



# The Associations between Problematic Social Networking Site Use and Sleep Quality, Attention-Deficit Hyperactivity Disorder, Depression, Anxiety and Stress

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## Abstract

Social networking sites (SNSs) are now used by billions of users worldwide and can help facilitate communication and the sharing of information. However, there is evidence that problematic SNS use (PSNSU) can have negative effects on health. The present study examined the associations between PSNSU, sleep quality, attention-deficit/hyperactivity disorder (ADHD), depression, anxiety and stress among SNS users. A total of 638 SNS users (mean age = 32.03 years, SD = 10.08) completed an online survey comprising instruments assessing SNS addiction, sleep quality, ADHD, depression, anxiety and stress. Regression analysis indicated that the factors of age ( $\beta = -.24, p < .01$ ), relationship status (i.e., being in a relationship) ( $\beta = -.09, p < .05$ ), ADHD ( $\beta = .43, p < .01$ ) and anxiety ( $\beta = .12, p < .01$ ) explained 23.9% of the variance in problematic SNS use. Bivariate correlations identified moderate positive correlations between PSNSU, poor sleep quality ( $r = .24, p < .01, R^2 = .06$ ), ADHD ( $r = .47, p < .01, R^2 = .22$ ), depression ( $r = .32, p < .01, R^2 = .10$ ), anxiety ( $r = .38, p < .01, R^2 = .14$ ) and stress ( $r = .34, p < .01, R^2 = .12$ ). The study demonstrated that PSNSU was associated with psychopathological and psychiatric disorders symptoms, the findings will help inform future interventions for reducing and tackling PSNSU.

**Keywords** Problematic social networking site use · Social media addiction · Sleep quality · Attention-deficit/hyperactivity disorder · Depression · Anxiety · Stress

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The use of social networking sites (SNSs) has increased with statistics showing that there are 3.196 billion users worldwide (wearesocial.com 2018). Using SNSs can help facilitate communication and the sharing of information (Kuss and Griffiths 2017). However, there is evidence that frequent use of SNSs (i.e., more than two hours every day) can be associated with poor mental health, higher levels of psychological distress and suicidal ideation (Sampasa-Kanyinga and Lewis 2015), as well as being potentially problematic and addictive to a small minority of individuals (Griffiths 2012; Kuss and Griffiths 2017). For instance, Alabi (2013) reported a *Facebook* addiction prevalence rate of 1.6%, and in a nationally representative study of almost 6000 adolescents, Bányaí et al. (2017) reported that 4.5% were at risk of social media addiction.

The term 'SNS addiction' or arguably the more appropriate term of 'problematic SNS use' (PSNSU), has been defined as an activity that occupies an individual's thinking, is driven by a strong motivation to log on or use SNSs, and the individual spends so much time and effort using SNSs that it impairs other social activities, work/studies, interpersonal relationships and/or psychological health and wellbeing (Andreassen and Pallesen 2014). PSNSU in its most extreme form has been classified as a behavioural addiction by some researchers (e.g., Andreassen et al. 2012; Griffiths et al. 2014). PSNSU can intrude on work, school, relationships and face-to-face social interactions and cause behavioural and psychological problems (Kuss and Griffiths 2011). Furthermore, Kuss and Griffiths (2017) have argued that SNS users who experience symptoms and consequences traditionally associated with substance-related addictions (i.e., salience, mood modification, tolerance, withdrawal, relapse and conflict) may be addicted to using SNSs.

Psychiatric disorders such as attention-deficit/hyperactivity disorder (ADHD) and obsessive-compulsive disorder (OCD) have been associated with addictive behaviours. Research by Andreassen et al. (2016) reported positive correlations between symptoms of addictive SNS use and psychiatric disorder symptoms (i.e., ADHD, OCD, anxiety and depression) and that age was inversely related to SNS addiction. Furthermore, regression analysis showed that the psychiatric disorder variables of ADHD, OCD, anxiety and depression explained 15% of the variance in SNS addiction, and the demographic variables of age, sex, marital status and educational level explained 11% of the variance in SNS addiction.

