CLINICAL REVIEW

Sleep and social relationships in healthy populations: A systematic review

Amie M. Gordon [a, *], Belinda Carrillo [b], Christopher M. Barnes [c]

[a] *University of Michigan, Ann Arbor, USA*
[b] *University of California, Berkeley, USA*
[c] *Foster School of Business, University of Washington, USA*

S U M M A R Y

Over the past decade, research linking sleep and social relationships has burgeoned. Researchers across the globe are trying to understand whether the quality and quantity of our social relationships matter for sleep, and vice versa. We conducted a systematic review of the literature, identifying over 200 relevant articles examining sleep and social relationships in healthy populations. Here, we summarize our findings by reviewing 1) links between sleep and broad social ties across the lifespan, and 2) links between sleep and specific social relationships identified in the literature search, including romantic relationships, family relationships, and work relationships. Taken together, the literature provides evidence that the quality and presence of social relationships, especially our closest relationships, play a role in how we sleep. Likewise, sleep appears to influence our social bonds. However, the majority of work is correlational, limiting conclusions about the directionality of these effects. We conclude by synthesizing the findings, considering the limitations of the present literature, and identifying key future directions for this emerging area of research.

Introduction

Decades of research have linked sleep to various aspects of daytime functioning, from cognition to emotion. Recently, researchers have turned their attention to the social side of sleep, seeking to understand the links between sleep and social relationships. Given the importance of both sleep and social relationships for long-term health and well-being, it seems critical to understand and quantify their association. Although interest in this topic is growing, to our knowledge a comprehensive review of the literature on sleep and social relationships has not yet been conducted. Several reviews have been conducted that examine different aspects of this area of research (e.g., romantic relationships, loneliness, social support, attachment, work relationships, parenting; see Table S2 for a full list of review articles and chapters obtained in our search). These reviews help shed light on the role of sleep in a variety of social relationships and social processes, but only a handful are systematic reviews of the literature and most are narrow in focus. The current review builds on these prior reviews by conducting a systematic review of the role of sleep in social relationships broadly, creating a synthesis of the research in one place. This review focuses on the links between the quantity and quality of sleep and the quantity and quality of social relationships in healthy populations across the lifespan (see Fig. 1). We synthesize the findings from over 200 empirical articles. We first describe our review methods, then review links between sleep and broad social ties in 1) adulthood and 2) childhood and adolescence. The literature search also yielded articles on several specific types of relationships. Thus, we review the literature on associations between sleep and the quality of 3) romantic relationships, 4) family relationships, and 5) work relationships. Finally, we consider limitations of the literature and pinpoint future directions revealed by this review.

Review method

A systematic review of the literature was conducted. We ran a series of computerized searches in PubMed and PsycInfo to identify all relevant peer-reviewed journal articles. First, we searched for the following terms in the title: (sleep) AND (interpersonal OR

* Corresponding author. Department of Psychology, University of Michigan, Ann Arbor, 48109, USA.
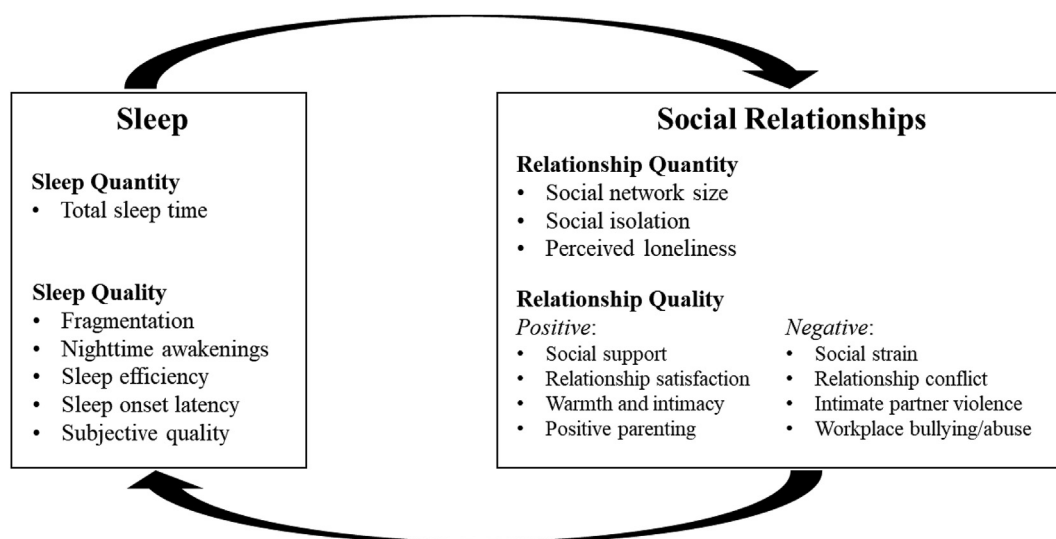*E-mail address:* amiemg@umich.edu (A.M. Gordon).

