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## Are you awake? Mobile phone use after lights out

L.L. Saling\*, M. Haire

School of Psychology, Charles Sturt University, 2678, Australia

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## ABSTRACT

Night-time mobile phone use has the potential to detract from sleep quality and continuity, resulting in tiredness and impaired psychological function. An on-line survey of the mobile phone habits of 397 adults (M age = 34.45, SD = 13.29) revealed that 75% used a mobile phone after lights out at least once a month, with 12.8% making calls at any time of night. More than 50% of participants reported being woken by the phone use of other people sharing their sleeping space. Using the phone after lights out and a general unwillingness to turn the phone off made a small but significant contribution to the level of tiredness. Tiredness made a significant contribution to DASS scores, with higher levels of tiredness being associated with more depression, anxiety and stress. Objective measures of sleep fragmentation and phone use along with diary recordings of participants' evaluations of the affective value of each call or text, would be valuable in the exploration of the impact of night time phone use on tiredness and psychological function.

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## 1. Introduction

Adequate sleep is relatively uninterrupted and of sufficient length for one to wake feeling refreshed (Akerstedt, Kecklund, & Gillberg, 2007b). Poor sleep is characterized by difficulty staying asleep, waking during the night or feeling restless, being unable to resume sleep, and not feeling refreshed upon waking (Akerstedt et al., 2007b). Reduced hours of sleep and poor sleep quality cause tiredness, which includes mental and physical fatigue and daytime sleepiness; and may increase the probability of workplace and traffic accidents, mood disorders and excessive alcohol consumption (Akerstedt et al., 2004; Akerstedt, Kecklund, Alfredsson, & Selen, 2007a; Akerstedt et al., 2007b; Belenky et al., 2003; Fukuda et al., 2010; Kubey, Lavin, & Barrows, 2001; Nilsson et al., 2005; Wiggs, 2007). In a review of sleep studies, Riemann and Voderholzer (2003) found 8 studies in which primary insomnia at baseline significantly predicted an increased depression risk at follow-up one to three years later.

## 1.1. Social and technological changes impacting on sleep

As early as 2001, the use of synchronous internet-based

communication, including chat rooms and instant messaging (where messages are exchanged in real time), was found to be related to students losing sleep and feeling tired (Kubey et al., 2001). Van den Bulck (2007) measured the relationship between self-reported tiredness and mobile phone use after lights out in a large cohort of school students in Belgium. Night-time mobile phone use explained the extreme tiredness endorsed by 35% of the students. Jenaro, Flores, Gomez-Vela, Gonzalez-Gil, and Caballo (2007) found that heavy use of internet and mobile phones was associated with insomnia, anxiety and depression. Soderqvist, Carlberg, and Hardell (2008) found that adolescents who used the phone more frequently reported significantly more tiredness and headaches than their counterparts, whose phone use was infrequent. Thomee, Eklof, Gustafsson, Nilsson, and Hagberg (2007) found that a high frequency of mobile phone calls at night predicted insomnia a year later (in men) while women in the high frequency group reported prolonged stress and symptoms of depression a year later. The time of night at which calls/texts occurred also influenced the impact of phone use, with calls and texts received or made later in the night predicting significantly more tiredness than the same received or made immediately after lights out (Van den Bulck, 2007).

## 1.2. Controlling mobile phone use

The use of mobile phones for calling and text messaging as well as accessing the internet and social networking sites has increased

\* Corresponding author. School of Psychology, Charles Sturt University, Wagga Wagga, 2678, Australia.

E-mail address: [lsaling@csu.edu.au](mailto:lsaling@csu.edu.au) (L.L. Saling).

exponentially, enabling individuals to stay connected at any time of day (Jenaro et al., 2007; Thomee et al., 2007, 2010). Social norms regarding their use are constantly evolving (Krishnan, 2008; Rettie, 2009; Thomee et al., 2010) with constant connection becoming a more ubiquitous feature of mobile phone use. However, managing availability is not unproblematic. Thomee et al. (2010) found that as the mobile phone call is targeted to a specific owner, there is pressure to respond in a timely manner. Some individuals reported feeling stressed and guilty if they had many unreturned calls and texts (Rettie, 2009; Thomee et al., 2010; Walsh, White & Young, 2009).

Walsh, White, and Young (2008) explored indicators of mobile phone over-use and addiction. One indicator of a loss of control over phone use was an unwillingness to turn the phone off in contexts where it is generally considered inappropriate for a mobile phone to remain on (For instance, when watching a movie, while driving and after lights out). Some participants admitted to compulsively checking for messages and missed calls if they woke at night and therefore sleep was still disturbed even when calls and texts were not received (Thomee et al., 2010; Walsh et al., 2008). Checking of the phone could prolong wakefulness and potentially make it difficult for sleep to resume. A mostly neglected area has been an investigation of the impact of the phone use of others (who share one's sleeping space) on tiredness and mood (but see Thomee et al., 2007; Thomee et al., 2010; Walsh et al., 2008). Given the increasing ubiquity of night-time phone use as well as the growing likelihood of multiple mobile phones in a single household, this is worthy of exploration.