Research by Wu et al. (2013) investigated addictive tendencies, impulsivity (a trait of ADHD), internet self-efficacy and outcome expectancies toward SNS use. Results showed that those who spent more time using SNSs reported higher addictive tendencies and that addictive tendencies were positively correlated with both outcome expectancies and impulsivity, but negatively associated with internet self-efficacy. These three variables explained 23% of the variance in addictive tendencies. More generally, studies have demonstrated associations between problematic internet use and ADHD (Carli et al. 2013; Yen et al. 2009). Furthermore, research by Ho et al. (2014) reported that internet addiction was significantly associated with alcohol abuse, ADHD, depression and anxiety. Sariyska et al. (2015) reported that internet addiction was associated with depression and ADHD, while research by Turel and Bechara (2016) reported that ADHD symptoms were associated with increased stress, reduced self-esteem and increased cravings to use SNSs.

Numerous studies have reported associations between OCD symptoms and addictive behaviours (e.g., Carli et al. 2013; Cho et al. 2013; Weinstein et al. 2014; Lee et al. 2014; Santos et al. 2015; Xiuqin et al. 2010). Rosen et al. (2013) examined SNS use and associations with psychiatric disorders. Their results showed that anxiety about not checking in with SNSs predicted more signs of compulsive disorder. Dong et al. (2011) reported high obsessive-

compulsive behaviours among participants before they became addicted to the internet. Psychopathological symptoms, such as depression, anxiety and stress, appear to be associated with PSNSU. Different patterns in the way individuals with depression and anxiety engage with SNSs are beginning to emerge (Seabrook et al. 2016). Ryan and Xenos (2011) reported that shy and anxious people spend more time on SNSs to escape from reality and to gratify their social needs and that such behaviour could lead to the development of addiction in some individuals (Hong et al. (2014). It has also been reported that depressive symptoms can increase the risk of SNS addiction (Wegmann et al. 2015). Symptoms of depression, anxiety and stress might culminate in negative psychosocial consequences like those reported by Wu et al. (2013) (i.e., a low interest for real life or problems maintaining offline relationships). Such consequences may lead to excessive and addictive SNS use.

The associations between PSNSU and psychopathological variables have been reported in several studies (e.g., Baker and Algorta 2016; Moreno et al. 2011; Simoncic et al. 2014). A recent study by Shensa et al. (2017) reported that PSNSU was strongly and independently associated with depressive symptoms. Several other studies have also reported correlations between PSNSU and depression (Bányai et al. 2017; Kross et al. 2013; Moreno et al. 2011; Pantic 2014), and psychiatric distress has been associated with SNS addiction (Pontes et al. 2018). Research has also reported associations between depression, anxiety and internet addiction (e.g., Alavi et al. 2012; Cho et al. 2013; Dong et al. 2011; Kratzer and Hegerl 2008; te Wildt et al. 2007; Ho et al. 2014). Relationships between depression, anxiety and other addictive technological behaviours have also been reported (e.g., Alavi et al. 2012; Carli et al. 2013; Cho et al. 2013; Guo et al. 2012; Hussain et al. 2017; Kuss et al. 2014; Lee et al. 2014; Lepp et al. 2014; Morrison and Gore 2010; Richardson et al. 2018; Wei et al. 2012; Weinstein et al. 2014). Taken together, these studies show the potential associations between psychopathological symptoms and PSNSU.

The effects of insomnia on mental health have been well documented (e.g., Taylor et al. 2003; Veda et al. 2016). Studies have reported bidirectional associations between insomnia symptoms and depression/anxiety (Jansson-Fröjmark and Lindblom 2008; Luo et al. 2013). Sleep problems are a significant health concern among adolescents, and it has been associated with technology use (Cheung and Wong 2011; Sami et al. 2018; Zhang et al. 2017; see Alimoradi et al. (2019) for a recent systematic review and meta-analysis). Poor sleep quality prevalence rates have been reported in various studies. For instance, Cheng et al. (2012) reported a prevalence rate of 54.7% among Taiwanese students, while Rocha et al. (2010) reported a prevalence rate of 71.4% among Brazilian students. There are a few studies that have examined the relationship between SNS use and sleep quality. For instance, Wolniczak et al. (2013) investigated the associations between *Facebook* dependence and poor sleep quality among Peruvian students. The results showed that *Facebook* dependence was present in 8.6% of the sample and poor sleep quality was present in 55% of the sample. A significant association between *Facebook* dependence and poor sleep quality was found (mainly explained by daytime dysfunction). The authors concluded that strategies to moderate the use of *Facebook* and to improve sleep quality were needed. In-depth case studies have also reported an association between excessive *Facebook* use and poor sleep quality (e.g., Karaïskos et al. 2010).

