1.18$, Cronbach’s $\alpha = 0.93$).

Neuroticism was measured by asking participants on a five-point Likert scale (“1” = “Strongly Disagree,” “5” = “Strongly Agree”) on how agreeable they were with the following

characteristics: “I am someone who … (a) “Is depressed,” (b) “Is relaxed, handles stress well” (reverse-coded), (c) “Can be tensed,” (d) “Worries a lot,” (e) “Can be moody,” (f) “Remains calm in tensed situations” (reverse-coded), and (g) “Gets nervous easily.” The measures were adapted from Benet-Martínez and John (1998). We averaged the seven items in each sample to create the composite indices, with higher scores indicating higher levels of neuroticism (Adolescent: M = 3.06, SD = 0.65, Cronbach’s α = 0.69; Adult: M = 2.47, SD = 0.67, Cronbach’s α = 0.74).

Extraversion was measured by asking participants to indicate on a five-point Likert scale (“1” = “Strongly Disagree;” = “5” “Strongly Agree”) on how agreeable they were with the following characteristics: “I am someone who … (a) “Is talkative,” (b) “Is reserved” (reverse-coded), (c) “Is full of energy,” (d) “Generates a lot of enthusiasm,” (e) “Tends to be quiet” (reverse-coded), (f) “Has an assertive personality,” (g) “Is sometimes shy, inhibited” (reverse-coded), and (h) “Is outgoing, sociable.” The measures, adapted from Benet-Martínez and John (1998) showed high reliability. We averaged the eight items in each sample to create the composite indices, with higher scores indicating higher levels of extraversion (Adolescent: M = 3.22, SD = 0.67, Cronbach’s α = 0.75; Adult: M = 3.20, SD = 0.70, Cronbach’s α = 0.80).

Need to belong. To measure *need to belong,* participants were asked on a seven-point Likert scale (“1” = “Strongly Disagree,” “7” = “Strongly Agree”) on how agreeable they were with the following statements: (a) “I try hard not to do things that will make other people avoid or reject me;” (b) “I need to feel that there are people I can turn to in times of need;” (c) “I want other people to accept me;” (d) “I do not like being alone;” (e) “I have a strong need to belong;” (f) “It bothers me a great deal when I am not included in other people's plans;” and (g) “My feelings are easily hurt when I feel that others do not accept me.” The measures, adapted from Leary, Kelly, Cottrell, and Schreindorfer (2013), showed

high internal consistency. We averaged the seven items in each sample to create the composite indices, with higher scores indicating higher need to belong (Adolescent: M = 4.72, SD = 1.11, Cronbach's α = 0.82; Adult: M = 3.42, SD = 1.43, Cronbach's α = 0.91).

Self-identity was measured by asking participants to indicate on a seven-point Likert scale ("1" = "Strongly Disagree," "7" = "Strongly Agree") the extent to which they were agreeable with the following statements: (a) "I would feel a loss if I were forced to give up SNSs;" (b) "For me, being a SNSs user means more than just using SNSs;" and (c) "SNSs are an important part of who I am." The measures were adapted from Callero (1985) and showed high reliability. We averaged the three items in each sample to create the composite indices, with higher scores indicating greater self-identity (Adolescent: M = 3.95, SD = 1.48, Cronbach's α = 0.75; Adult: M = 3.29, SD = 1.66, Cronbach's α = 0.86).

Self-esteem was measured by asking participants on a seven-point Likert scale ("1" = "Strongly Disagree," "7" = "Strongly Agree") on how agreeable they were with the following statements: (a) "On the whole, I am satisfied with myself," (b) "I feel that I have a number of good qualities;" (c) "I am able to do things as well as most other people;" and (d) "I feel that I'm a person of worth, at least on an equal plane with others." The measures were adapted from Patchin and Hinduja (2010). We averaged the four items in each sample to create the composite indices, with higher scores indicating higher self-esteem (Adolescent: M = 3.40, SD = 0.45, Cronbach's α = 0.74; Adult: M = 3.38, SD = 0.57, Cronbach's α = 0.92).

