



## Full length article

## The association between the use of social network sites, sleep quality and cognitive function during the day



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## ABSTRACT

Previous studies have suggested that excessive use of the internet can affect the daily cognitive functioning of users. Furthermore, it has been argued that excessive users of the internet could demonstrate addiction behaviour patterns. Social network sites (SNS) are currently one of the most popular applications of internet use and have almost one billion active users. Studies which examined the dependence on the use of internet have found significant association with sleep deprivation. This study examined associations between questionnaire measures of SNS use, sleep quality and everyday cognitive failures in 324 users of SNS. The sample ranged from 18 to 58 years old and was drawn from 29.6% males and 70.4% females from diverse countries and educational backgrounds. Additionally, behaviours indicating potential dependence on SNS were examined with a new-developed questionnaire. Results indicated that increased dependence on SNS was correlated with decreased sleep quality and with increased everyday cognitive failures. The correlation of SNS use with cognitive failures was mediated by sleep quality. Finally, the final nine items of the new developed questionnaire indicated Withdrawal and Compulsion as two distinct but correlated aspects of possible dependence on SNS.

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## 1. Introduction

The use of the internet constitutes an integral part of daily life activities, especially among young adults (Jones, Johnson-Yale, Pérez, & Schuler, 2007). However, since 1996 an increasing number of researchers have described individuals, using the internet to such an extent, that they started to demonstrate behavioral and psychological patterns seen in other forms of addiction such as drugs, alcohol or gambling (Brenner, 1997; Greenfield, 1999; Young, 1996). The use of internet applications, such as Social Network Sites (SNS) has been increasingly observed since 2004. According to Boyd and Ellison (2007) SNS are:

“Internet applications that allow people to design a public or semi-public profile within a bounded system, interact with a list of other users with whom they share a connection, and view profiles of their list of connections and those made by others within the system” (p. 211).

Studies suggest that SNS are mainly used by young adults (Sheldon, 2008) and that their usage has dramatically increased during the last few years (Kuss & Griffiths, 2011). The increase of SNS and the time spend on them led to the question whether excessive use could lead to dependence symptoms (Echeburua & de Corral, 2010). Studies have demonstrated that using SNS to address loneliness and stress (Xu & Tan, 2012) and to maintain and establish new relationships (Wan, 2009; Walsh, White, & Young, 2007) significantly predicted dependence symptoms.

Recent studies have used either adapted versions of the Internet Addiction Test (Young, 1998a; e.g. Cam & Isbulan, 2012; Wan, 2009) or have developed their own scales (e.g. Alabi, 2012; Andraessen, Tosheim, Brunborg, & Pallesen, 2012; Koc & Gulyagci, 2013) to measure SNS addiction. Participants who were identified in these studies as SNS addicted varied from 1.6% to 34% mainly because these studies had used specific and convenient samples (university students and adolescents) and different measures to evaluate SNS addiction. Additionally, they assessed addiction only on one SNS (Griffiths, Kuss, & Demetrovics, 2014). Alternatively, the current study examines dependence on more than one SNS by examining a sample from different educational backgrounds and age groups.

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### 1.1. The relationship between SNS and poor sleep quality

Studies, found that television, computer games and the internet can lead to declination of sleep quality (Choi et al., 2009; Van den Bulck, 2004). Furthermore, a recent literature review (Lam, 2014) suggested that participants who reported sleep problems had 1.5 more chances to be classified as Internet Addicted compare to those who did not report any sleep disturbance.

Moreover, Andraessen et al., 2012 suggested that dependence on SNS was associated with late sleep and late waking hours. Similarly, Wolniczak et al. (2013) found that the participants who were identified as SNS dependent, had 1.3 times greater prevalence of poor sleep quality, than participants who did not report any SNS dependence symptom. However, Wolniczak et al. (2013) examined only Peruvian undergraduate students and investigated dependence on one SNS (Facebook®).

### 1.2. The relationship between poor sleep quality and cognitive functioning

It has been argued that sleep quality affects the functioning of the prefrontal cortex of the brain which is linked to cognitive activities, such as creativity, integration and planning (Cursio, Ferrara, & De Gennaro, 2006). Furthermore, Wilkerson, Boals, and Taylor (2012) examined the relationship of insomnia and everyday cognitive failures in a large sample ( $N = 941$ ) of young adults (college students) and suggested that insomnia and poor sleep quality were associated particularly with cognitive failures related to distractibility, blunders and poor memory for names. Interestingly, Stickgold and Walker (2007) suggested that sleep quality affects the new learning process, which relates to the ability of the brain to store new learned task to long-term memory and subsequently leads to everyday cognitive failures.