Fig. 1. Model depicting the main sleep and relationship processes identified in this systematic review of the bidirectional links between the quantity and quality of sleep and the quantity and quality of social relationships.

social OR dyadic). We then conducted relationship-specific searches, combining (sleep) with the following: *romantic* (marital OR marriage OR couples OR romantic OR cohabiting OR dating OR married OR wife OR wives OR husband* OR spouse* OR partner* OR spousal); *family* (family OR families OR sibling* OR relative*); *parent-child* (parent* OR child OR children OR parent-child OR mother* OR father* OR maternal OR paternal OR son OR sons OR daughter*); *friend* (friend* OR acquaintance* OR peer relation*); and *work* (work* OR organization* OR supervisor* OR boss OR bosses OR employer* OR employee* OR subordinate* OR leader* OR follower* OR colleague* OR coworker* OR team* OR manager*). The initial parent-child and work searches yielded high volumes of irrelevant articles given that the search terms were not specific to relationships. To capture relationship-relevant articles and reduce the number of irrelevant articles, we reran those searches including the terms (relation* OR interaction*) in the abstract. In all searches, we focused on healthy populations, excluding articles with disorder*, apnea, or CPAP in the title or abstract. We also confined our searches to English language with human populations. All articles published through August 6th, 2020 were included.

Fig. 2 outlines our study selection process. The initial search yielded 2234 articles (1532 articles after removing duplicates). Articles retrieved through this search were screened for relevancy. To remove irrelevant articles, we first searched for keywords related to disorders and chronic illness (e.g., cancer, diabetes, depression), shiftwork, sleep timing, and co-sleeping (e.g., circadian, chronotype, shift, synchrony, co-sleeping), shiftwork professions (e.g., doctors, nurses, EMTs), and social media/technology (e.g., media, phone). We examined the titles and abstracts of these articles for relevancy and removed those that did not include measures of quality or quantity of sleep (e.g., measured daytime fatigue only) or quality or quantity of established social relationships (e.g., social jetlag, interactions with strangers). Review articles were also removed. We examined all remaining articles to determine relevancy and removed those that did not include analyses of the link between sleep and social relationships as a main goal of the paper (i.e., articles that measured both sleep and social relationships but never examined their association) or included relationship measures that were not about the quality or quantity of relationships (e,g, general social competence or aggressive tendencies, social rhythmicity). This process left 160 relevant articles.

Additionally, we examined reference lists of articles retrieved through our search and articles known by the authors that were not included in the computerized search. These methods led us to obtain an additional 47 articles for a final list of 207 relevant peer-reviewed empirical articles. The final set of articles were coded for research method, population type, sample size, and year published. Given the large number of articles found, we attempt to strike a balance between reviewing specific articles and synthesizing the literature. In terms of the specific articles we review, we sought to highlight the different methods, samples, and findings in each section, but when multiple articles had similar findings, we chose to review those with the largest samples and most rigorous methods. Lists of the 207 empirical articles as well as relevant reviews can be found in supplementary materials (Tables S1 and S2).

Section 1: adult broad social ties

Our search produced 52 empirical articles that examined associations between sleep and the quantity and quality of people's broad social ties in adulthood.[1] Thirty-one of these were cross-sectional, twenty were longitudinal (six daily diaries), and one had both experimental and longitudinal methods. Sample sizes were 18–31,059. Studies were published between 1996 and 2020. Samples spanned college students to older adults.

One area of research considers whether the *quantity* of one's relationships is related to sleep. These studies look at the size of one's social network, level of social isolation, and/or perceived loneliness. In terms of social network size, studies have shown that more integration with social networks is associated with getting an adequate amount of sleep (7–8 h) [1] and better self-reported sleep quality, particularly for women [2,3]. In terms of the bidirectionality of these effects, one 3-year study of 942 college students found that students who had fewer social ties at the university reported experiencing more sleep problems over time, and experiencing more sleep problems predicted fewer social ties over time [4]. They found no effect for sleep duration. Another study focused on older