Sleep problems have also been associated with problematic internet use (Lam 2014). Research by Song et al. (2010) reported that internet addiction among adolescents was correlated with depression and sleep problems. Many studies have reported that increased time spent on the internet significantly disrupts sleep-wake schedules and that heavy internet users experience high levels of insomnia (e.g., Bener et al. 2019; Choi et al. 2009; Jenaro et al.

2007; Rotunda et al. 2003; Thomée et al. 2007). Cheung and Wong (2011) found that both insomnia and internet addiction were associated significantly with depression. Tan et al. (2016) reported that problematic internet use was significantly associated with depressive symptoms and sleep disturbance. Lemola et al. (2015) reported that electronic media use at night was related to sleep disturbances and depressive symptoms. Other studies (e.g., Munezawa et al. 2011) report associations between smartphone use and sleep disorders among Japanese adolescents and poor sleep quality due to using electronic media in the bedroom (Brunborg et al. 2011). Fossum et al. (2014) reported that smartphone usage for texting, playing and surfing the internet was positively associated with insomnia and chronotype and negatively associated with morningness. Demirci et al. (2015) investigated the relationship between smartphone use severity, sleep quality, depression and anxiety in students. The findings showed that depression, anxiety and daytime dysfunction were elevated in the high smartphone use group compared with the low smartphone use group. Altogether, these studies demonstrate comorbidity of sleep disorders and psychological illnesses.

Previous research (e.g., Karaïskos et al. 2010; Lam 2014) suggests that poor sleep quality can have detrimental effects on an individual's health. Research examining addictive technology use has focused on sub-groups of participants (i.e., adolescents), internet use and smartphone use. Other research has focused on specific SNSs such as *Facebook* (Wolniczak et al. 2013). However, to the best of the authors' knowledge, there are no studies examining general SNS use (i.e., the use of a variety of SNSs such as *Instagram*, *Twitter*, *YouTube*) and associations with sleep quality and symptoms of psychiatric disorders. Identifying factors that influence sleep dysfunction (such as PSNSU) and lead to sleep disorders may predispose people to psychological and psychiatric illnesses (Sateia 2009). At present, there is little empirical evidence highlighting the associations between PSNSU, sleep quality and mental health variables. Further investigation is warranted as this is an area of concern for psychologists, health professionals and those experiencing mental health problems. The present study identified a gap in scientific knowledge by focusing on the associations between PSNSU, sleep quality, ADHD, depression, anxiety and stress among SNS users of all ages.

## Method

### Participants

The sample comprised 638 participants. The mean age of the participants was 32.03 years ( $SD = 10.08$ ). Over half of the participants (52.4%) were male ( $n = 334$ ), 47.3% were female ( $n = 302$ ), and two participants did not disclose their gender (0.3%). Participants were from the USA (46%,  $n = 293$ ), India (40.7%,  $n = 260$ ), the UK (3%,  $n = 19$ ) and Canada (2.7%,  $n = 17$ ), although many other countries were represented among the sample (e.g., Italy, France, Spain, Mexico, Germany and Greece). Participants were mostly employed (63.6%,  $n = 406$ ), self-employed (18.3%,  $n = 117$ ), students (8.5%,  $n = 54$ ), unemployed (7.7%,  $n = 49$ ) or retired (1.9%,  $n = 12$ ). The ethnicity of the sample was varied with the sample comprising of white (42.6%;  $n = 272$ ), Asian (40.1%;  $n = 256$ ), black (5.8%,  $n = 37$ ), South-East Asian (5.3%;  $n = 34$ ), mixed/multiple ethnic group (3.1%;  $n = 20$ ), African, North African, Arab (1.3%,  $n = 8$ ) and other (1.7%,  $n = 11$ ) (see Table 1 for main sociodemographic characteristics).

