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## Trading likes for sleepless nights: A lifespan investigation of social media and sleep

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### Abstract

**Objectives:** The present study sought to examine the association between social media use and sleep and whether the association differed by age.

**Methods:** 3,284 adults (*M* age = 42.74, *SD* = 16.72; 48.5% female; 80.8% White) participated in an online study of sleep and health across the lifespan. Sleep quality and duration were assessed using the Pittsburg Sleep Quality Index (PSQI). Participants reported the total time they spent using social media daily.

**Results:** Greater social media use was associated with poorer sleep quality ( $p < .001$ ) and shorter sleep duration ( $p = .002$ ). Age moderated the relationship between social media use and sleep quality ( $p = .006$ ), as well as duration ( $p = .001$ ). The strength of the associations between social media and sleep increased with age.

**Conclusion:** The findings highlight potential adverse sleep outcomes associated with social media use. They also provide preliminary evidence suggesting the need for further exploration of age-related processes involved in social media use and sleep.

### Keywords

sleep; aging; social media

### Introduction

Sleep is a complex, multidimensional health behavior associated with numerous essential biopsychosocial processes including endocrine, metabolic, immune, cognitive, and motor functioning.<sup>1</sup> Decades of research have documented sleep changes that occur across the lifespan, including longer sleep latency, more time awake at night, shorter sleep duration, and earlier wake times.<sup>2</sup> One behavior that also appears to be related to sleep is social media use.<sup>3</sup> Social media and sleep are suspected to be linked via several potential

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mechanisms such as delayed bedtimes, interrupted nighttime sleep, circadian rhythms changes associated with screen light exposure, and increased cognitive arousal at bedtime.<sup>3</sup> Previous investigations into the relationship between social media use and sleep has largely focused on young adults or adolescents. In adolescence, heavy social media use is associated with poor sleep quality and shorter sleep duration.<sup>4,5</sup> In young adulthood (i.e., 18–30) negative social media experiences, but not positive ones, are associated with disturbed sleep.<sup>6</sup> Although social media use traditionally declines as an individual ages, recent data suggests that social media use among older adults ages 65 years and older is increasing.<sup>7</sup> Social media use within this age group expanded 150% from April 2009 to May 2011, and 18% of older adults use social media sites on a typical day.<sup>8</sup> However, the bulk of the work on sleep and social media has focused on adolescents or young adults.

Additional information is needed on how social media and sleep are related across all age groups. Therefore, the purpose of this study was to examine the association between social media use and both sleep quality and duration. Moreover, the current study investigated whether the associations differed by age after controlling for sex,<sup>9</sup> self-reported physical health,<sup>10</sup> depression,<sup>11</sup> anxiety,<sup>11</sup> and total internet use—factors related to social media use or sleep. It was hypothesized that social media would be negatively associated with sleep quality and duration. Furthermore, the negative relationship between social media use and sleep was expected to be weaker for older than younger adults as social media use may increase access to social networks for older adults. Increased access to social networks may reduce limitations to in-person contact and social support due to mobility impairments,<sup>12,13</sup> thus proving beneficial for sleep.

## Methods

### Participants

The study was approved by the university's institutional review board. 3,284 adults participated in an online study investigating sleep longitudinally across normal development (ISLAND). In order to be eligible to participate, individuals had to be 18 years or older and have access to a computer, tablet, or phone.

### Procedure

Participants were recruited and participated in the study via Amazon MTurk and Qualtrics. MTurk has been shown to meet or exceed the reliability of traditional data collection methods.<sup>14</sup> Prior to study initiation, participants were informed about the purpose of the study and provided consent. Participants then completed a series of behavioral and psychological self-report questionnaires and received \$0.25 in exchange for participation. An instructional manipulation and age consistency check were included to ensure the validity of the data.