---

[1] Articles may be counted in more than one section if they included analyses relevant to multiple sections, such as articles that looked at both marital status and broad social support.
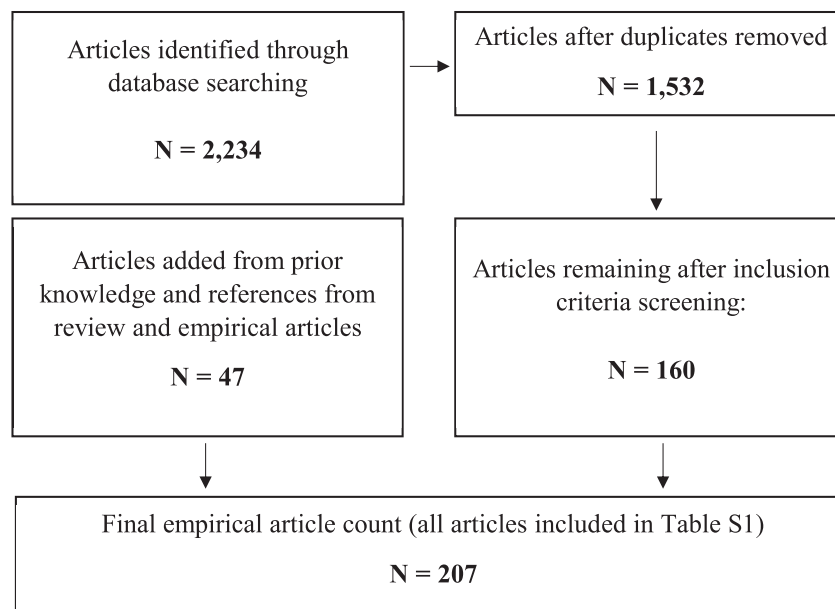
Fig. 2. Flow chart depicting study selection process. Review synthesizes findings from 207 articles, with all articles included in Table S1.

adulthood, across six years and 1417 participants, social networks and sleep disturbances were not directly linked to each other, but were indirectly linked such that both social networks and sleep at Time 1 predicted the other at Time 3 through Time 2 depression [5]. Another study of 524 older adults found cross−sectional associations between social participation and sleep quality (fragmentation and wake after sleep onset) but no evidence that increases in social participation improved sleep over a five-year period [6]. They also found no effect for sleep duration within or across time. Neither of these studies looked at whether sleep predicts changes in social networks or isolation, limiting our ability to draw conclusions about the bidirectionality of these effects.

The literature on sleep and loneliness is more robust. Studies have linked loneliness to fatigue, sleep fragmentation, and reduced sleep efficiency and sleep quality. For example, one study of 95 adults found that lonelier people had worse sleep fragmentation but not duration, quality, or daytime sleepiness [7], whereas a 3-day study of 215 adults only found an effect for daytime fatigue [8]. In a sample of 290 older adults, loneliness at age 70 predicted worse global sleep satisfaction at age 77, accounting for other risk factors [9]. Whereas there was no evidence of a reverse effect in the older adult sample, the 3-day study found links between daytime fatigue and loneliness in both directions [8].

In the only experiment linking sleep and broad social relationships in adulthood, 18 participants wanted more social distance and were rated as lonelier by 1033 raters when they were sleep-deprived compared to well-rested [10]. The raters who viewed the sleep-deprived participants also felt lonelier themselves. In a second study of 138 participants, loneliness was predicted by reduced sleep efficiency the prior night. In terms of interventions, one study of 71 college students found lonely students spent more time in bed and slept more on days when they had more social connections, whereas the link between social connections and sleep was not present for the less lonely [11]. Loneliness is suggested as one potential mediator between interpersonal stress and sleep problems [12]. Other potential mediators between social relationships and sleep include emotion regulation [4], depression [5], and positive affect [13]. Taken together, the literature on sleep and loneliness clearly point to lonely people sleeping worse and

poor sleep influencing loneliness, though there are inconsistent findings regarding which aspects of sleep (duration, fragmentation, efficiency, daytime fatigue) matter.

Two studies directly compared objective (social network size, social isolation) and subjective (perceived loneliness) measures of relationship quantity, with differing results. Both studies found that when assessed separately, objective and subjective measures of relationship quantity were associated with self-reported sleep. However, when considered simultaneously, one cross-sectional study of 2541 older adults found that perceived loneliness was more strongly correlated with poor sleep than was one's number of close friends and relatives [14], whereas another study of 639 older adults found that social isolation (e.g., living alone, not participating in social groups) better predicted poor sleep than perceived loneliness [15]. The two studies were conducted in different countries (U.S. and Taiwan) and the latter study used a 1-item measure of perceived loneliness over the past week, thus more work is needed to determine whether this is a measurement or meaningful difference.

Questions concerning the *quality* of one's relationships have received more attention. Large-scale cross-sectional studies have been conducted in numerous countries including Brazil, China, Finland, Great Britain, Israel, Japan, Norway, Singapore, Taiwan, and the United States and the effects are consistent: people's reports of the quality of their social relationships are linked to their sleep. When looking at broad social relationships, the most common measure of relationship quality is social support. A 2018 meta-analysis found evidence that poor sleep (both quality and quantity) is associated with less social support [16]. The largest study obtained in our search (and also in the meta-analysis) included a sample of 31,059 mid-life individuals [17]. Participants who reported no social and emotional support had a greater likelihood of reporting insufficient sleep (i.e., less than 7 h in a 24-h period), even when accounting for a large number of control variables. In terms of the directionality of these effects, although no experimental work has been done, three longitudinal studies (two of which were reported in the meta-analysis) examined whether social support predicts sleep over time. One study of 2446 older adults found that greater exposure to positive support and lower exposure to

negative support were independently associated with better self-reported sleep quality across 15 years [18]. Another study of 1946 working mid-life adults found that negative support from friends and family, but not positive support, predicted greater self-reported sleep disturbances across eight years [19]. A third study of 1688 mid-life and older adults published in 2020 found that social support from friends, family, and partners each predicted reduced risk of reporting more than one sleep complaint and short sleep duration (<6 h) across four years [20]. The lack of bidirectional analyses prevents us from being able to conclude whether sleep similarly influences social support over time.