**Table 1** Sample's main sociodemographic characteristics, patterns of SNS use, levels of addiction to SNSs and psychological health ( $n = 638$ )

Variable		Minimum	Maximum
Age (years) (mean, SD)	32.08 (10.08)	18	75
Gender (male, %)	334 (52.4)	—	—
In a relationship ( $n$ , %)	478 (74.9)	—	—
Minutes spent on SNSs per day (mean, SD)	125.93 (110.78)	1	880
Social media addiction levels (mean, SD)	15.19 (4.71)	6	30
PSQI levels (mean, SD)	11.67 (3.25)	5	21
ADHD levels (mean, SD)	28.43 (11.46)	0	71
Depression levels (mean, SD)	13.67 (10.25)	0	42
Anxiety levels (mean, SD)	12.40 (9.80)	0	42
Stress levels (mean, SD)	14.92 (9.26)	0	42

Minutes spent on SNSs per day refer to self-reported number of minutes

SD standard deviation, SNSs social networking sites, PSQI Pittsburgh Sleep Quality Index, ADHD attention-deficit and hyperactivity disorder

## Design and Materials

An online survey was used in the present study for the collection of data and was developed with the use of *Qualtrics* online survey software. The survey comprised four psychological instruments that together assessed the associations between SNS use, ADHD, psychopathological symptoms and sleep quality. The four instruments are described below.

### Bergen Social Media Addiction Scale

PSNSU was assessed using the Bergen Social Media Addiction Scale (BSMAS) which is a modified version of the Bergen Facebook Addiction (BFAS; Andreassen et al. 2012). Scale questions were modified by Andreassen et al. (2016) by using the word 'social media' instead of the word 'Facebook'. There are six questions that assess the six criteria of addiction outlined by Griffiths (2005), i.e., salience, conflict, mood modification, withdrawal, tolerance and relapse. Example questions include the following: 'How often during the last year have you felt an urge to use social media more and more?' and 'How often during the last year have you used social media in order to forget about personal problems?' Participants rate all items on a five-point Likert scale (where 1 = very rarely, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often). Internal consistency of the BSMAS was good in the present study (Cronbach's  $\alpha = .78$ ).

### ADHD Self-Report Scale

ADHD symptoms were assessed using the Adult ADHD Self-Report Scale (ASRS, version 1.1.) (Kessler et al. 2005). The ASRS comprises 18 questions reflecting symptoms of ADHD and is based on the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) criteria for ADHD (American Psychiatric Association 1994). Example questions include the following: 'How often do you have difficulty keeping your attention when you are doing boring or repetitive work?', 'How often do you have problems remembering appointments or obligations?' and 'How often do you feel restless or fidgety?'. Participants rated all items on a five-point Likert scale ranging from *never* (0) to *very often* (4). Overall scores ranged from 0 to 72. Internal consistency of the ARSR was excellent in the present study (Cronbach's  $\alpha = .91$ ).

## Depression, Anxiety and Stress Scale

The symptoms of depression, anxiety and stress were assessed using the 21-item short form Depression, Anxiety and Stress Scale (DASS-21) (Lovibond and Lovibond 1995). The scale comprises three seven-item sub-scales covering the three symptoms that are rated on a four-point Likert scale ranging from *never* (0) to *almost always* (3). Example questions include the following: 'I found it hard to wind down', 'I felt down-hearted and blue' and 'I found myself getting agitated'. Scores are summed and then multiplied by two (to make scores comparable to the DASS-42). Overall scores range from 0 to 42 with high scores indicating elevated depression, anxiety and stress. Cronbach's  $\alpha$  for this measure were excellent in the present study: .92 (depression), .90 (anxiety) and .88 (stress).

## Pittsburgh Sleep Quality Index

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al. 1989), which assesses subjective sleep quality during the preceding month. It comprises 19 self-rated questions and five questions rated by the bed partner. The 19 items are grouped into scores with the seven following components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction. These component scores were added to a global PSQI score with a range of 0 to 21, with higher scores indicating worse sleep quality. The internal consistency of the PSQI was moderate in the present study (Cronbach's  $\alpha = .59$ ).

## Procedure

Most participants were recruited via the crowdsourcing website *Amazon Turk* ( $n = 500$ ). The remaining 138 were recruited from an internet-posted message inviting SNS users to participate in the study posted on the first author's social networking accounts (e.g., *Facebook*, *Twitter*, *WhatsApp*). The online recruitment posts included information about the purpose of the study and a hyperlink to the online survey. The hyperlink directed participants to the survey where they were presented with a participant information page followed by clear instructions on how to complete the survey. All participants were assured that their data would remain anonymous and confidential. A debriefing statement at the end of the survey reiterated the purpose of the study and informed participants of their right to withdraw from the study.

