

# Sleep and Social Processes



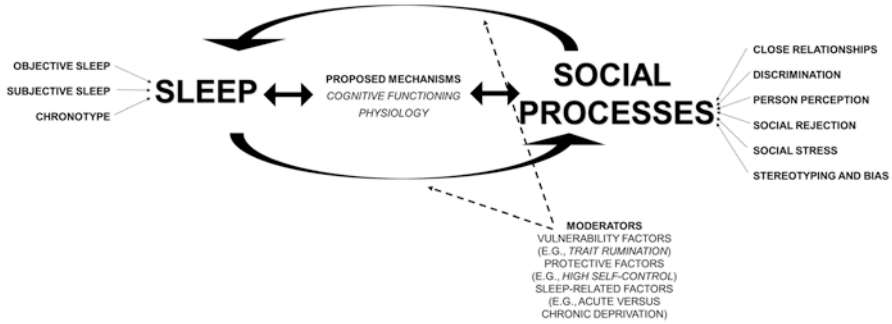
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Sleep problems are increasingly being recognized as a public health epidemic. Over 69% of US adults get less sleep than they need (Sleep in America Poll, 2014), and poor sleep is related to negative physical and mental health outcomes (for recent reviews, see Barnes & Drake, 2015; Buysse, 2014). Historically, sleep research has separated sleep from the social context in which it occurs and sleep has been largely neglected in social psychological research. However, researchers are increasingly recognizing the importance of considering the bidirectional links between sleep and social processes (Gordon, Mendes, & Prather, 2017). This work provides important evidence that how well we sleep affects how we interact with the social world. Similarly, how we interact with those around us affects how well we sleep. In Fig. 1, we present a conceptual model of these bidirectional links. In the following chapter, we summarize this research by providing illustrative examples of how sleep is linked to a variety of social processes from relationship conflicts to discrimination. We also suggest areas of future research, including the need to identify mechanisms and moderators.

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**Fig. 1** Conceptual model depicting the bidirectional links between sleep and social processes, as well as potential mechanisms and moderators

## Evidence of Bidirectional Links Between Sleep and Social Processes

Evidence is mounting that sleep (or the lack thereof) plays a role in nearly every social process. Below we outline the current research in three key areas: (1) close relationships, (2) aggression, anger, and social stress, and (3) person perception and discrimination.

**Close Relationships** Romantic partners often share beds, making sleep integral to the relationship experience. Whether sharing a bed improves or impedes sleep quality is an open question. Some work shows that partners negatively influence each other's sleep, with people exhibiting more movement during the night when they are bed-sharing relative to when they are alone (Pankhurst & Horne, 1994). However, those couples also report better subjective sleep and other research indicates that cohabitating couples report more sleep problems when one partner is traveling (Diamond, Hicks, & Otter-Henderson, 2008). In line with these subjective experiences, a pilot study in which young, satisfied couples slept in a laboratory for several nights found that co-sleeping led to greater sleep efficiency, more slow wave sleep, and more REM sleep, compared to when sleeping alone (Drews et al., 2017). Couples with more concordant sleep, both in terms of overall sleep-wake patterns, and in terms of matched minutes awake throughout the night, are more satisfied with their relationships and experience less marital conflict (Gunn, Buysse, Hasler, Begley, & Troxel, 2015; Larson, Russell Crane, & Smith, 1991). Given these potential effects of co-sleeping, researchers have increasingly recognized the need to consider the dyadic nature of sleep (for reviews and a comprehensive model linking sleep to relationship functioning, see Troxel, Robles, Hall, & Buysse, 2007; Troxel, 2010; see also Rogojanski, Carney, & Monson, 2013).

Quality of sleep also plays a role in how partners interact outside of the bedroom. People who tend to sleep better report being generally more satisfied with their marriages (Strawbridge, Shema, & Roberts, 2004). In daily life, people report

sleeping better when they feel close and connected with their romantic partners (Kane, Slatcher, Reynolds, Repetti, & Robles, 2014; Selcuk, Stanton, Slatcher, & Ong, 2017). Sleep is related to negative interpersonal processes as well. Individuals report sleeping worse after experiencing romantic conflict (Hicks & Diamond, 2011). Looking at the other direction, poor sleep is associated with greater conflict the following day (Gordon & Chen, 2014). Sleep may also play a role in the nature and resolution of romantic conflict—in one laboratory study, sleeping poorly the prior night was associated with less empathic accuracy, a lower ratio of positive to negative affect (self- and observer-rated), and less conflict resolution (Gordon & Chen, 2014).