Therefore the aims of this study were to investigate the following research questions: (i) Is there any significant correlation between dependence on SNS, sleep quality and everyday cognitive failures? (ii) Does sleep quality mediate the relationship between SNS dependence and everyday cognitive failures?

We predicted that increased dependence on SNS would be associated with poor sleep quality and an increased level of cognitive failures and that sleep quality would explain the relationship between dependence on SNS and the frequency of everyday cognitive failures.

## 2. Method

### 2.1. Participants

A total of 340 participants completed the questionnaires. However, some of the participants were excluded from the present study ( $n = 16$ ), because they reported specific reasons (e.g. noisy housemates, medication) for not being able to have adequate sleep during the past month. The final sample ( $N = 324$ ) consisted of 101 males ( $M_{\text{age}} = 26.11$ ,  $SD = 6.54$ ) and 231 females ( $M_{\text{age}} = 24.76$ ,  $SD = 6.37$ ) ranging from 18 to 58 years old from diverse countries (Greece = 61%, UK = 22.6%, other = 16.4) and educational backgrounds (Bachelor = 49.7%, Postgraduate = 31.1%, College degree and High School = 19.2%).

### 2.2. Materials

#### 2.2.1. Internet addiction diagnostic questionnaire

SNS dependence was examined with the Internet Addiction Diagnostic Questionnaire (IADQ; Young, 1998b), which we adapted for this study to measure dependence on SNS (Appendix C). The

only change was that the word internet was replaced by the word SNS in each of the items. The IADQ consists of eight two-choice questions (yes/no). A cutoff of five or greater indicates possible dependence. Cronbach's alpha of IADQ in this study indicated an acceptable reliability ( $\alpha = .64$ ).

#### 2.2.2. Social media use questionnaire

In order to examine thoroughly aspects specifically related to the dependence on SNS, we developed a 21-item questionnaire (Appendix A) and evaluated each item based on a five-point Likert scale, ranging from 0 (never) to 4 (always). We named this questionnaire the Social Media Use Questionnaire (SMUQ).

The questions in the initial version of SMUQ were generated based on the gambling addiction symptoms described in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association, 2013), from the Internet Addiction Test (IAT; Young, 1998a) and Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991).

#### 2.2.3. Pittsburg sleep quality index

The differentiation between efficient and poor sleep quality was assessed using the Pittsburg Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The PSQI consists of 19 items asking about seven domains of sleep patterns, in the preceding one month period. The components refer to domains such as daytime dysfunction; subjective sleep quality; sleep duration; use of sleep medication; sleep latency; sleep disturbances and habitual sleep efficiency. The Cronbach's alpha for the current sample was .72.

#### 2.2.4. Cognitive failures questionnaire

Everyday cognitive failures were assessed with Cognitive Failures Questionnaire (CFQ; Broadbent, Cooper, FitzGerald, & Parkes, 1982). The CFQ is a 25 item questionnaire, which examines the frequency of minor mistakes, which relate to perception, distractibility, memory and motor functioning during the last six months. The Cronbach's alpha of CFQ in the current study was ( $\alpha = .93$ ).

### 2.3. Design

We designed an online cross-sectional study, using iSurvey which is the online survey generating tool of the University of Southampton.

### 2.4. Procedure

The study was reviewed and approved by the ethics committee of the University of Southampton. The recruitment of participants was based on two different pathways. The study was advertised at the University of Southampton and undergraduate psychology students ( $n = 83$ ) were offered with research credits, in exchange for participation. Additionally, SNS pages in the two most popular SNS (Facebook® and Twitter®), advertised the study in UK and Greek social media groups and contained a link to the online survey ( $n = 245$ ). Participants gave informed consent, filled in the questionnaires and read a page of debriefing information online.

### 2.5. Statistical analyses

SMUQ was analysed using Principal Component Analysis (PCA) to investigate the structure of the construct of SNS dependence (Tabachnick & Fidell, 2014) with oblique rotation (direct oblimin), due to the expectation that components would be correlated.

Pearson's correlation was used to examine the association

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