

Association of mildly insufficient sleep with symptoms of anxiety and depression

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ARTICLE INFO

Keywords:

Sleep duration
Depression
Anxiety
Insomnia
Mental health

ABSTRACT

Objective/Background: Sleep disorders are common among people with depression and anxiety. This study examines the independent association of mild sleep insufficiency and symptoms of anxiety and depression among adults.

Design/Methods: Data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS), a cross-sectional nationwide telephone-administered survey were used. Participants reported how often in the past month they felt nervous, hopeless, restless/fidgety, depressed, the number of days their mental health was “not good”, and the number of hours of sleep they received per day. Covariates included age, sex, race, education, BMI, marital status, exercise, employment and household income. Linear and ordinal logistic regression analyses included survey weighting procedures.

Results: Data were examined for 20,851 participants (mean \pm SE age = 47.47 \pm 0.18 years; 49.64% men). Each additional hour of sleep was associated with decreased odds (OR; 95% CI) of depression (0.77; 0.73–0.80), hopelessness (0.79; 0.76–0.82), nervousness (0.80; 0.77–0.82), and feeling restless/fidgety (0.75; 0.72–0.77) controlling for other covariates. Sleep duration was inversely associated with number of poor mental health days ($\beta = -1.06 \pm 0.07$ SE). One hour less than optimum sleep duration was associated with 60–80% higher odds of depression, hopelessness, nervousness, and feeling restless/fidgety ($p < 0.05$).

Limitations: Temporality of these associations cannot be inferred due to the cross-sectional study design.

Conclusions: Sleep duration and mental health symptoms were strongly associated in this nation-wide, representative sample. Providers should be aware that even minor sleep insufficiency is associated with these symptoms.

1. Introduction

Sleep disorders are a serious public health issue in need of increased awareness, as their influence on the health and social well being of individuals is pervasive. According to the Centers for Disease Control (CDC) an estimated 50–70 million of American adults, approximately 25% of the population, have sleep or wakefulness disorder, which cost the US economy \$30–35 billion (Taylor, Lichstein, & Durrence, 2005). The indirect cost of sleep disorders to the economy is said to outweigh the direct cost in monetary terms, and greatly impacts the psychological and cognitive functioning of individuals.

Chronic or severe sleep problems have been linked to deficits in daytime performance, fatigue, decreased immunity, depression, anxiety disorders, worsened cognitive performance, increased accident risk, and death (Durmer & Dinges, 2005). The effect of chronic suboptimal sleep has been shown to have a greater impact on mood than motor, neuro-hormonal or cognitive function (Durmer & Dinges, 2005).

Although problems associated with severe insufficient sleep and its association with depression, mood disorders, anxiety and psychiatric disorders have been thoroughly elucidated over the past four decades, very little work has been done to understand the possible association between mild sleep deficiencies and mood disorders. The objective of this study is to examine the association between symptoms of anxiety and depression with chronic insufficient sleep, with a focus on sleep times that were less than optimal, but not technically insufficient, in order to understand how seemingly mild sleep deficiencies could be associated with wellbeing.

2. Methods

2.1. Participants

Data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) provided a unique opportunity to examine the correlates of this

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less extreme sleep deficiency. The CDC conducts this state-based survey annually and provides a timely, reliable source of information related to health behaviors, preventive health practices and access to healthcare (CDC, 2012). This telephone-administered survey includes a stratified random sample of over 400,000 participants annually. Participants are aged 18 years and older, US residents, and are not incarcerated or institutionalized. Detailed survey methodology and full-text questionnaires are available at <http://www.cdc.gov/brfss>

2.2. Measures

Data from the inadequate sleep module provided the foundation for the current analysis. One question asks participants “During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?” (CDC, 2012). Participant responses were recorded as whole numbers representing the number of hours. For the present analysis, sleep time was used as a continuous variable and was also categorized based on guidelines from the National Sleep Foundation (NSF), with 7–9 h per day considered optimal, 6 h acceptable but low (referred to as mildly insufficient in this analysis), and fewer than 6 h deemed as insufficient (referred to as severely insufficient in this analysis) (Hirshkowitz, Whiton, & Albert, 2015). The BRFSS self-reported sleep time has been shown to be a valid assessment of sleep duration (Jungquist et al., 2016).

Data from the Mental Health and Stigma module included the Kessler 6 (CDC, 2012; Kessler, Green, & Gruber, 2010) to assess frequency of feeling nervous, hopeless, restless or fidgety and “so depressed that nothing could cheer [them] up” within the past 30 days. Participants categorized their responses as all of the time, most of the time, some of the time, a little of the time or none of the time. Additionally, in the Healthy Days module, participants are asked to consider their mental health, including stress, depression and emotional problems, and estimate the number of days their mental health was not good in the past month. This response was treated as a continuous variable.