Studies looking at sleep and broad social ties in adulthood typically rely on self-reported sleep, but a small handful of studies include objective measures (actigraphy, in—home polysomnography [PSG], and mobile sensing). These studies tend to find stronger results for subjective sleep compared to objective sleep [21]. Daily diary studies have also examined within-person associations between sleep and social relationships. One 7-day study of 47 adults found that people reported more sleep disturbances on days when they experienced more interpersonal conflict, particularly if they were higher in cynical hostility [22].

In later adulthood, both social ties and sleep can become problematic, which may be why many studies focused specifically on older populations. In general, social relationships appear to be linked to sleep across adulthood, and studies often account for age. However, one study of 592 adults found that the effect of negative social relationships on sleep was stronger for younger adults than older adults [23]. A handful of studies have also shown that social relationships attenuate the effects of poor sleep on cognitive and health outcomes in older adults. For example, being married and having a stronger social network buffered against the negative effects of sleep deprivation on cognitive functioning in a sample of 4169 older adults [24]. Moreover, a longitudinal study of 2962 mid-life adults found that sleep disturbances heightened the risk of systemic inflammation over five years particularly for those who were socially isolated [25]. Two other studies have found similar effects, though with gender differences: In a study of 74 older women, either good sleep or strong social ties were protective factors against inflammation [21]. In a follow up study of 1229 mid-life and older adults, positive relationships with others helped buffer against the effects of poor sleep on inflammation, but the finding was only significant for men [26]. Given the known protective effects of sleep and social relationships on health outcomes, this may be an important avenue for future research.

Correlational studies of sleep and social relationships often control for potential confounds, such as age, gender, socioeconomic status and relevant health variables such as BMI and depression. Although confounding variables varied from study to study, results typically show that the associations between sleep and social relationships persist beyond these other factors.

Taken together, these articles examining the quality and quantity of broad social relationships provide consistent evidence that having larger social networks, being less isolated, feeling less lonely, and receiving more social support are associated with sleep in the moment and may predict better sleep over time. They also show that sleep may predict later relationship quantity, at least in terms of number of social ties and perceived loneliness (we found no studies on relationship quality that examined effects in this direction). What is less clear is which aspects of sleep matter—-studies often assess different dimensions of sleep and those that assess multiple sleep dimensions (e.g., duration, quality, efficiency) often vary in terms of which sleep dimensions are linked to social relationships. Furthermore, studies have overwhelmingly relied on self-reports. They have also differed in terms of their measurement of social relationships. One finding that does emerge from our

review is that positive and negative relationship quality appear to independently influence sleep. Several studies simultaneously examined positive and negative features of relationships both within and across time and found unique effects [19,20,27].

Section 2: child/adolescent broad social ties

Our search yielded 16 relevant articles: Five were cross-sectional, eight were longitudinal, one included observational methods, one was a within-person quasi-experiment (comparing times of high and low stress) and one was experimental. Sample sizes ranges from 16 to 6366. Studies were published between 2000 and 2019. Ages ranged from infants to high schoolers.

As with adults, cross-sectional studies link sleep and broad social relationships in childhood and adolescence. In terms of the quantity of social relationships, our search returned one study of 2550 adolescents looking at sleep and social networks in high schools [28]. Boys who were more isolated and had fewer social network ties reported more insomnia symptoms. Among girls, being more popular (nominated as a friend by more peers) was actually associated with shorter sleep duration and greater sleep insufficiency. We also retrieved articles on sleep and loneliness that align with findings in adulthood. A longitudinal study tracked 209 children from ages 8 to 11 and found that children who were lonelier across that period reported having more trouble sleeping, taking longer to fall asleep, and waking up more throughout the night compared to children who were less lonely. Another study of 78 adolescents found that loneliness moderated the association between stress and sleep, such that lonelier teens had shorter sleep durations and shorter sleep latencies after more stressful days [29].