### Measures

**Social Media Time.**—Participants were asked to respond to the following prompt: “How much time do you spend on social media (Facebook, Twitter, Instagram, etc.) per day?” Participants provided a numerical value of hours and minutes via a pull-down menu of

response options that best represented their total expenditure per day. All responses were subsequently recorded to total social media time in minutes.

**Pittsburgh Sleep Quality Index (PSQI).**—Participants completed the 19-item PSQI, a self-report questionnaire that evaluates subjective sleep quality over the previous month.<sup>15</sup> The PSQI has demonstrated good internal consistency, test-retest reliability, and construct validity.<sup>16,17</sup> The seven PSQI composite scores were summed to yield a global sleep quality score (ranging from 0–21), with higher scores indicating worse sleep quality. Total scores greater than 5 indicate poor sleep quality.<sup>15</sup> Sleep duration in minutes was obtained from item 4 of the PSQI, which asks: “During the past month, how many hours of actual sleep did you get at night?”

**Covariates.**—Participants self-reported their sex. Anxiety and depression were measured using the Generalized Anxiety Disorder-2 (GAD-2)<sup>18</sup> and Patient Health Questionnaire-2 (PHQ-2)<sup>19</sup> scales, respectively. Self-reported physical health was rated by participants on a visual analogue scale from 0 (*poor*) to 100 (*excellent*). Similar to social media use, participants provided an estimate of the amount of time spent per day on the internet (coded as total minutes of use per day).

## Data Analysis

Two moderation analyses were performed using SPSS PROCESS macro version 3.5, with PSQI-derived sleep quality and duration separately serving as outcome variables across analyses.<sup>20</sup> The analyses generated 5,000 bootstrapped confidence intervals of the conditional effect. Expectation maximization (EM) was used to address missing data for PSQI total sleep time, PSQI sleep quality, age, and self-reported physical health. Imputed values using EM included 2.4% of all PSQI sleep quality and duration values, 4.6% of all age values, and 30% of all self-reported physical health values. There were no missing data for other variables. All continuous variables were converted to z-scores prior to data analyses. Age and social media variables were mean-centered prior to analyses. Moderation analyses controlled for sex, depression, anxiety, self-reported physical health, and total internet time.

## Results

The average participant was middle-aged ( $M_{\text{years}}=42.74$ ,  $SD=16.72$ ,  $\text{range}=19\text{--}99$ ), largely split between female (48.5%) and male (45.0%). 6.4% of participants did not identify as either male or female. Most participants were married (51.1%), White (80.8%), and college-educated (35.7% bachelor’s degree). Overall, participants reported good physical health ( $M=57.62$ ,  $SD=20.06$ ), low depressive ( $M=1.59$ ,  $SD=1.74$ ), and anxiety symptoms ( $M=1.73$ ,  $SD=1.86$ ). Participants reported sleeping slightly over six and a half hours per night ( $M_{\text{minutes}}=398.33$ ,  $SD=89.98$ ) and obtaining fairly poor sleep quality ( $M=7.47$ ,  $SD=4.06$ ). Participants spent slightly over five hours per day on the internet ( $M_{\text{minutes}}=311.02$ ,  $SD=172.34$ ), with slightly less than a third of total internet time on social media ( $M_{\text{minutes}}=91.29$ ,  $SD=95.86$ ).

Table 1 contains model statistics for the moderation analyses. The first analysis evaluated whether age moderated the relationship between social media time and sleep quality. After controlling for covariates, the interaction between age and social media remained a small but significant predictor of sleep quality,  $R^2=.001$ ,  $F=6.86$ ,  $p=.009$ ,  $\beta=.04$ , 95% CI [.01, .07]. While greater social media use was associated with poorer sleep quality, the strength of the association increased with age. The Johnson-Neyman technique revealed the association was significant for individuals between the ages of 23 years old,  $p=.042$ ,  $\beta=.04$ , 95% CI [.002, .08], and 99 years old  $p<.001$ ,  $\beta=.23$ , 95% CI [.11, .36].