## Ethics

The study was carried out in accordance with the Declaration of Helsinki and adhering to the British Psychological Society ethical guidelines. The university's ethics committee of the first author approved the study. All participants were informed about the study and all provided informed consent.

## Analytic Strategy

The analytic strategy involved (i) cleaning the data set by inspecting cases with missing values above the conventional threshold of 10% in all relevant instruments; (ii) checking for univariate normality of all items of the BSMAS, ASRS, DASS-21 and PSQI; and (iii)

screening for multivariate outliers using Cook's distance, leverages and Mahalanobis distances (Field, 2013). Statistical analyses included (i) descriptive analysis of the main sample's characteristics, (ii) correlational analysis of the main variables of the study by estimation of Pearson's product-moment correlation coefficients with 95% bias-corrected and -accelerated (BCa) confidence interval (CI) and accompanying coefficients of determination ( $R^2$ ) and (iii) a hierarchical multiple regression to ascertain the association between PSNSU and the predictor variables. Data analyses were performed using IBM SPSS 24 for Windows.

## Results

### Descriptive Statistics

Table 1 presents a summary of the study sample's main socio-demographic characteristics, patterns of SNS use, SNS addiction levels, sleep quality levels and psychological health. The observed levels of SNS addiction (mean = 15.19, [BCa = 14.83–15.55], SD = 4.71) were moderate. In relation to the other main study variables, all scores were also at moderate levels: PSQI scores (mean = 11.67, [BCa = 11.41–11.96], SD = 3.25), ADHD scores (mean = 28.43, [BCa = 27.55–29.42], SD = 11.46), depression scores (mean = 13.67, [BCa = 12.89–14.51], SD = 10.25), anxiety scores (mean = 12.40, [BCa = 11.59–13.19], SD = 9.80) and stress scores (mean = 14.92, [BCa = 14.18–15.69], SD = 9.26).

### Social Networking Behaviour

Most participants (60.2%) used *Facebook* ( $n = 384$ ), followed by *Instagram* (11.4%,  $n = 73$ ), *WhatsApp* (11.1%,  $n = 71$ ), *Twitter* (5.5%,  $n = 35$ ), *YouTube* (4.9%,  $n = 31$ ) and *Google+* (1.4%,  $n = 9$ ), with 5.7% of participants ( $n = 35$ ) stating that they used other SNSs. In regard to SNS activities, 30.4% of participants checked their newsfeeds ( $n = 194$ ), 20.1% chatted to friends ( $n = 128$ ), 17.6% viewed photos ( $n = 112$ ), 9.6% updated their status ( $n = 61$ ), 8.0% checked the conversations of others ( $n = 51$ ), 5.3% uploaded photos ( $n = 34$ ), 4.5% watched videos ( $n = 29$ ), 2.4% played games ( $n = 15$ ) and 2.2% checked profiles of others ( $n = 14$ ).

### Correlational Analysis

A correlational analysis involving the main study variables was performed to provide preliminary insight and statistical context for the subsequent multiple regression analysis. The analysis demonstrated that social media addiction was positively associated with PSQI ( $r = .24$ ,  $p < .01$ ,  $R^2 = .06$ ), ADHD ( $r = .47$ ,  $p < .01$ ,  $R^2 = .22$ ), depression ( $r = .32$ ,  $p < .01$ ,  $R^2 = .10$ ), anxiety ( $r = .38$ ,  $p < .01$ ,  $R^2 = .14$ ) and stress ( $r = .34$ ,  $p < .01$ ,  $R^2 = .12$ ) and negatively associated with age ( $r = .24$ ,  $p < .01$ ,  $R^2 = .06$ ) (Table 2).

