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"To sleep, perchance to tweet": in-bed electronic social media use and its associations with insomnia, daytime sleepiness, mood, and sleep duration in adults

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ABSTRACT

Objectives: The use of mobile device–based electronic social media (ESM) in bed is rapidly becoming commonplace, with potentially adverse impacts on sleep and daytime functioning. The purpose of this study was to determine the extent to which in-bed ESM use is associated with insomnia, daytime sleepiness, mood, and sleep duration in adults.
Methods: This was a cross-sectional observational study conducted among 855 hospital employees and university students (mean age, 43.6 years; 85% female) via an online questionnaire.
Results: Nearly 70% of participants indulged in in-bed ESM use, with nearly 15% spending an hour or more a night doing so. The degree of in-bed ESM use did not vary by gender, but higher levels of in-bed ESM use were seen in younger and middle-aged than elderly participants. Compared with participants with no in-bed ESM use and controlling for age, gender, and ethnicity, participants with high in-bed ESM use were more likely to have insomnia, anxiety, and short sleep duration on weeknights, but not depression or daytime sleepiness; low in-bed ESM use only increased the likelihood of short sleep duration on weeknights. In-bed ESM use by a bed partner did not have an adverse association with sleep or mood.
Conclusions: In-bed ESM use is associated with sleep and mood dysfunction in adults. These findings are of relevance to clinicians, therapists, and the public at large, as they suggest that limitation of in-bed ESM use is a potential interventional strategy in the overall management of sleep hygiene and mental health.

Introduction

The recent proliferation of Internet-capable mobile devices (smartphones and tablets), along with a burgeoning number of electronic social media (ESM) platforms such as Twitter, Facebook, and Instagram, has led to a society that is "always connected." Together with the texting capabilities available through most cellular service carriers, round-the-clock ESM accessibility now makes it possible to remain constantly in touch with friends, family, and even strangers whom one has never met in person (including celebrities), in any part of the world, breaking traditional geographic and time zone barriers. Constant ESM accessibility is not without its drawbacks, however; many individuals have difficulty setting personal limits on ESM use, which can easily become maladaptive. There have been several reports in the literature about the occurrence of addictive ESM use in susceptible individuals,[1–4] with sufferers often reporting a compulsive need to constantly check texts, tweets, and online messages "for fear of missing out."[5] Similarly, there appears to be a clear association between increased ESM use and anxiety,[6] as well as depression,[7–10] and frequency of texting and duration of ESM use both during the day and at bedtime have been shown to be predictive of sleep disturbances.[8,10,11]

Given its addictive nature, it is not surprising that ESM use has pervaded every aspect of daily life, exemplified by employees updating their Facebook pages or sending tweets from their desks at the workplace.[12] Bedtime, in particular, has become an opportunity for many people, having completed their required tasks and unencumbered by other demands of daily living, to immerse themselves fully and without restriction in ESM use. Settling down with a mobile device in bed has become a nightly routine for many adults,[13] with bedtime ESM use often being used as a sleep aid, resulting in later bed times and rise times.[14] Freed from limitations of bulky size and the need for physical connectivity, Wi-Fi capable mobile devices

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have increasingly converted the bedroom from a place to wind down and relax into a highly stimulating, media-rich environment where long periods in bed are spent indulging in ESM use, presumably at the cost of adequate hours of sleep. For a society already chronically sleep deprived,[15] there appears to be considerable cause for concern. The interactive nature of ESM, with new messages, texts, posts, and tweets occurring nonstop in real time and lacking a predefined end point, makes it likely to continue far longer into the night than a passive exercise such as watching television or listening to the radio, the bedtime vices of yore. Indeed, recent studies in Western societies have shown that a majority of adults take their mobile device to bed with them, and a quarter spend 45 minutes or more using it between the time they get in bed and the time they actually intend to try and fall asleep.[16]

Concern about the impact of bedtime activities such as the use of television, radio, cell phones, and computers on sleep quality, mood, and daytime functioning is not new, and several previous studies have confirmed varying degrees of deleterious effects of such media on sleep schedules, quality, and duration.[17–20] However, many of those studies were conducted before devices became wi-fi compatible and small enough to carry into bed. Media, communication, and entertainment technology has continued to evolve at a rapid pace such that a study from a few years ago may well be describing a different era. It is clear that mobile device–based ESM is fast becoming the most frequently used media at bedtime,[16,20] and it is reasonable to expect a commensurate increased impact on sleep habits. Sleep research has failed to keep pace with the rapid advancements in Internet and mobile device technology, and as a result, there have been few studies determining the effect of in-bed ESM use on sleep quality and mood, with the bulk of such research being conducted among children and adolescents.[10,21–27] Nevertheless, most early work in the field suggests that those in "emerging adulthood" (late teens to early twenties) are equally susceptible to the adverse effects of bedtime mobile phone and ESM use.[16,18,20,28–30] Studies conducted among adults in Finland show that texting in bed is associated with fatigue, insomnia, and poor sleep quality and is a risk factor for increased sleep latency, decreased sleep efficiency, and daytime dysfunction, measured subjectively.[13]

Our focus in conducting this study was therefore to determine the associations between in-bed ESM use, in particular, and insomnia, daytime sleepiness, mood, and sleep duration in American adults, including middle-aged and older individuals. Additionally, we wished to determine whether the use of ESM in bed by a bed-partner, even if a person does not himself or herself indulge in in-bed ESM use, has an association with these symptoms.