SNSs Excessive Use was measured by asking participants on a five-point scale ("1" = "Strongly Disagree," "5" = "Strongly Agree") on how agreeable they were with the following statements: (a) "I lose track of time while using SNSs;" (b) "I use SNSs for longer time than I expected to;" (c) "I spend a good deal of time on SNSs;" and (d) "I go on SNSs for longer time than intended." The measures were adapted from Caplan (2005) and showed high internal consistency (Adolescent: M = 2.81, SD = 1.13, Cronbach's α = 0.90; Adult: M =

2.27, *SD* = 1.15, Cronbach's α = 0.93).

SNSs Addiction was measured by asking participants on a five-point scale ("1" = "Strongly Disagree," "5" = "Strongly Agree") on how agreeable they were with the following statements: (a) "Others in my life often complain about the amount of time I spend on SNSs;" (b) "I often become defensive or secretive when anyone asks me about what I do on SNSs;" (c) "I often block out disturbing thoughts about my life with soothing thoughts of SNSs;" (d) "I often fear that life without SNSs would be boring, empty and joyless;" (e) "I often snap, yell, or act annoyed if someone bothers me while I am on SNSs;" (f) "I often find myself saying "just a few more minutes" when on SNSs;" (g) "I often try to hide how long (time spent) I have been on SNSs;" (h) "I often choose to spend more time on SNSs than going out with others;" and (i) "I lose sleep at times due to late night log-ins to SNSs." The measures were adapted from Fioravanti, De'ttore, and Casale (2012). The composite scale showed a high internal consistency (Adolescent: *M* = 2.52, *SD* = 0.73, Cronbach's α = 0.87; Adult: *M* = 1.82, *SD* = 0.73, Cronbach's α = 0.87).

4.3. Analytical approach

We used hierarchical ordinary least squares (OLS) regression analysis and independent sample *t*-test to examine the relationships between the independent and dependent variables in *SPSS20*. We entered the blocks into the regression model in a presumed causal order. Demographics (age, gender, education, and ethnic groups) were entered as the first block. Self-identity and self-esteem were placed in the second block. For the third and fourth blocks, we input personality traits (neuroticism and extraversion) and need to belong respectively. The TPB variables were placed in the last block.

We have decided on using $p < 0.001$ as a cutoff instead of $p < 0.05$ or $p < 0.01$ to

determine statistical significance in our adolescent sample[4]. There are three key reasons for this decision. First, although the practice of using $p < 0.05$ as a threshold for significance is commonly accepted, it is essentially an *arbitrary* figure with no strict objective basis (Dahiru, 2008). Moreover, it has been criticized as a weak evidence against the null hypothesis in the light of extremely large sample sizes (Johnson, 2013). To deal with extremely large sample sizes, researchers have recommended decreasing *p*-value (e.g., Greene, 2003), and statisticians have specifically recommended a cutoff of $p < 0.001$ for large datasets (Johnson, 2013).

Second, in accordance to classical hypothesis testing, determining the significance level is an a priori step — that is, researchers have the prerogative to specify the significance level and the respective critical value of the test statistic in a case where null hypothesis is true (Dahiru, 2008). As such, to avoid making Type 1 error — claiming a significant relationship when it does not exist — we apply the most rigorous set of threshold to test for significance (i.e., $p < 0.001$). We decided not to use $p < 0.01$ as a cutoff because there were sufficient grounds to believe that the certain significant relationships between our independent and dependent variables (where $p < 0.01$) were due to the effect of the extremely large sample size, and not because of the presence of a *true effect*. For example, the regression results showed that the strength of the relationship between Malays and SNSs addiction in the adolescent sample ($\beta = 0.03$ $p < 0.01$) was highly significant despite the very minute effect size.

Third, we believe that the chances of committing a Type 2 error (false negative) by using $p < 0.001$ in our case is low, as many of the relationships between our independent and dependent variables still remained statistically significant even though we adopted the strictest possible threshold. This suggests that the likelihood of our hypothesized associations

[4] For the adult sample, we used $p < 0.05$, $p < 0.01$, and $p < 0.001$ as the threshold to determine statistical significance.

occurring due to random chance is extremely low.