### 1.3. The present study

Qualitative studies of young adults reveal that the practice of keeping mobile phones on at all times is widespread (Thomee et al., 2010.; Walsh et al., 2009). Typically, research has focused on the mobile phone use of young adults or teenagers (but see Rettie, 2009) as this cohort were early adopters of mobile phones generally and text messaging in particular. It is important to explore the mobile phone use of the broader adult cohort since the uptake by this group is increasing exponentially.

The aims of the present study were to characterise the night-time mobile phone use of adults and to examine the relationship between current mobile phone use after lights out and tiredness, depression, anxiety and stress in an adult sample. The following specific predictions were assessed; 1. Sending/receiving text messages or mobile phone calls after lights out would be associated with more tiredness, depression, anxiety and stress than never using the phone after lights out; 2. Calls/texts later in the night would be related to greater tiredness and depression, anxiety and stress than calls immediately after lights out; 3. Leaving the mobile phone on after lights out would be associated with more tiredness, depression, anxiety and stress than turning the phone off, and 4. Sleep disturbance caused by others' phone use would be associated with more tiredness, depression, anxiety and stress.

## 2. Method

### 2.1. Participants

A snowball sampling technique was used to recruit participants. Inclusion criteria were a) age 18 years and over and, b) owning a mobile phone. No incentives or payments were offered for participation. Survey responses were received from 431 participants. 6 participants did not own a mobile phone and were excluded from the analysis. Data from 24 participants were excluded as they had not completed at least one of the Depression, Anxiety and Stress

Scales or the tiredness measure. Data from four participants aged 78–80 years were excluded from the analysis as they were separated from the sample by 13 years (see Tabachnick & Fidell, 2007). The final data set comprised of 397 participants (108 males and 289 females). The mean age of the sample was 34.45 (SD = 13.29). Five participants did not report their age.

### 2.2. Measures

#### 2.2.1. Van den Bulck's (2007) night-time mobile phone use questionnaire

This questionnaire has 12 items in three sections measuring frequency, timing and number of inward and outward calls and text messages after lights out (See Appendix A for the full measure).

Two questions were added to capture broader use patterns: 1. "Have you ever been woken at night by someone else (sibling, roommate, partner etc) receiving or making calls or texts after lights out?" (response options were never, 1–3 times a month, once a week, several times a week, every day), and 2. "In situations where the phone can be a disturbance (such as when going to bed, in the cinema, while driving etc) do you turn your phone off completely (that is not just using the silent setting)?" (response options for this question were: always, frequently, rarely and never). For the purposes of the present study, "text messages" included email, photo upload/download, social networking message or internet use on the phone. "After lights out" was defined as after participants had turned the lights out and were in bed intending to sleep. Participants were informed of these definitions.

#### 2.2.2. Self-reported tiredness scale (Van den Bulck, 2007; see Appendix B for the full measure)

This is a four-item scale (measured on an 11 point rating scale from –5 not tired at all, 0 neutral, to +5 Very tired). Participants were asked "How tired are you: generally, on waking, at school (in the current study this was changed to 'during the day'), and after the weekend".

#### 2.2.3. Depression, anxiety, stress scale (DASS, Lovibond & Lovibond, 1995)

This is a 21 item dimensional measure of three scales of negative emotional states, depression, anxiety and stress. It was validated with a non-clinical population aged 17 years and over. Chronbach's  $\alpha$  values for the 7-item scales (N = 717) are: Depression 0.81; Anxiety 0.73 Stress 0.81 (Lovibond & Lovibond, 1995).

### 2.3. Data analysis

Less than 5% of data for any variable was found to be missing and missing data occurred randomly. An exclude cases pairwise approach was used for missing data.

A DASS Total score was computed by adding the three subscale scores together. An examination of the distribution showed it was severely positively skewed and so a log transformation was applied which resulted in an improved distribution.

A principal components factor analysis showed that the four tiredness measures loaded on one factor (loadings between 0.84 and 0.92; Eigenvalue: 3.11; Explained variance: 77.8%; Chronbach's alpha 0.90). Given this, a new variable Tiredness Overall, was computed by adding each of the 4 tiredness scores together and averaging the score.

A principal components factor analysis revealed that the four questionnaire items measuring the frequency with which calls/texts were made and received (frequency section of Van den Bulck's night-time mobile phone use questionnaire) loaded on one factor (loadings between 0.86 and 0.91; Eigenvalue: 3.15; Explained

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