In terms of relationship quality, cross-sectional studies show that the quality of peer relations as reported by parents, children, and teachers are linked to self-reported [30] and actigraphically-measured sleep [31]. However, in one of the only studies on infants, reports from 1351 mothers showed that their perceptions of their infant's mood, but not their perceptions of their infant's social relationships, were correlated with multiple aspects of mother-reported infant sleep [32]. In terms of the directionality of these effects, in one study of 974 young adolescents, social relationships with both peers and parents predicted changes in self-reported sleep duration and disruption from ages 12 to 15 [33]. These social factors were better predictors of sleep than other factors such as depression and BMI. Another longitudinal study of 3379 3- to 15-year-olds found that greater psychosocial well-being (including family life and relations to peers) was correlated with longer sleep duration and fewer sleep disturbances for both preschoolers and adolescents [34]. In addition, increases in psychosocial well-being across four years predicted longer sleep duration and fewer sleep disturbances, but there was only weak evidence that baseline psychosocial well-being predicted sleep four years later. Some researchers have also looked at the reverse direction; in a sample of 72 young children, greater sleep consolidation (more sleep during the night) at 1 year predicted fewer peer problems (as rated by parents) and better friendship quality (as rated by the child) in elementary school [35]. In a laboratory interaction, sixteen adolescents displayed greater negative affect and greater reactivity to negative interactions with a friend when sleep-deprived (4 h sleep) compared to when well-rested (10 h sleep), providing some of the only causal evidence for the effects of sleep deprivation on the quality of social relationships with close others [36].

Paralleling the findings with older adults, sleep and social support also appear to work together to predict health outcomes in adolescence. In a study of 87 late adolescents, experiencing both interpersonal stress and poor sleep was particularly problematic for inflammation [37]. As with adulthood, the work on childhood/

adolescence sleep and broad social ties has been largely correlational, tends to utilize self-reports and is focused more on the quality of relationships, rather than quantity. Longitudinal studies provide evidence that sleep and peer relationships may influence each other over time. However, it is hard to draw strong conclusions about bidirectionality since studies tend to focus on one direction or the other. Overall, there is a dearth of work on the associations between sleep and broad social relationships in childhood and adolescence. In contrast, there is more evidence, with more consistent findings, when looking directly at relationships between children and their parents (a topic we turn to in Section 4).

Section 3: romantic relationships

Fifty-two relevant empirical articles were found that investigate how sleep is linked to romantic relationship functioning. Of these, 22 were cross-sectional, 27 were longitudinal (12 of which were daily diary studies), two were laboratory studies, one included daily diary and laboratory methods, and there was one quasi-experimental study. Publication years were 1993−2020. Sample sizes were between 28 and 37,253 individuals and between 29 and 405 couples when employing dyadic designs. Samples were diverse, from dating college undergraduates to married and cohabiting couples, including newlyweds military couples, and couples over 60, to bereaved seniors.

The general pattern suggests greater romantic relationship quality goes hand in hand with better sleep. Simply being unmarried was a risk factor for poorer sleep in one large-scale cross-sectional study of 4868 adults [38]. In an actigraphy-based study of 727 older adults, the positive association between marital status and sleep quality held while controlling for physical health, psychological well-being, and household environment [39]. Additionally, romantic relationships seem to be uniquely associated with sleep. Although the quality of both romantic relationships and friendships were some of the strongest correlates of sleep quality among a sample of 380 monozygotic twins, only romantic relationship satisfaction predicted differences in sleep quality within female twin pairs [40]. Among undergraduates, subjective reports of "being in love" as well as the length of the love relationship have been linked to better self-reported sleep quality, fewer nighttime awakenings, and shorter sleep latency [41,42]. Moreover, sleep and romantic relationship quality appear to be linked over time. In one study of 2446 older adults, social support from romantic partners predicted better subjective sleep quality over 15 years beyond the positive effects of social support acquired from close others generally [18]. Results further indicated that positive and negative support were uniquely associated with self-reported sleep quality. Another longitudinal study spanning 8 years and comprised of 4981 participants found that higher self-reported sleep quality was positively correlated with marital support and negatively correlated with marital strain within and across study waves [43].

Research linking sleep to relationship quality has primarily utilized self-reported sleep quality. However, dyadic daily diary studies are becoming more popular and often measure sleep both subjectively and using actigraphy watches. In a sample of 698 cohabiting mid-life and older adults, greater perceived partner responsiveness (i.e., feeling cared for, understood and validated by a partner), was related to fewer self-reported sleep problems but unrelated to actigraphically-measured sleep efficiency or duration [44]. In a study of 46 couples over 56 days, subjective sleep quality and actigraphically-measured sleep efficiency and duration were greater when wives self-disclosed to husbands more than their typical amount [45]. However, greater mean levels of self-disclosure across the diary period was associated with lower partner actigraphically-measured sleep efficiency and was unrelated to partners' subjective sleep quality. Another study found a similar effect: In a sample of 159 military veterans and their spouses tracked over 32 days, when veterans reported receiving greater capitalization support, they reported fewer sleep difficulties, but their spouses reported lower sleep quality [46]. Taken together, these findings suggest that support provision may have costs for one's own sleep. More broadly, they suggest not all positive aspects of relationships are beneficial for each partner's sleep. The association between sleep and dyadic relationship functioning is complex and more work is needed to gain a comprehensive understanding of how seemingly positive relationship behaviors (e.g. more self-disclosure, greater support provision, etc.) may differently impact the sleep of each member of the couple.