5. Results

Table 1 shows the regression results for both the dependent variables in our adolescent and adult samples. With regard to excessive use, the results showed that attitude had no relationship with excessive use in both samples. Thus, H1a was not supported. Subjective norms were positively associated with excessive use in the adult sample ($\beta = 0.10$, $p < 0.05$) but had no association in the case of adolescents, thus H2a was partially supported. PBC was positively associated with excessive use ($\beta = 0.10$, $p < 0.001$) in the adolescent sample; it had no significant association with excessive use in the adult sampledH3a was partially supported. The three TPB variables accounted for 1.90% of the variance in excessive use in the adolescent sample and 1.30% of the variance in excessive use in the adult sample.

Next, neuroticism had positive association with excessive use in both the adolescent ($\beta = 0.18$, $p < 0.001$) and adult ($\beta = 0.19$, $p < 0.001$) samples, supporting H4a. Extraversion, however, was positively associated with excessive use in the case of adults ($\beta = 0.06$, $p < 0.05$), thus H5a received partial support. The personality block accounted for 3.60% of the variance in excessive use in the adolescent sample and 3.40% of the variance in excessive use in the adult sample.

Need to belong was positively associated with excessive use in adults ($\beta = 0.07$, $p < 0.05$) but had no significant association in the case of adolescents, thus H6a was partially supported. The need to belong block accounted for 0.30% as well as 0.50% of the variances in excessive use in the adolescent and adult samples respectively.

Self-identity was positively associated with excessive use in both the adolescent sample ($\beta = 0.19$, $p < 0.001$) and the adult samples ($\beta = 0.24$, $p < 0.001$), supporting H7a. RQ1a asked how self-esteem was associated with excessive use. Results showed that self-

esteem was negatively associated with excessive use in the adult sample (β = -0.14, p < 0.001), but had no significant association with excessive use in the adolescent sample. Self-identity and self-esteem explained 9.20% of the variance in excessive use in the adolescent sample, and 13.70% of the variance in the adult sample. The total variance explained in excessive use was 18.50% for adolescents and 30.0% for adults.

Next, pertaining to SNSs addiction, results showed that attitude (β = 0.07, p < 0.001) and subjective norms (β = 0.11, p < 0.001) were positively associated with SNSs addiction among the adolescents but not for the adults, thus H1b and H2b were partially supported. As for PBC, results showed that it was negatively associated with SNSs addiction in both the adolescent (β = -0.06, p < 0.001) and adult (β = 0.06, p < 0.05) samples respectively. Thus, H3b was supported. The TPB variables accounted for 1.50% of the variance in SNSs addiction in the adolescent sample and 0.50% of the variance in SNSs addiction in the adult sample.

Next, the results showed that neuroticism was positively associated with SNSs addiction in both the adolescent (β = 0.13, p < 0.001) and the adult samples (β = 0.21, p < 0.001), supporting H4b. Extraversion was positively associated with SNSs addiction in the adult (β = 0.08, p < 0.05) sample. Thus, H5b was partially supported. Need to belong had no significant association with SNSs addiction in the adolescent sample. However, it was positively associated with SNSs addiction (β = 0.15, p < 0.001) in the adult sample. Thus, H6b was partially supported. The personality block accounted for 1.90% and 5.00% of the variances in SNSs addiction in the adolescent and adult samples respectively. As for the need to belong block, it accounted for 0% and 1.80% of the variances in SNSs addiction in the adolescent and adult samples respectively.

Self-identity was positively associated with SNSs addiction in both the adolescent (β = 0.25, p < 0.001) and the adult samples (β = 0.36, p < 0.001), supporting H7b. RQ1b asked

how was self-esteem associated with SNSs addiction. The results showed that self-esteem had no significant association with SNSs addiction in the adolescent sample. However, it was negatively associated with SNSs addiction in the adult sample (β = -0.13, $p < 0.001$). The self-identity and self-esteem block explained 11.3% and 24.20% of the variances in SNSs addiction in the adolescent and adult sample, respectively. The total variance explained for SNSs addiction was 21.40% for adolescents and 37.90% for adults.