2.3. Analysis

Socio-demographic covariates for the analysis included age (continuous), race (white, black or other), education (less than high school, high school graduate or college graduate), body mass index (BMI), marital status (married/cohabitating or single/widowed/divorced/separated), exercise (any or none), employment status (paid employment or no paid employment), and household income (less than \$35,000 annually or \$35,000 + annually). Analyses were also stratified by sex in order to evaluate potentially unique correlates of sleep duration and mood in each group. All participants with complete data for the variables of interest were included in the analysis. SAS software version 9.4 (SAS Institute Inc, 2001) was used to conduct linear and ordinal logistic regression analysis incorporating survey weighting procedures. Because depression is commonly associated with excess sleep, linear analysis was restricted to participants who slept ≤ 10 h daily (which is classified by the NSF as high, but acceptable). In order to identify the characteristics independently associated with sleep duration, all covariates were included in each model. The institutional review board of the authors’ institution determined this study met requirements for exempt status.

3. Results

3.1. Sample characteristics

A total of 20,851 adults were analyzed. Demographic, sleep and mental health characteristics of the sample are shown in Table 1. Participants averaged 47.47 ± 0.18 (SE) years of age and 49.64% were male. The majority of participants, 60.55%, reported optimum sleep

Table 1
Demographic, Sleep and Mood Characteristics.

		N = 20,851
Age (years, mean \pm se)		47.47 \pm 0.18
Sex	Men	49.64%
	Women	50.39%
Education	< High School	20.78%
	HS grad	25.66%
	Some college	30.22%
	College	23.35%
Marital Status	Married/long-term relationship	55.84%
	Not married	44.16%
Exercise	Yes	70.22%
	No	29.78%
Employed	Yes	50.03%
	No	49.97%
Income	< \$35,000	63.75%
	\geq \$35,000	36.25%
Sleep Duration	Hours daily (mean \pm se)	7.04 \pm 0.02
	Optimum sleep (7–9 h)	60.55%
	Low, but acceptable sleep (6 h)	23.83%
	Insufficient sleep (\leq 5 h)	12.94%
Mental Health (in past month)	# Bad mental health days (mean \pm se)	3.75 \pm 0.09
	Depressed	24.60%
	Hopeless	26.08%
	Nervous	50.17%
	Restless	49.35%

duration, while 12.94% reported insufficient sleep and 23.83% reported low, but acceptable sleep duration (6 h).

3.2. Sleep duration and mental health symptoms

In the linear regression model controlling for age, sex, race, education, marital status, BMI, education, employment and income, sleep duration was inversely associated with the number of bad mental health days ($\beta = -1.06$, 95% CI -0.91 , -1.20), indicating each additional hour of sleep correlated with nearly one more day of good mental health. Odds ratios examining sleep time as a continuous variable and the ordinal presence or severity of each mental health symptom showed each additional hour of sleep was associated with approximately 20% decreased odds of mental health symptoms (depression OR (95% CI) = 0.77 (0.73–0.80); hopelessness OR = 0.79 (0.76–0.82); nervousness OR = 0.80 (0.77–0.82); feeling restless or fidgety OR = 0.75 (0.72–0.77), controlling for other covariates. When examining sleep categorized as too little compared to optimal, that is 5 or fewer hours daily compared to 7 to 9 h daily, sleeping too little was independently associated with higher odds of each symptom, increasing the odds of each symptom three to four fold (Fig. 1).

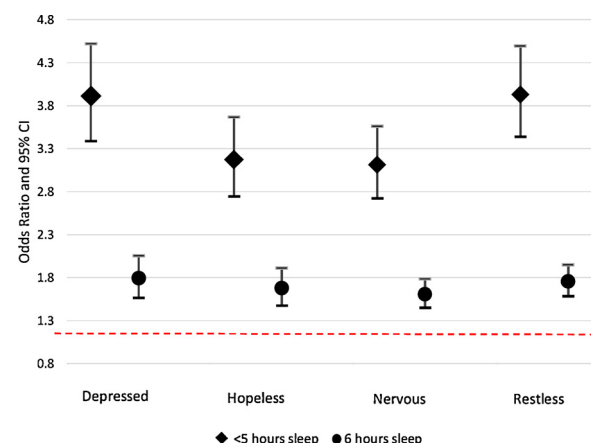


Fig. 1. Symptoms Associated with Low Sleep Duration.

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