Methods

Participants

This study was approved by the Institutional Review Boards at both JFK Medical Center in Edison, NJ, and Seton Hall University in South Orange, NJ, and informed consent was electronically obtained from all participants. Data were collected by means of a confidential online questionnaire, further described under the "Instrument" section below. All hospital employees of JFK Medical Center with an e-mail address on file were sent an invitational e-mail explaining the purpose of the study and containing an individualized link to the online survey site. A reminder e-mail was sent to those who had not responded after 4 weeks. As an incentive for participation, the e-mail addresses of 4 respondents who had completed the survey were randomly drawn to receive $25 Amazon.com gift cards. The survey site remained open for 6 weeks between December 2015 and January 2016. Simultaneously, undergraduate and graduate students at Seton Hall University were invited to participate via a flyer that was distributed in classrooms, providing an open link to the online survey site; this was done in 2 rounds, initially for 4 months between October 2015 and January 2016 and again for 2 months between January and February 2017, to capture students from 2 consecutive years of enrollment.

Instrument

All participants completed a 26-item online questionnaire. The first 4 questions collected demographic data. Insomnia was measured via the *Minimal Insomnia Severity Scale* (constituting questions 5 through 7 of our questionnaire), an ultrabrief instrument with demonstrated reliability and validity in identifying subjects with insomnia according to the *International Classification of Diseases, 10th Revision,* criteria; scores range from 0 to 12, with scores of 6 and above used to identify clinically significant insomnia.[31] Daytime sleepiness was measured via the *Epworth Sleepiness Scale* (constituting questions 8 through 15 of our questionnaire), a widely used instrument with scores ranging from 0 to 24 and with scores of 10 or higher identifying hypersomnolence.[32] The next 4 questions were comprised by the anxiety (questions 16 and 17) and depression (questions 18 and 19) components of the *Public Health Questionnaire for Depression and Anxiety*, which is a valid ultrabrief tool for detecting mood disorders[33]; anxiety and depression components individually provided scores ranging from 0 to 6, with a cutoff point of 3 or higher being considered clinically significant. Participants were asked how many nights a week on average they used their mobile phone for ESM use (texting/Twitter/Facebook, etc) in the hour before they went to bed (question 20) and in bed (question 21) and, in the latter situation, how much time per night on average they spent doing so (question 22, which had 5 options, scored 1-5, respectively: less than half an hour, half an hour to an hour, 1-2 hours, 2-3 hours, more than 3 hours). The product of the scores from questions 21 and 22, a measure of the volume of weekly in-bed ESM use, was designated as the "in-bed ESM score." Participants were queried as to whether they had a regular bed-partner (who spent at least 4 nights a week in bed with them, question 23) and, if so, how many nights per week the bed-partner indulged in in-bed ESM use (question 24). Finally, questions 25 and 26 collected data about sleep duration (number of hours slept on weeknights and weekend nights, which had 8 options each, scored 1-8: less than 4, 4-5, 5-6, 6-7, 7-8, 8-9, 9-10, and more than 10 respectively).

For the purposes of determining differences in variables based on degree of ESM use, participants were divided into those with no in-bed ESM use (in-bed ESM score of 0, $n = 269$), low in-bed ESM use (in-bed ESM score of 1-10, $n = 349$), and high in-bed ESM use (in-bed ESM score 11-35, $n = 237$). For the latter 2 groups, the cut-off chosen was based on the mean in-bed ESM score among those who reported in-bed ESM use (10.4 ± 7.9). To determine differences by age, our sample was divided into 3 groups: younger participants (age 18-44 years, $n = 420$), middle-aged participants (age 45-64 years, $n = 397$), and older participants (age 65 years and above, $n = 38$). The prevalence of insomnia, daytime sleepiness, anxiety, and depression among various groups was determined based on the cutoff scores for each respective scale mentioned above. For this study, participants who indicated that they slept less than 6 hours a night on average were defined as having short sleep duration, for both weeknights and weekend nights.

Statistical analysis

Given large sample sizes, parametric tests were used for analyses. Correlations between variables were tested using Pearson product-moment correlation coefficient. Because some of the variables failed the Levene test for homogeneity of variances, comparisons of

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