RQ2 asked how might adolescents and adults differ in terms of SNSs excessive use and addiction. Result from an independent sample *t*-test showed that while adolescents and adults do not differ significantly in terms of excessive use, adolescents (M = 2.49, SD = 0.73) showed a higher level of SNSs addiction than adults (M = 1.82, SD = 0.74) ($t(5918) = 26.4$, $p < 0.001$).

Last but not least, RQ3 asked how do the antecedent factors and their relations with SNSs (a) excessive use and (b) addiction differ between adolescents and adults. In summary, the results showed that for adolescents, only PBC, self-identity, and neuroticism had positive associations with SNSs excessive use. For adults, all the factors except for attitude and PBC were significantly associated with SNSs excessive use. With regard to SNSs addiction among adolescents, all factors except for self-esteem, extraversion, and need to belong had significant associations with SNSs addiction. For adults, most of the factors (except attitude and subjective norms) had significant associations with SNSs addiction.

[Insert Table 1 about here.]

6. Discussion

Overall, we found partial support for our proposed TPB framework in examining the antecedents of SNSs excessive use and addiction in the context of Singaporean adolescents and adults. Notably, we found that adolescents are more addicted to SNSs as compared to adults, and there are key differences in how the antecedents relate to SNSs excessive use and

addiction in both samples. First, our hypothesized relationships for TPB were largely supported in the case of adolescents' SNSs addiction. Second, neuroticism and self-identity emerged as the most consistent antecedents of excessive use and addiction among both samples. Extraversion, need to belong, and self-esteem were significantly associated with excessive use and addiction only among Singaporean adults.

With regard to TPB, our hypothesized relationships were largely supported in the context of adolescents' SNSs addiction. Adolescents who adopt a more favorable evaluation of SNSs, and believe that SNSs use is prevalent and that their significant others want them to be active are more likely to exhibit addictive tendencies towards SNSs use. These expected outcomes of SNSs use are necessary precursors of achieving a degree of automaticity in media consumption behaviors (LaRose, 2010). However, this was not the case for adults — attitude and subjective norms were not significantly associated with SNSs addiction. This suggests that unlike adolescents, a general positive liking of the SNSs platform is not strong enough for the development of addictive tendencies in adults. Past studies have suggested that specific uses of SNSs — such as posting and viewing updates — or motivational factors (e.g., mood modification) are the drivers of high intensity SNSs usage (Alhabash et al., 2012; Ancu, 2012). The nonsignificant relationship between subjective norms and addiction while contrary to our hypothesis, may be due to adults being less susceptible to influences from peers as compared to adolescents — peer influences may matter more for adolescents as becoming part of a peer group is an important developmental goal for teenagers (Meece & Daniels, 2008).

While we observed differential relationships for attitude and subjective norms in relation to addiction for both samples, PBC, on the other hand, was consistently negatively associated with SNSs addiction. The more efficacious individuals perceive themselves to be in control of their SNSs usage, the less addictive tendencies they will show. This is in line

with past research that demonstrated empirically that there is a negative relationship between self-regulatory functions and the development of problematic media use (Caplan, 2010; LaRose et al., 2010).

Contrary to our expectations for TPB and excessive use, the relationships were largely nonsignificant — with the exception of two observations: (a) subjective norms and excessive use among adults and (b) PBC and excessive use among adolescents. One of the key reasons that adults use SNSs is to maintain social connection, such as contacting friends who are away from home or people whom otherwise they would have lost contact with (Aladwani, 2014; Joinson, 2008). As such, based on their own motivation for SNSs use, they may make assumptions about why others use SNSs and estimate the prevalence of such a behavior (Ho, Lee, Ng, Leong, & Tham, 2016; Ho, Poorisat, Neo, & Detenber, 2014; Liao, Ho, & Yang, 2016). This may induce social pressure to use SNSs more than they usually would. For adolescents, subjective norms was not significantly associated with excessive use. This suggests that external pressures from friends may not be enough in motivating adolescents to use SNS more than they should — using SNSs excessively could be due to intrinsic motivations such as using SNSs for self-presentation and mood-modification purposes (Darvell, Walsh, & White, 2011; LaRose et al., 2010; Van Der Heide et al., 2012).