When studying sleep in the context of romantic relationships, researchers often consider gender differences. A diary study of 191 older heterosexual couples found between-person effects for both husbands and wives revealing that higher mean levels of feeling well-rested across the entire diary period were associated with greater relationship satisfaction. However, following nights of longer sleep duration or better sleep quality, only wives reported an increased number of positive marital interactions, fewer negative interactions, and higher relationship satisfaction [47]. Conversely, in a separate daily diary study of 68 heterosexual newlyweds, for husbands, but not wives, better self-reported sleep the previous night buffered the extent to which negative evaluations of partner interactions were linked to lower levels of daily relationship satisfaction [48]. There is also evidence to suggest gender differences in the reverse direction. In a daily diary study of 29 couples, when females reported more positive and less negative daytime partner interactions their male partners experienced better sleep efficiency that night [49]. Finally, in a quasi-experimental study of 108 couples, those who completed 12 weeks of marital therapy were compared to a control group of couples who received no therapy to investigate the effect of improving marital quality on insomnia symptoms [50]. The study found that improvements in husband's marital satisfaction were associated with decreased odds of reporting insomnia symptoms at the end of treatment; however, this pattern of results did not hold for wives. In sum, many studies have looked at gender differences when investigating specific features of relationship functioning with some evidence to suggest stronger effects among females, but overall a clear pattern has not yet emerged.

Several studies document a robust link between poor sleep and dating aggression, relationship conflict/abuse, and relationship dissolution. Several cross-sectional and longitudinal studies link self-reported marital conflict to multiple parameters of actigraphy-based sleep, including longer sleep latencies and greater sleep fragmentation [51,52]. Poorer sleep has been posited as a causal factor contributing to conflict, although no experimental studies have tested this effect. Poorer empathic accuracy, more negative mood, and less positive affect have all been noted as possible mechanisms. In a laboratory study of 71 couples, self-reports of prior night sleep predicted the nature and resolution of conflict, and conflict conversations tended to be worse (i.e., lower positive to negative affect ratio, less empathic accuracy) if *either* partner had slept poorly [53]. Similarly, in a study of military veterans and their partners, couples underwent 2 nights of PSG recording and then engaged in a laboratory conflict conversation. Observer-coded actor hostility was associated with poorer PSG measured sleep efficiency [54]. These studies underscore how poor sleep may cause more and worse conflict either because of greater negative mood or an inability to accurately detect how one's partner is feeling. There is also evidence for bidirectional links between poor sleep and both experiencing and perpetrating physical and psychological abuse (i.e., extreme forms of conflict). In a longitudinal study of 183

couples, individuals who reported stable or increasing levels of psychological abuse from their partner had poorer global sleep quality [55]. In reverse, those who reported more sleep difficulties initially were more likely to report engaging in increasing levels of psychological abuse over time. These effects were exacerbated in violent households. Cross-sectionally, in a sample of 34,975 adults, those with a history of intimate partner violence reported experiencing more sleep disturbances, which helped explain why they had worse mental and physical health [56].

The dissolution of romantic relationships, such as a break-up or death of a partner, has also been linked to greater instances of sleep disturbances [57]. In a 2-year longitudinal study of 296 adults over age 50, bereaved spouses reported more difficulty sleeping than the non-bereaved [58]. In a separate study utilizing PSG, those experiencing high levels of grief slept significantly less [59]. However, in a study of 27 bereaved spouses specifically recruited for the absence of clinical major depression, and age matched to a non-bereaved control group, no differences were found for subjective sleep quality or PSG-measured sleep efficiency [60].

In sum, the literature regarding sleep and romantic relationship quality is growing. Strengths of the literature include its attention to dyadic associations and a high number of daily diary and longitudinal studies. An individual's sleep appears to be clearly associated with both their own and their partner's behavior. Many studies have looked at gender differences, but a consistent pattern has not yet emerged. Paralleling the broad social relationships findings, sleep is uniquely associated with both positive and negative aspects of relationships.

Section 4: family social ties

We found 72 relevant empirical articles that investigated how sleep is associated with familial relationship quality. Of these 22 were cross-sectional, 48 were longitudinal (13 of which were daily diary studies), one was an observational lab study, and one was experimental. Articles were published between the years of 2001 and 2020 with sample sizes ranging between 31 and 23,088 individuals and between 8 and 658 when investigating family units. Samples were diverse, including postpartum parents, families with multiple children ranging in age from infancy to teens, and family relationships in older adult life.

From the moment a child is born, and arguably even sooner during pregnancy [61], parents' sleep is drastically altered, potentially impacting the development and maintenance of numerous social bonds. In both cross-sectional and daily diary studies of new parents, researchers have found that better sleep (measured both with self-report and actigraphy) is associated with greater marital satisfaction [62,63].