The second moderation analysis examined whether age moderated the association between social media use and sleep duration. The interaction between social media use and age significantly predicted sleep duration,  $R^2=.002$ ,  $F=7.44$ ,  $p=.006$ ,  $\beta=-.05$ , 95% CI [-.09, -.01]. Greater social media use was associated with shorter sleep duration and the strength of the association increased with age. The interaction between social media use and sleep duration was significant for individuals between the ages of 38 years old,  $p=.027$ ,  $\beta=-.04$ , 95% CI [-.08, -.005], and 99 years old,  $p=.002$ ,  $\beta=-.22$ , 95% CI [-.36, -.08]. See Figure 1 for graphical representation of model results.

## Discussion

This current study examined the association between social media use and sleep employing a lifespan approach. Previous studies have assessed this association in the context of discrete younger age groups, such as adolescence and young adulthood.<sup>4,5,6</sup> Greater social media use was associated with poorer sleep quality and shortened sleep duration across the lifespan; however, the strength of the association between social media use and sleep increased with age, indicating that as we age, susceptibility to the negative effects of social media increases. Notably, the decreasing effect of age on sleep duration emerged among both average and high social media users. These findings underlie the importance of examining the influence of external factors, such as social media use, on an increasingly compromised sleep system.

There is limited literature regarding the association between social media use, sleep, and aging. Poor sleep in older adulthood may be further exacerbated by social media use via disruptions to the circadian rhythm and additional nighttime awakenings.<sup>3</sup> It is unclear which effective interventions for late-life sleep disturbances<sup>21</sup> could aid with sleep disturbances associated with social media use; however, it is worth additional investigation. As with younger adults, potential negative consequences of social media use have also been discussed for older adults.<sup>7</sup> These consequences may confer additional stress or harm that may lead to poor sleep. For example, older adults may be less aware of appropriate internet disclosure and reveal too much information, leading to potential identity theft, among other stress or harm.<sup>7</sup> Further research is needed to explore factors that could elucidate the relationship between social media and sleep in older adulthood.

Most covariates included in the study were significantly associated with sleep quality and/or sleep duration. These findings further corroborate evidence documented in previous studies regarding these relationships.<sup>9-11</sup> In the present study, the strength of the association between age and sleep quality was small. Although age-related decline in sleep quality

has been documented,<sup>2,22</sup> previous research has suggested that changes in sleep with age are largely related to changes in physical and mental health<sup>23</sup>. We controlled for self-rated physical health, depressive symptoms, and anxiety symptoms in all analyses, which may have resulted in attenuated age effects on sleep quality.

Findings from the study should be interpreted in light of limitations. The cross-sectional design limits conclusions regarding directionality of the influence of social media on sleep. Measurement of daily social media use via diaries or electronic means may provide a more comprehensive view of social media use than single-item retrospective recall estimates. Moreover, sleep quality and sleep duration were assessed through self-report which may introduce potential bias in reporting. Additional research utilizing objective methods of sleep measurement capable of longitudinal assessment would be beneficial for corroborating findings. The current study also did not obtain information regarding which social media services were used by participants and what emotions were evoked by the platform during use. Data regarding timing of social media use was also not available, which may provide additional information regarding when during the day or night social media use can be more or less disruptive to sleep. Information was not obtained regarding the qualification levels of MTurk workers that participated in the study. Any individual who was eligible based on inclusion criteria was able to participate. Furthermore, data obtained from MTurk may not be representative of the general population, as previous work suggests sample characteristics obtained from MTurk may differ from traditional samples.<sup>14</sup> Lastly, samples recruited from MTurk may be more biased, as they are likely to be using the internet and social media more than those who would participate in traditional forms of recruitment and study participation. Strengths of the study include its large sample size of adults across the US. Moreover, this study is one of the first to examine social media use and sleep across the lifespan. With the increasing use of social media in late-life, it is important to gauge its impact on health in order to minimize negative consequences and enhance social benefits. Future studies may benefit from exploring the positive and negative processes associated with social media use in older adults and how these processes relate to sleep.