### Multiple Regression Analysis

A hierarchical multiple regression analysis was conducted to predict SNS addiction (Table 3). The step 1 variables of gender, age and relationship status accounted for 6.7% of the variance ( $F(3, 634) = 15.151$ ,  $p < .05$ ). The addition of the step 2 variable of ADHD increased the



**Table 2** Bootstrapped correlation matrix with bias-corrected and accelerated (BCa) 95% confidence interval (CI) between social media addiction and the study variables ( $N = 638$ )

Variables	Social media addiction	$R^2$	95% BCA CI
Gender	-.06	—	-.132–.011
Age	-.24*	.06	-.304–.168
Relationship status	-.08	—	-.156–.002
PSQI	.24*	.06	.163–.315
ADHD	.47*	.22	.392–.541
Depression	.32*	.10	.242–.400
Anxiety	.38*	.14	.287–.443
Stress	.34*	.12	.267–.418

Bootstrap results are based on 1000 bootstrap samples

ADHD attention-deficit and hyperactivity disorder, PSQI Pittsburgh Sleep Quality Index

\*Correlation is significant at  $p < .01$

proportion of variance to 16.5% ( $F(4, 633) = 47.811, p < .05$ ). The step 3 variable of anxiety accounted for 0.7% of the variance ( $F(5, 632) = 39.589, p < .05$ ). The results identified age ( $\beta = .24, t(634) = -6.24, p < .01, pr^2 = .06$ ), relationship status ( $\beta = -.09, t(634) = -2.39, p < .05, pr^2 = .01$ ), ADHD ( $\beta = .43, t(633) = 11.6, p < .01, pr^2 = .18$ ) and anxiety ( $\beta = .12, t(632) = 2.31, p < .01, pr^2 = .01$ ) as significant predictors of social media addiction.

## Discussion

The aim of the present study was to examine the associations between PSNSU, sleep quality, ADHD, depression, anxiety and stress. This investigation was needed to add to the small but growing research literature in this area and to provide much needed insights into the

**Table 3** Stepwise multiple linear regression of the relationship between social media addiction and key psychosocial predictors

Variables	Step 1			Step 2			Step 3		
	$B$	$SE$	$\beta$	$B$	$SE$	$\beta$	$B$	$SE$	$\beta$
Gender	-.41	.36	-.04	-.01	.33	-.00	.02	.33	.00
Age	-.11	.02	-.24**	-.05	.02	-.11**	-.04	.02	-.09*
Relationship status	-.99	.42	-.09*	-.73	.38	-.07	-.69	.38	-.06
ADHD				.18	.02	.43**	.15	.02	.37**
Anxiety							.05	.02	.11**
Model summary									
Variance explained by model	$R^2 = .067$ (6.7%)			$R^2 = .232$ (23.2%)			$R^2 = .239$ (23.9%)		
Change in variance by next step				$\Delta R^2 = .165$ (16.5%)			$\Delta R^2 = .007$ (0.7%)		
Statistical significance of model	$F(3, 634) = 15.151^*$			$F(4, 633) = 47.811^*$			$F(5, 632) = 39.589^*$		
Statistical significance of steps				$\Delta F(1, 633) = 136.105^*$			$\Delta F(1, 632) = 5.379^*$		

Outcome: social networking site addiction. The final model (i.e., step 3) excluded the following variables due to their low predictive and non-significant power in the outcome variable: PSQI, depression and stress

$B$  unstandardized regression coefficient,  $SE$  standard error,  $\beta$  standardized regression coefficient,  $R^2$  R square,  $\Delta R^2$   $R^2$  change,  $\Delta F$   $F$  change, ADHD attention-deficit and hyperactivity disorder

\* $p < .05$ , \*\* $p < .01$



increasingly common activity of SNS use and its relationship to various psychological and mental health conditions. The study showed that gender, age, being in a relationship, ADHD and anxiety significantly predicted PSNSU. Furthermore, ADHD and anxiety significantly predicted PSNSU, over and above the effects of demographic variables. The findings suggest that high levels of ADHD and anxiety are associated with PSNSU. These findings support previous research (e.g., Primack et al. 2017; Sampasa-Kanyinga and Lewis 2015) that reported associations between mental health and SNS addiction. The variables of ADHD and anxiety accounted for 17.2% of the variance in SNS addiction and confirm previous research that reported the effects of psychopathological symptoms on SNS addiction (e.g., Andreassen et al. 2016; Rosen et al. 2013).

