

Examining the Relationship Between Worry and Sleep: A Daily Process Approach

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There is growing evidence suggesting that worry and sleep are intimately linked. However, the relationship between these two phenomena over the course of a day remains largely unstudied. It is possible that (a) worry predicts sleep disturbance that night, (b) sleep disturbance predicts worry the following day, or (c) there is a bidirectional relationship between worry and sleep disturbance. The present study examined the daily relationship between worry (both during the day and immediately prior to sleep onset) and sleep in 50 high trait worriers who were randomly assigned to one of two interventions aimed at reducing worry as part of a larger study. A daily process approach was utilized wherein participants completed daily reports of sleep and worry during a 7-day baseline period followed by a 14-day intervention period. Results of repeated measures multilevel modeling analyses indicated that worry experienced on a particular day predicted increased sleep disturbance that night during both the baseline and intervention weeks. However, there was no evidence of a bidirectional relationship as sleep characteristics did not predict worry the following day. Additionally, the type of intervention that participants engaged in did not affect the daily relationship between worry and sleep. Results of the present study are consistent with the cognitive model of insomnia (Harvey,

2002) and highlight the importance of addressing and treating worry among individuals with high trait worry and sleep disturbance.

Keywords: worry; anxiety; sleep; insomnia; daily process approach

WORRY AND SLEEP SHARE a close relationship. Worry is a common occurrence in individuals suffering from insomnia (Morin, 1993), and insomnia likely plays a role in exacerbating symptoms of psychopathology (Ford & Kamerow, 1989), including chronic and severe worry. Several forms of psychopathology that involve chronic worry are also associated with sleep difficulties. One reason for this relationship is that sleep disturbance is a symptom or clinical feature of several psychological disorders in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed. (DSM-5; American Psychiatric Association, 2013) and is particularly associated with anxiety disorders. For example, Ohayon, Caulet, and Lemoine (1998) found that 41.6% of individuals with insomnia were diagnosed with an anxiety disorder, and difficulty with sleep onset is a feature of many anxiety disorders (Morin, 1993). Furthermore, generalized anxiety disorder (GAD), which is characterized by chronic worry, is the most prevalent anxiety disorder diagnosis among individuals with sleep disturbance (Ohayon et al., 1998). Among those with severe sleep disturbance, 13% report symptoms of GAD (Mellinger, Balter, & Uhlenhuth, 1985).

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Additionally, it is estimated that 50–70% of individuals with GAD have insomnia (Anderson, Noyes, & Crowe, 1984). Given that the diagnostic criteria for GAD includes sleep disturbance, it is not surprising that individuals with GAD often complain of difficulty engaging in sleep due to excessive and uncontrollable worry (Monti & Monti, 2000).

Despite strong evidence indicating a general association between worry and sleep disturbance, little research has examined how they might affect each other on a daily basis. There are three possible ways in which worry and sleep disturbance are related: it is possible that (a) worry contributes to sleep disturbance; (b) sleep disturbance contributes to worry; or (c) there is a bidirectional relationship between worry and sleep disturbance. An important step in understanding the relationship between these two phenomena is to examine the degree to which they predict each other over the course of a day. Understanding the relationship between worry and sleep disturbance has the potential to elucidate key processes involved in these phenomena and may aid in the development and implementation of interventions.

The Effect of Worry on Sleep Disturbance

According to the cognitive model of insomnia (Harvey, 2002), worry contributes to poor sleep quality, thus maintaining and exacerbating insomnia. Generally, individuals with insomnia experience intrusive thoughts and excessive and uncontrollable worry while trying to fall asleep (Borkovec, 1979, 1982; Morin, 1993) that exacerbate insomnia symptoms. Additionally, during the day these individuals have distorted beliefs about the previous night's sleep and the perceived consequences of a poor night's sleep (Bonnet, 1990; Morin, Stone, Trinkle, Mercer, & Remsburg, 1993). These beliefs lead them to engage in counterproductive safety behaviors (e.g., drinking before bedtime, limiting physical activities during the day; Wooley & Simon, 2006). Together, experiencing catastrophizing worries that result in increases in anxiety and distress (Harvey & Greenall, 2003) and engaging in counterproductive behaviors create conditions that impede successful sleep onset (Espie, 2002). As individuals become trapped in this cyclical cognitive process, the escalation of anxiety and emotional distress can lead to an actual deficit in sleep, which subsequently reinforces and strengthens their concerns. Thus, the cognitive model of insomnia suggests that a relationship exists between worry, examination of threat cues, beliefs about sleep, and counterproductive safety behaviors that ultimately maintain and strengthen insomnia.

Although the content of worry discussed in the cognitive model of insomnia is specifically related

to sleep concerns, it is also possible that increased general worry (not specific to sleep) leads to the development of insomnia. For example, Gross and Borkovec (1982) manipulated participants' likelihood of engaging in cognitive mentation prior to sleep onset by informing one group of good sleepers that they would have to give a speech immediately following a nap. Participants who were informed about the speech took significantly longer to fall asleep than did participants who were not asked to give a speech upon awakening. This finding suggests that participants had difficulty falling asleep as a result of the cognitive intrusions (i.e., worry) related to giving a speech. Additionally, Hall, Buysse, Reynolds, Kupfer, and Baum (1996) manipulated presleep stress in female good sleepers and found a positive relationship between subjective stress-related intrusive thoughts and objective sleep onset latency. Finally, in addition to cognitive consequences, worry has also been demonstrated to have physiological effects that subsequently disrupt sleep (Brosschot, Van Dijk, & Thayer, 2007).

The Effect of Sleep Disturbance on Worry

It is also possible that sleep disturbance leads to the emergence and exacerbation of worry. Compared with individuals without insomnia, those with insomnia report higher trait worry symptoms during the day (Means, Lichstein, Epperson, & Johnson, 2000), and individuals who sleep less tend to worry more even after controlling for sleep disturbance attributed to worry, suggesting that reduced sleep length continues to be associated with worry beyond the negative effects of presleep cognitive activity (Kelly, 2002). Research has also shown that individuals who sleep for fewer than 6 hours per night report more anxiety than do individuals who sleep 9 or more hours per night (Kumar & Vaidya, 1984). Bonnet and Arand (1992) induced objective (i.e., increased sleep onset latency, decreased total sleep time) and subjective (i.e., perceived sleep quality, number of awakenings) sleep disturbance in good sleepers over the course of a week and found that participants reported significant increases in anxiety, dysphoria, and tension, suggesting that insomnia leads to psychological distress.

Although insomnia is often conceptualized as an epiphenomenon of various physical and psychological conditions (Spielman & Glovinsky, 1997), a growing body of literature suggests that insomnia may predate the onset of these disorders and contribute to their development (Ford & Kamerow, 1989; Vollrath, Wicki, & Angst, 1989; see Harvey, 2001, for a review). The National Institute of Mental Health Epidemiologic Catchment Area

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