Lack of close relationships can impact sleep as well. Sleep has been linked to loneliness, with lonelier individuals exhibiting worse sleep efficiency, fragmentation, and daytime fatigue (Cacioppo et al., 2002; Hawkey, Preacher, & Cacioppo, 2010; Kurina et al., 2011). In the opposite direction, researchers have found that when people sleep worse, they report feeling lonelier the following day. In this vein, depriving people of sleep leads to behaviors associated with social withdrawal, such as maintaining greater physical distance from others (Ben Simon & Walker, 2018).

People seem to be affected not just by their own poor sleep but by the sleep of those around them as well—people experience deficits in empathic accuracy whether they *or* their partners are poorly rested (Gordon & Chen, 2014) and people tend to be less satisfied with their relationships if their partner typically sleeps poorly (Maranges & McNulty, 2016; Strawbridge, et al., 2004). Moreover, people who view a video of a sleep-deprived individual (compared to when they are well-rested) not only rate the sleep-deprived person as lonelier, they actually report feeling lonelier themselves (Ben Simon & Walker, 2018). In related research using a similar paradigm, people reported feeling less inclined to socialize with targets in photos if the target was sleep-deprived (Sundelin, Lekander, Sorjonen, & Axelsson, 2017). These contagion effects highlight the social nature of sleep, particularly within close relationships (for review see Gunn and Eberhardt, Chap. 9, this volume).

**Aggression, Anger, and Social Stress** Sleep is related to negative social behaviors outside of close relationships as well. Krizan and Hisler (2018) found a causal effect of sleep on anger. After two nights of partial sleep deprivation (compared to two nights of normal sleep), participants showed amplified angry responses in the lab. Although this task was non-social, anger is often an interpersonal emotion with social consequences. For example, research suggests that sleep problems may perpetuate reactive aggression and violence (e.g., Kamphuis, Meerlo, Koolhaas, & Lancel, 2012).

Sleep is also associated with other types of social stressors, such as rejection. In a within-person field experiment, we found that people took significantly longer to go to bed and slept less after experiencing social rejection just before bedtime compared to a control night where they watched a neutral film. This was particularly true for people high in trait rumination (Gordon, Del Rosario, Flores, Mendes, & Prather, 2019). We also found some evidence for the reverse direction—suggesting sleep modulates how people deal with social stressors. In one study, people who had slept worse the night prior to the rejection task had greater physiological reactivity

(i.e., greater increase in heart rate relative to baseline) during and up to an hour after the rejection task. Relatedly, researchers have shown that sleep deprivation and poorer global sleep quality result in greater physiological responses (i.e., blood pressure reactivity and systemic inflammation) to a stressful social-evaluative task (Prather, Puterman, Epel, & Dhabhar, 2014). In other work, compared with a control group, sleep-deprived participants had greater amygdala activation and reduced activity in the prefrontal cortex when observing emotional faces (Yoo, Gujar, Hu, Jolesz, & Walker, 2007). Poor sleep also strengthens links between amygdala activation in response to emotional stimuli and more general reports of perceived stress (Prather, Bogden, & Hariri, 2013). Together, these studies highlight the possibility that sleep disruption and negative social behaviors, such as anger, aggression, and rejection, mutually amplify each other.

**Person Perception and Discrimination** Sleep plays a role in how we perceive others. Individuals shown pictures of strangers are less accurate at identifying anger and happiness after sleep deprivation compared to when they are well-rested (Van der Helm, Gujar, & Walker, 2010). Other work shows that people perceive leaders as less charismatic if they've slept poorly (Barnes, Guarana, Nauman, & Kong, 2016). Sleep also affects heuristic tendencies, leading to more stereotyping and bias. For example, people who are more alert in the morning engage in more social stereotyping at night than in the morning whereas the opposite is true for those more alert in the evening (Bodenhausen, 1990). Sleepier people are more likely to engage in racial stereotyping, including rating a job candidate as less qualified if the candidate has a Black-sounding name as opposed to a White-sounding name (Ghumman & Barnes, 2013). This effect of sleep on stereotyping seems particularly pronounced among individuals with strong implicit racial biases.