The second observation is that PBC is positively associated with excessive use only for adolescents and not adults. This may be because as digital natives, adolescents are more competent in navigating the SNSs environment as compared to adults (Ross et al., 2009). As such, this confidence and efficacy may result in adolescents spending more time on SNSs as they seek out and make sense of the availability of different features of SNSs.

In addition, we found that attitude was not significantly associated with excessive use for both adolescents and adults. As highlighted earlier, the evaluation of the platform itself may play a lesser role in explaining why people use SNSs as compared to other psychosocial

or motivational factors (e.g., Alhabash et al., 2012; Clayton, Osborne, Miller, & Oberle, 2013). Past research have shown that while attitude is often a significant antecedent of intention, its relationship with actual behavior is often nonsignificant (Baker & White, 2010; Pelling & White, 2009). For instance, in two separate studies that applied extended TPB models to understand adolescents' SNSs use, both Baker and White (2010), as well as Pelling and White (2009), found that attitude was not significantly associated with SNSs use. This suggests that a favorable evaluation of SNSs itself is not a strong motivator to drive individuals into using SNSs excessively.

In terms of personality traits, our study has shown that neuroticism is the most consistent antecedent of SNSs excessive use and addiction for both adolescents and adults. This finding is largely in line with existing research on personality and Internet uses and addiction (e.g., Mark & Ganzach, 2014). Individuals who score high on neuroticism use SNSs excessively as research has argued that their emotional volatility may predispose them to desire to engage in information regulation to weed out extraneous information about them (Ross et al., 2009). This may include constant surveillance of Facebook wall posts by friends about them, comments, or tweets or retweets.

Extraversion and need to belong, on the other hand, were positively associated with excessive use and addiction only in the case of adults. Past research has shown that extroverted adults are more likely to use SNSs daily for a longer duration, and have more friends (Caci et al., 2014). Caci et al. (2014) argued that adults who are extroverted may tend to exhibit excessive use and addiction because they are more likely to be attracted by stimulating environments and to seek out new friends. This constant access may facilitate an unhealthy dependence on SNSs. On the contrary, extroverted young people — who are active seekers of interactions — tend not to replace their social interactions with SNSs as establishing offline friendships is an important developmental goal (Ross et al., 2009;

Santrock, 2008). This is supported by past research that have shown that online social contacts may not be an effective replacement for offline interactions (Yao & Zhong, 2014).

As for why need to belong is only significantly associated with excessive use and addiction in adults, it may be due to the adults' primary motivation of SNSs use — to connect with people (Joinson, 2008). Adolescents, on the other hand, may see SNSs as an avenue to differentiate themselves from their peers through self-presentation so as to gain popularity. This is supported by research which has shown that need for popularity is a strong antecedent of SNSs behaviors (Utz, Tanis, & Vermeulen, 2012).

Finally, our findings revealed that dependence on SNSs for identity formation was positively associated with excessive use and addiction for both samples. Regardless of age, the SNSs platform offers an important avenue for individuals to construct how they would like to be perceived by others (Pelling & White, 2009). However, self-esteem was only negatively associated with excessive use and addiction for the adult sample — consistent with past research (Vogel et al., 2014). Adults with lower self-esteem are more likely to use SNSs to alleviate dysphoric moods and gain social approval over time, and thus develop an inability to regulate SNSs usage (LaRose et al., 2010). As for adolescents, self-esteem may not be associated with excessive use and addiction because social comparison with others on SNSs may lead to jealousy and envy, and thus may deter them from SNSs (Tandoc, Ferrucci, & Duffy, 2015; Utz & Beukeboom, 2011).