The bivariate correlations demonstrated significant relationships between several of the study variables and SNS addiction. More specifically, SNS addiction was positively associated with ADHD, depression and anxiety. These findings support previous research studies that have reported similar associations (Andreassen et al. 2016; Bányai et al. 2017; Pantic 2014; Shensa et al. 2017). SNS addiction was positively associated with stress, as has been found in previous research that has reported associations between online behaviours and stress (e.g., Hou et al. 2017; Park et al. 2014; Lam et al. 2009; Samaha and Hawi 2016). Xu and Tan (2012) argued that PSNSU occurs when an individual views SNS use as a mechanism to relieve stress. In the present study, SNS addiction was positively associated with depression supporting previous research findings (e.g., Bányai et al. 2017; Kross et al. 2013; Moreno et al. 2011; Pantic 2014; Shensa et al. 2017). Continued use of SNSs to relieve undesirable mood states may lead to psychological dependence in a small minority of individuals (Griffiths 2013). SNS addiction was negatively associated with age suggesting that younger SNS users are more likely to develop an addiction to SNSs. This corroborates previous research that has reported higher SNS addiction prevalence rates among young users (e.g., Andreassen et al. 2013; Turel and Serenko 2012).

SNS addiction was positively associated with poor sleep quality; this finding provides support for previous research (e.g., Karaikos et al. 2010; Wolniczak et al. 2013) that reported associations between PSNSU and poor sleep quality. There are implications for these findings in the present study. The quantity and quality of sleep may influence health and wellbeing. Poor sleep quality has been reported to be associated with neurobehavioural deficits including slowed working memory, lapses of attention and reduced cognitive functions (Banks and Dinges 2007). Furthermore, poor sleep quality may negatively impact academic and/or work performance (Huang and Leung 2009).

The present study highlights the potential negative effects of SNS use. These negative consequences may be exacerbated if SNS users are constantly online and using more than one SNS as reported by previous research (Lenhart 2015). SNSs are used for a variety of activities (e.g., checking newsfeeds, messaging, chatting, blogging, watching videos, sharing and posting pictures) that can cause users to be distracted (Kuss and Griffiths 2017). These potentially distracting activities may co-occur with other behaviours such as short-term attention, restlessness, forgetfulness, impulsiveness and decreased ability to retain information. These behaviours are symptoms of ADHD that can lead to maladaptive functioning in academic, home and recreational settings. There is also concern that ADHD may be comorbid with anxiety as found in the present study and in previous research (i.e., Andreassen et al. 2016). Both disorders may affect the quality of sleep. Consequently, it can be speculated that ADHD, anxiety and poor sleep quality may be a contributing factor to PSNSU. As SNS use increases, it is becoming increasingly important to address the potential detrimental effects of problematic use.

The limitations of the present study included the use of a convenience sample which limited the generalizability of the findings and the cross-sectional study design which did not allow for causal relationships to be determined (Wang et al. 2018). There are also limitations associated with self-report methods because the validity of the data is contingent upon the accuracy of the participant responses (Blackwell et al. 2017). Additionally, some of the correlations between variables were of a moderate strength. In the present study, the Cronbach's alpha for the PSQI was relatively low. This could be due to inconsistent responses from participants, or the number of items in the scale may have influenced the inconsistency (Vaske et al. 2016). Alternative methods of measuring the reliability of scales should be considered in future research. It should also be noted that data concerning employment or student roles outside of educational commitments were not collected. If any of the participants were involved in shift work or took night classes, this could have affected the results given the study context in relation to sleep. The strengths of the study included the use of a validated scale for the measurement of PSNSU and the examination of general SNS use and sleep quality. Future research studies should attempt to recruit larger nationally representative samples and should attempt to use longitudinal study methods that focus on analysing real-time SNS data. Also, studies that focus on new strategies to help SNS users to manage their online activities are also warranted.

The present study findings showed that PSNSU was associated with symptoms of psychopathological and psychiatric disorders. The findings also suggested that PSNSU was associated with poor sleep quality. With the large amount of information being uploaded and posted on SNSs every day and with increasing number users of these technologies, there is a need for further research that examines excessive/compulsive monitoring of SNS accounts and potentially associated addictive behaviours. The present study findings may help inform future developments of interventions to reduce and tackle the negative effects of SNS use.

**Authors' Contribution** Study concept and design: ZH; analysis and interpretation of data: ZH and MG; access to data: ZH and MG. Both authors contributed to the writing of the paper. Both authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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## Compliance with Ethical Standards

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all participants for being included in the study.

**Conflict of Interest** The authors declare that they have no conflict of interest.

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