Sleep has also been linked to discrimination (for a review, see Slopen, Lewis, & Williams, 2016). Although these studies are primarily cross-sectional, there is strong evidence that people who experience more discrimination in their daily lives exhibit worse self-reported sleep, and some studies have shown that discrimination is associated with disturbed sleep, as measured by objective EEG recording (Beatty et al., 2011; Lewis et al., 2013). Some research has suggested that loneliness, stress, and rumination may be pathways through which discrimination disrupts sleep (Hoggard & Hill, 2018; Majeno, Tsai, Huynh, McCreath, & Fuligni, 2018). For decades researchers have worked to understand social bias and prejudice, uncover processes related to differential empathy towards ingroup over outgroup members and understand how discrimination gets under the skin. These studies suggest that lack of sleep may be a neglected factor in the literature.

From relationship conflict to discrimination, the growing research in this area highlights the breadth of ties between sleep and social processes—when people sleep poorly they are more susceptible to social stressors such as rejection and relationship conflict, have more difficulty judging other people's expressions, and are quicker to rely on stereotypes. Moreover, there is evidence that these negative social experiences portend poorer sleep, creating the possibility of a vicious downward

cycle not just for poor sleepers but for those who interact with them. This is an emerging literature and many questions remain about the bidirectional links between sleep and social processes.

## Future Directions

**Mechanisms and Moderators** Although the research on sleep and social processes is burgeoning, the focus has been primarily on establishing main effects. To move this literature forward, rigorous research is needed to uncover the mechanisms likely underlying these links. Some researchers have peered “under the skin” to identify potential pathways through which sleep and social processes may impact each other: executive functioning—particularly self-regulatory capacity and attentional focus—and physiologic arousal.

Poor sleep is robustly linked to impaired executive functioning (Durmer & Dinges, 2005). One consequence of this is impaired *self-regulation*. Poor sleepers have more difficulty overriding initial impulses (Krizan & Hisler, 2016; for review see Hisler and Krizan, Chap. 7, this volume) and depend more on automatic processing, such as relying on implicit racial biases (Ghumman & Barnes, 2013). Reduced self-regulation may also be one reason why people are more reactive to social stressors, such as rejection, after sleeping poorly. In work by Mauss and colleagues, poor sleepers engaged in less cognitive reappraisal to regulate their emotions after a stressful experience (Mauss, Troy, & LeBourgeois, 2013).

Reduced self-regulation may also be one reason why social processes affect sleep. Self-regulation is required in order to get adequate sleep. People have to turn off their screens, leave the bar, or quit their work in order to go to bed. Smart phones appear to be one reason that adolescents are getting less sleep than they previously did (Kroese, Evers, Adriaanse, & de Ridder, 2016; Twenge, Krizan, & Hisler, 2017). Moreover, some social experiences—such as arguing with a spouse or being the victim of discrimination—may be depleting, making it more difficult to engage in the self-regulatory behaviors necessary to get a good night of sleep.

*Attention* is another aspect of executive functioning that may help explain the links between sleep and social processes (Lim & Dinges, 2008, 2010). In order to pick up on subtle social cues, such as a person’s emotional expression, people must be able to sustain attention and re-direct it when appropriate (Whitney, Hinson, Satterfield, Grant, Horn, & Van Dongen, 2017). Reduced attention might also explain why poor sleepers rely more on heuristics and stereotypes during social interactions rather than gathering, integrating, and updating held beliefs with new information.

The autonomic nervous system made up of the sympathetic (SNS) and parasympathetic nervous systems (PNS) activates during social and affective experiences (Mendes, 2016), and can directly affect the ability to fall and stay asleep. PNS activation is imperative for sleep onset and uninterrupted sleep; thus, any experience

that alters the PNS might quicken or delay sleep onset. For example, social experiences such as interpersonal conflict or social rejection, particularly right before bed, might increase SNS and/or decrease PNS, possibly delaying sleep onset and decreasing sleep quality.

Biological systems, such as the autonomic nervous system, may also be a pathway through which sleep impacts social processes. Poor sleep may lead to physiological dysregulation. Indeed, couples with higher sleep-wake concordance have lower systolic blood pressure both during sleep and while awake (Gunn et al., 2017). Tying it together, we know from other research that physiological reactivity and flexibility are linked to processes such as accurately identifying emotional stimuli and responding to social cues (Muhtadie, Koslov, Akinola, & Mendes, 2015). Thus, it is likely that physiological arousal plays an important role in the recursive nature between sleep and social processes.