Like all studies, there are some limitations to our research. First, due to the cross-sectional nature of the study, causality could not be determined. Second, we mostly focused on how individual-level factors and not external factors (e.g., family environment) relate to excessive use and addiction. Future research should account for both personal as well as external influences on excessive use and addiction, and to model how the relationships may change overtime.

All in all, our study has contributed to theory and practice. In terms of theoretical contribution, our proposed TPB framework received partial support and we have demonstrated empirically that apart from the original TPB variables, the inclusion of self-traits, personality and need to belong significantly increased the variance explained for excessive use and addiction in both the adolescent and adult samples. Second, to the best of our knowledge, our research is one of the few studies that have attempted to explore how antecedents of SNSs excessive use and addiction differ across adolescents and adults. This is one of the gaps in existing literature, where many of the studies on SNSs use focused primarily on younger samples (Clayton et al., 2013; Ross et al., 2009). Last but not least, our findings can contribute to media literacy programs and will be useful to parents, education institutions, as well as the general public in identifying the antecedents of excessive use and addiction. Based on our findings, individuals who score higher on neuroticism and dependence on SNSs for identify formation are more at risk of developing addiction. Hence, policymakers and educators may want to be more targeted in their public education approach and specifically craft strategies for these individuals to overcome addictive tendencies.

As research in excessive SNSs use and addiction is still relatively nascent, this field of research is fertile, and has tremendous potential for extensive theoretical developments. We echo the calls of existing scholars, who advocate more complex research design that have large representative samples, or are longitudinal in nature, that will add a greater depth and clarity to existing findings drawn from cross-sectional surveys (Andreassen & Pallesen, 2014; LaRose et al., 2010). While we celebrate the affordances for a plethora of communicative capabilities made possible by SNSs, scholars should also be mindful of the unintended negative effects that come along with SNSs use, and continue to research on understanding the causes, consequences, and examine ways to empower people to overcome addictive tendencies and leave less conceptual stones unturned.

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Table 1: Hierarchical regression analyses of SNSs excessive use and addiction.

Independent variables	SNSs Excessive Use		SNSs Addiction	
	Adolescents (*N = 4920)*	Adults (*N = 1000)*	Adolescents (*N = 4920)*	Adults (*N = 1000)*
	β	β	β	β
Block 1: Demographics				
Age	0.01	-0.22***	0.06	-0.09***
Gender (1 = Male; 2 = Female)	0.10***	0.00	0.02	-0.03
Education	0.04	-0.05	-0.27***	-0.05
Ethnicity				
Malay	0.00	0.00	0.03	0.05
Indian	-0.03	0.01	0.01	0.12***
Others	0.03	0.03	-0.01	0.03
R^2 Change (%)	3.50***	11.10***	6.70***	6.40***
Block 2: Self-identity and esteem				
Self-identity	0.19***	0.24***	0.25***	0.36***
Self-esteem	-0.02	-0.14***	0.00	-0.13***
R^2 Change (%)	9.20***	13.70***	11.30***	24.20***
Block 3: Personality				
Neuroticism	0.18***	0.19***	0.13***	0.21***
Extraversion	-0.04	0.06*	-0.04	0.08*
R^2 Change (%)	3.60***	3.40***	1.90***	5.00***
Block 4: Need to belong				
Need to belong	0.03	0.07*	0.00	0.15***
R^2 Change (%)	0.30***	0.50**	0.00	1.80***
Block 5: TPB				
Attitude	0.03	0.05	0.07***	0.04
Subjective norms	0.06	0.10*	0.11***	0.06
Perceived behavioral control	0.10***	-0.02	-0.06***	-0.06*
R^2 Change (%)	1.90***	1.30***	1.50***	0.50*
Total R^2 (%)	18.50***	30.0***	21.40***	37.90***

Note: For adolescents: ***$p < 0.001$. For adults: ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.
For ethnicity, Chinese is used as the baseline group for comparison.