The link between sleep and relationship quality of romantic partners during the transition to parenthood is important to consider because it may influence the sleep and social bonds of other household members. For example, several studies suggest that parents' relationship quality may impact their children's sleep. In one study of 54 families, parent and child reports of marital conflict were independently associated with greater children's actigraphy-based sleep fragmentation and daytime sleepiness [64]. These effects appear to be exacerbated within lower SES families [65]. Longitudinally, greater parent-reported marital aggression/ conflict at Time 1 predicted increases in children's self-reported emotional insecurity at Time 2 in a sample of 176 families. Time 2 emotional insecurity was related to children's self-reported sleep problems at Time 3, but was unrelated to children's actigraphically-measured sleep efficiency or duration [66]. Children's sleep can also be influenced by sibling conflict. In a longitudinal study of 582 twins, parent-reported sibling conflict was associated with declines

in twins' sleep duration. Moreover, children with higher levels of sibling conflict and those with unmarried parents experienced more total sleep problems over time [67]. Taken together, the research suggests a fairly robust link between family conflict and poorer subjective and actigraphically-measured child sleep quality, and these effects have been observed from infancy through young adulthood.

Parental engagement also shapes children's sleep. In a study of 70 families, a mother's responsiveness during interactions with her toddler predicted the child's ability to sleep longer at night and have more positive developmental outcomes at age 4 [68]. This is in line with numerous other studies that suggest a warm and attentive parenting style, as compared to a domineering or abusive approach, is beneficial for sleep quality, particularly for younger children [69,70].

Obtaining good quality sleep also appears to help children develop higher social competence and benefits their family relationships. In a study of 207 dyads, behaviorally-coded social competence was observed during laboratory caregiver–child interactions when children were 18, 30, and 42 months old. Having a bedtime before 10:00 pm, and sleeping for more than 10 hrs at night were both positively related to children's social competence during these interactions [71].

As children enter adolescence and early adulthood, familial relationships are still associated with sleep. In a cross-sectional study of 3177 7th to 12th graders, adolescents who obtained adequate amounts of sleep had higher levels of perceived closeness to their mothers, fathers, and viewed their family as more connected compared to short sleepers [72]. Moreover, in a longitudinal study of 387 adults greater family affiliation was associated with less loneliness, which in turn was related to better sleep quality and fewer insomnia symptoms [73]. Considering the effects of negative familial relationships, a study of 9396 young adults found that sexual minorities had more sleep problems than heterosexuals due to more distant relationships with their parents and the stress of these strained relationships [74]. Another study found that strained relationships with parents can have effects well into older adulthood. In a longitudinal study of 877 adults over 60-years-old, parental emotional abuse during childhood was associated with greater sleep complaints. Additionally, current parental relationship strain and the accompanying emotional distress mediated this effect [75].

Parental sleep also appears to play a role in the parent–child relationship: In one study of 67 mother-infant dyads, mothers with more disrupted sleep (as measured by actigraphy) were observed as less sensitive to their 18-week-old infants during a laboratory interaction [76]. In the other direction, parental sleep may be affected by providing support for and having stress or worries about children [77]. Results from 186 couples indicated that fathers slept worse when they reported providing support (e.g. emotional and financial support) to adult children but slept better if their wives provided support to the children. Wives' sleep was only poorer when they reported stress about providing support for adult children.

The literature provides consistent evidence that familial relationships are linked to sleep. There is evidence for associations with both parental and child sleep, though the focus has been child sleep. The research in this area has primarily focused on mother-child dyads, with few studies investigating father and sibling relationships. Several daily experience and large-scale longitudinal studies suggest a bidirectional relationship between parent–child relationships and both subjective and actigraphically-measured sleep. The only experimental study we found assigned infants to wear disposable versus cloth diapers [78]. Infants in disposable diapers, compared to those in cloth diapers, experienced fewer

sleep disruptions and both infants and mothers were more engaged during a parent-child interaction. However, sleep disruptions were not directly tested as a mediator of these effects.

For both romantic and familial relationships, the link between attachment style and sleep is well studied. We do not summarize it here given that a systematic review was conducted by Adams and colleagues in 2014. The review and meta-analysis show that attachment security is linked to better sleep across the lifespan [79].

Section 5: work relationships

We found 24 relevant empirical articles investigating how sleep is associated with work relationships. These articles included 11 studies that were cross-sectional, 13 that were longitudinal (8 of which were daily diary studies), and 3 that were experimental. Articles were published between the years of 2009–2020 with sample sizes ranging between 16 and 7694 participants. A diversity of samples was investigated including military personnel, teachers, technology firm employees, convenience and snowball samples, and nationally representative samples.

