

The Impact of Sleep on Female Sexual Response and Behavior: A Pilot Study

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ABSTRACT

Introduction. The etiological role of sleep disturbance in sexual difficulties has been largely overlooked. Research suggests that short sleep duration and poor sleep quality lead to poor female sexual response. However, prior research consists of cross-sectional studies, and the influence of sleep on sexual functioning and behavior has not been prospectively examined.

Aim. We sought to examine the influence of nightly sleep duration, sleep quality, and sleep onset latency on daily female sexual response and activity.

Methods. This study used a longitudinal design to study 171 women free of antidepressants and with reliable Internet access who were recruited from a university setting in the United States. Participants first completed baseline measures in a laboratory, and then completed web-delivered surveys at their habitual wake time for 14 consecutive days.

Main Outcome Measures. All outcome measures were modified for daily recall. Participants completed the Profile of Female Sexual Function's desire, subjective arousal, and orgasmic functioning scales and the Female Sexual Function Index's genital arousal scale, and indicated whether they engaged in partnered sexual activity or self-stimulation in response to dichotomous items.

Results. Analyses revealed that longer sleep duration was related to greater next-day sexual desire ($b = 0.32$, $P = 0.02$), and that a 1-hour increase in sleep length corresponded to a 14% increase in odds of engaging in partnered sexual activity (odds ratio = 1.14, $P < 0.05$). In contrast, sleeping longer predicted poorer next-day genital arousal ($b = -0.19$, $P < 0.01$). However, results showed that women with longer *average* sleep duration reported better genital arousal than women with shorter average sleep length ($b = 0.54$, $P = 0.03$).

Conclusions. Obtaining sufficient sleep is important to the promotion of healthy sexual desire and genital response, as well as the likelihood of engaging in partnered sexual activity. These relationships were independent of daytime affect and fatigue. Future directions may investigate sleep disorders as risk factors for sexual dysfunction. **Kalmbach DA, Arnedt JT, Pillai V, and Ciesla JA. The impact of sleep on female sexual response and behavior: A pilot study. J Sex Med 2015;12:1221–1232.**

Key Words. Sleep Duration; Sleep Quality; Female Sexual Response; Sexual Dysfunction; Insomnia; Sleep Disturbance

Introduction

The biopsychosocial model of female sexual response highlights the complexity of the factors underlying sexual dysfunction. Prior

research has identified medical illness [1], psychological disorder [1–3], and relationship dissatisfaction [4] as risk factors for sexual dysfunctions, such as hypoactive desire or diminished sexual arousal. Though initially studied as early as the 1960s, the

intersection of sleep and sexual functioning has since been largely overlooked. The literature on sleep and female sexuality is limited to a modest number of studies on rapid eye movement (REM) sleep and nocturnal vaginal vasocongestion from the 1960s through mid-1980s [5–7], then more recently on the roles of hormones in sexual function and sleep, and sleep-disordered breathing (e.g., obstructive sleep apnea) as a risk factor for sexual problems [8–10]. With growing recognition of the morbidity associated with disordered or insufficient sleep [11], it is surprising that the fields of sexology and sleep medicine have paid little attention to this area. As a step toward addressing this gap, we examined the influence of nightly sleep on sexual response and activity in young women.

In the 1960s, the occurrence of penile tumescence during REM sleep periods became the focus of much research, eventually aiding differential diagnosis between psychogenic and organic causes of erectile dysfunction [12]. These findings naturally led to an interest in sleep stage-related genital arousal changes in women. Researchers identified sleep-related changes in nocturnal vaginal vasocongestion such that, similar to nocturnal penile tumescence in men, increases in vaginal blood flow occurred during 95% of REM periods [6,12]. However, unlike men, women experienced a moderately high frequency of vaginal blood flow increases during non-REM periods (~66% [6]). To this day, it remains unclear what function REM sleep plays, if any, in human sexual response. One theory from the 1970s, based on findings that chronic REM sleep deprivation in laboratory animals led to hypersexuality, proposed that REM sleep decreases waking drive-motivated behavior, such as appetitive sexual behavior [7,13]. This theory, however, has not been borne out in the literature.

More recently, Andersen and colleagues' qualitative review [12] offered that neuroendocrine reproductive control activity may mediate the influence of sleep on human sexual response. To support their theory, the authors attempted to marry two literatures: (i) sex hormones (namely androgens) and sexual behavior; and (ii) sex hormones and sleep. They noted that sufficient levels of testosterone, progesterone, and estrogen have all been identified as important to healthy sexual function (indicated by greater desire and arousability) and increased sexual behavior in women. Additionally, the authors highlighted that sleeping increases androgen levels, whereas waking is related to their reduction. Therefore, they hypothesized that one

pathway from sleep loss or deprivation to impaired sexual function may be mediated by deficient androgen levels. They concluded their review by emphasizing the importance of sufficient sleep duration and sleep quality (SQ) as crucial to the maintenance of healthy sexual functioning in men and women.

Despite this growing body of research, a number of gaps exist in our understanding of the impact of sleep on female sexual response and behavior. Though it has been hypothesized that poor sleep duration and quality lead to greater difficulties with sexual function [12], no studies to date have prospectively examined this hypothesis. Experience sampling techniques would capture the manner in which nightly sleep experience is related to next-day sexual functioning and behavior. Additionally, though studies have demonstrated poorer sexual response in patients with untreated sleep-related breathing disorders (e.g., Köseoglu et al. and other authors [8–10]), it is presently unclear if this association is directly sleep-related or due to confounding comorbid conditions. As such, it is important to investigate sleep and sexual function and behavior in a relatively healthy sample that is less likely to be confounded by medical, psychiatric, or sleep-related illnesses or disorders.

Aims

Using a 2-week daily diary approach, we characterized the manner in which nightly sleep predicted next-day sexual functioning and behavior in a sample of young adult women. To reduce potential confounds, we accounted for the influence of age, oral contraceptive use, baseline severity of sexual distress, anxiety, and depression. Additionally, as changes in sexual activity [14] and desire [15] have been associated with the menstrual cycle, the presence of menstruation was also examined as a possible confound. We also accounted for daily affect and fatigue to minimize the potential confounding influences of affect and fatigue on sleep and sexual response. Regarding affect, we specifically focused on affect balance, which is conceptualized as the ratio of positive to negative affect an individual experiences. That is, more important than how *happy* or *sad* someone may be is how much happier than they were sad within a certain time period. Affect balance has been viewed as an overall measure of psychological well-being that has shown to be related to sexual functioning [16]. By using repeated assessments, we aimed to capture nightly variations in total sleep time (TST), SQ,

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