Here we suggest executive functioning and physiologic arousal as two potential pathways linking sleep and social processes. However, little work has rigorously examined these links, and more work is clearly needed to help elucidate these neurological and physiological mechanisms, as well as robustly test other potential mechanisms (e.g., rumination, stress). In addition, uncovering moderators will help pinpoint when and for whom sleep is linked with social processes. In our work on social rejection, we found that trait ruminators were most susceptible to the negative effects of social rejection on sleep (Gordon et al., 2019). In work by Hisler and colleagues (2018), they found that individuals with higher chronic stress were particularly susceptible to the effects of short sleep on daily stress. We anticipate that there are other individual differences which make people particularly vulnerable to the negative effects of poor sleep. On the flipside, there may be individual differences that help protect people from such negative effects. These might be sleep-based (e.g., having low sleep needs, acute versus partial sleep deprivation), personality-based (e.g., being good at regulating emotions, see Duggan and Križan, Chap. 12, this volume), or context-based (e.g., being highly motivated to pay attention). The literature also points to another moderator that needs to be attended to—the distinction between subjective and objective measures of sleep. Work on sleep has consistently shown different effects depending on whether the sleep is subjectively or objectively measured. Moreover, studies in which people are given false feedback about their sleep show that in these situations subjective sleep feedback influences perceptions of alertness, but not objective measures of attention (Gavriloff et al., 2018). Thus, careful attention should be paid to when these two aspects of sleep provide consistent versus divergent results.

**Leveraging Technology to Collect Big Data** We are on the cusp of a technological revolution in which wearable devices may produce cheap but also reliable sleep measurement. This technology paves the way for “big data” on sleep that can be collected on a large scale and cross-culturally. Examining the links between sleep and social processes in different cultures will reveal important information about the inherent nature of these links, as well as the extent to which they are context-based or universal. This new technology also provides the opportunity for exciting

work measuring sleep contagion via social network analyses (e.g., Mednick, Christakis, & Fowler, 2010). Given the evidence that people are affected by the sleep of those around them, with global data on sleep patterns matched to social interactions via social media, we will have the ability to plot the spread of poor sleep across social networks.

**Manipulating Sleep: Sleep Deprivation and Sleep Extension** One reason that social psychologists may have neglected sleep previously is the difficulty in successfully manipulating it. The majority of studies examining the links between sleep and social processes use a correlational approach. Future work is needed that carefully manipulates sleep to examine its causal effects. Sleep deprivation is one important avenue for testing these effects; however, given the increasing number of people who suffer from chronic insufficient sleep (i.e., less than 7 hours per night), another approach to assessing the causal effects of sleep is sleep extension—increasing the number of hours participants sleep either through naps or an earlier bed time. Ideally, work will directly compare these two approaches to identify whether they produce similar results in opposite directions, or if, perhaps, deprivation and extension have unique effects.

**Capturing Complex Social Behavior** Just as more work is needed to carefully measure and manipulate sleep, we also need research which moves away from self-reports of social behavior to methods that capture complex social processes as they unfold without the requirement of conscious self-assessment. Social psychologists have created rigorous methods to induce meaningful social situations in the lab, from inducing discrimination, to forming new friendships, to capturing relationship conflict. As this body of research moves forward, we will need to focus on marrying the gold-standard measures of sleep and sleep-deprivation from sleep science with the best-validated in-lab tasks used by social psychologists. Given the potential effects of sleep contagion, examining meaningful social interactions between two or more individuals (some of whom are sleep deprived) will allow us to test interesting and important questions about how sleep spreads and affects those who interact with poor sleepers.

**Sleep as a Control Variable** For the researchers who are not primarily interested in sleep, we would urge the measurement and accounting of sleep differences in studies. Individual differences in sleep may be adding unnecessary noise to social experiments. For example, people of different chronotypes differ in their response to social stimuli—from stereotyping to reports of trustworthiness and altruism—depending on the time of day the study is conducted (Bodenhausen et al., 1990; Dickinson & McElroy, 2017) and insomnia is associated with error in survey responding, reducing reliability (Barber, Barnes, & Carlson, 2013). We argue that like other basic demographics, such as gender, race, and age, sleep should become a background variable collected and accounted for during studies of social processes.



## Conclusion

The research on sleep and social processes increasingly shows that our nights invade our days, and our days invade our nights. When people sleep poorly, they are less satisfied with their romantic relationships, more aggressive, and engage in more stereotyping, to name a few social consequences. Conversely, social experiences impact sleep. Social rejection disrupts sleep while social connection enhances sleep quality. This is a small but growing body of work, and as this literature develops, there are many areas ripe for exploration, from uncovering mechanisms and moderators to leveraging new technology to identify global patterns in sleep.

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