Social media use plays a unique, evolving role in today's society with the potential for positive and negative health consequences. Preliminary information indicates age plays a role in the association between social media use and sleep. Additional empirical work may aid in identifying age-related processes involved in the association between social media use and sleep.

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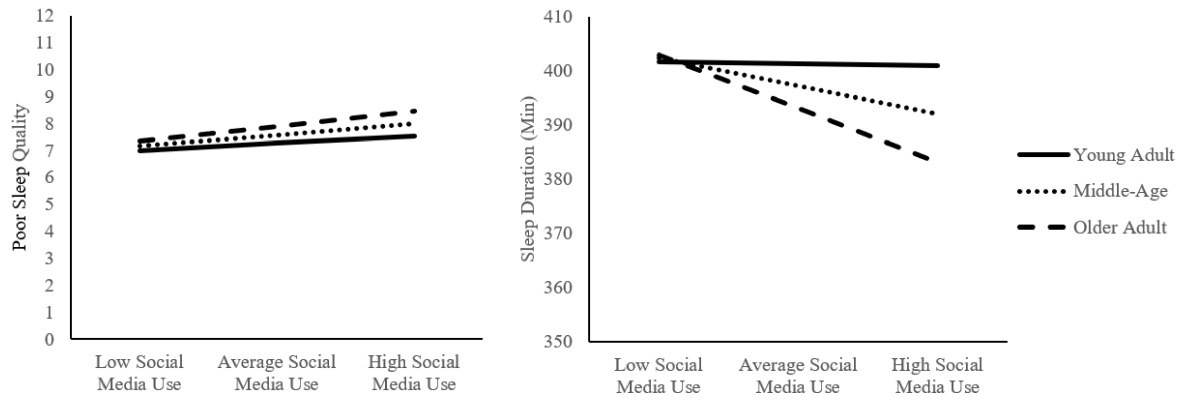
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**Figure 1.** Sleep quality (left panel) and sleep duration (right panel) as a function of social media use and age. *Note.* Low, average, and high social media use was represented using the mean social media use in minutes plus or minus a standard deviation. Similarly, age groups were represented using the mean age (middle-age, 43 years), plus (older adult, 59 years) or minus a standard deviation (young adult, 25 years). Higher sleep quality scores indicate worse overall sleep.

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**Table 1.**Moderation analyses for sleep quality and sleep duration ( $N=3284$ ).

Variables	Poor Sleep Quality				Sleep Duration			
	$\beta$	<i>SE</i>	<i>p</i>	95% CI	$\beta$	<i>SE</i>	<i>p</i>	95% CI
Social Media Use	0.09	0.02	<.001	[.06, .13]	-0.05	0.02	.008	[-.09, -.01]
Age	0.07	0.02	<.001	[.04 to .10]	-0.03	0.02	.09	[-.06, .005]
PHQ-2	0.26	0.02	<.001	[.22 to .31]	-0.12	0.02	<.001	[-.17, -.07]
GAD-2	0.19	0.02	<.001	[.15 to .24]	-0.04	0.02	.09	[-.09, .01]
Self-Rated Physical Health	-0.22	0.02	<.001	[-.25, -.18]	0.11	0.02	<.001	[.07, .14]
Total Internet Time	0.01	0.02	.46	[-.02, .04]	0.001	0.02	.95	[-.03, .04]
Sex	0.07	0.02	.007	[.02, .11]	0.03	0.03	.21	[-.02, .09]
Social Media Use X Age	0.04	0.02	.009	[.01, .07]	-0.05	0.02	.006	[-.09, -.01]

Note: PHQ-2 = Patient Health Questionnaire-2; GAD-2 = Generalized Anxiety Disorder-2