Some of this research has focused on relationships with co-workers in general, most of which are at the peer level. A large nationally representative study of 4827 working adults found that sleep disturbances predicted later (low) social support [80]. Similarly, a daily diary study found that sleep quantity predicted helping behavior directed toward peers [81]. A related body of work depicts the causal arrow pointing the other direction. Several studies have found that social stressors and social exclusion at work are associated with subsequent sleep fragmentation [82–84]. Moreover, a study of 48 teachers found that being socially excluded is associated with increased sleep quality during vacation compared to sleep quality during work, which suggests that social exclusion at work undermines sleep quality across contexts. Another study of 474 employees also found that ostracism was negatively associated with sleep quality [85]. Finally, a study of 7694 working professionals found the experience of workplace bullying is associated with sleep disturbances [86].

Another branch of the literature focuses on how sleep influences the relationships between leaders and subordinates. In a study of 89 leaders, leaders were more likely to engage in abusive supervisor behavior toward subordinates if they had experienced worse sleep quality the prior night [87]. In turn, their subordinates reported lower work engagement. Similarly, sleep-deprived leaders express more hostility toward their subordinates which then lead subordinates to perceive poorer relationship quality with their leader [88]. The same study indicates that subordinates do the same; subordinates who are more sleep-deprived express greater hostility towards their leaders, who then perceive their relationships as poorer quality with that given subordinate. Neither leaders nor subordinates appear to be aware of the harmful effects of their own sleep deprivation on their work relationship.

Relationships between leaders and subordinates can also influence sleep. One study of 222 working adults found that the experience of abusive supervision was associated with sleep deprivation [89]. Similarly, one multi-study paper sampling from a variety of occupations and industries found that when leaders role model sleep deprivation and punish subordinates for not prioritizing work over sleep, their subordinates tend to sleep less and engage in higher levels of unethical behavior [90]. Sleep also influences leadership style. In a sleep deprivation experiment involving 16 military Naval officers sleep deprivation resulted in leaders engaging in less transformational and transactional leadership, and more passive-avoidant leadership [91].

However, leaders can also be helpful to the sleep of their subordinates. A set of studies involving Army soldiers found that leaders who make efforts to improve the sleep of their subordinates tend to have subordinates who sleep more [92]. Social support provided by supervisors to subordinates is associated with less difficulty initiating sleep and less disturbed sleep [93]. Similarly, an actigraphy-based study of 595 employees showed that an intervention to improve family-supportive supervisory behavior of leaders (e.g., giving workers more flexibility with their time) led to better sleep outcomes for subordinates [94].

Finally, sleep and leadership can have interactive effects. A daily diary study of 164 business school alumni found that subordinates with poor sleep quality had a weaker relationship between the empowering leadership of their leader and their own daily proactive goals the next day [95]. Thus, a good night of sleep enhances the benefits of empowering leadership. Relatedly, in a study of 78 Naval cadets, transformational leadership moderated the effect of sleep quality on performance [96]. Specifically, high levels of transformational leadership mitigated the harmful effects of low sleep quality on performance, indicating that some leadership approaches can potentially offset the harmful effects of poor sleep quality for followers.

Both field and lab studies provide consistent evidence that sleep is linked to work relationships. This work has focused on both peer relationships and supervisor–subordinate relationships. Stressful work relationships appear to be associated with greater sleep difficulties, and sleep deprivation undermines relationship quality at work. However, in some contexts, work relationships (such as leader–subordinate relationships) can have beneficial effects on sleep. Research on work relationships has rarely utilized experimental methods. Increasing the prevalence of true experiments would strengthen this literature.

Limitations and future directions

The studies we reviewed were varied in their methods and populations, but some key themes emerged from the review: First, although we found research on broad social relationships, most research focused on specific relationships (romantic, family, and work relationships). These studies tended to have more repeated measures and dyadic components relative to the research on broader social relationships. However, across all topics we reviewed, the research was overwhelmingly cross-sectional and self-report. This contrasts with the strong experimental work linking sleep to other types of functioning (e.g., cognitive, affective). Research manipulating sleep and social relationship processes is needed before we can draw causal conclusions about their bidirectional nature.

Another limitation is the measurement of social relationships. Building on the handful of studies that have observed interactions between romantic partners, peers, and parents with their children, research is needed that moves beyond people's self-reported perceptions of their relationships. Studies of sleep and social relationships that capture behavior and physiological responses during both positive and negative social interactions will greatly strengthen this literature.

Several studies indicated psychological distress (depression, anxiety, negative affect) as one possible mechanism linking sleep and social relationships. Other work on sleep and social processes more generally has identified other potential mechanisms, such as self-regulation [4], motivation [97], and social perception [98]. However, studies of mechanisms have been limited. More research is needed to delineate mechanisms, including cognitive and physiological ones. We need research that takes a systematic view and identifies whether there are robust mechanisms that emerge

regardless of how sleep and social relationships are measured, as well as identifying the specific mechanisms that emerge in more nuanced situations (e.g., specifically linking social conflict to sleep onset latency). Research on mechanisms must also consider whether the same pathways work in both directions (sleep to social relationships and social relationships to sleep). There is also almost no work exploring potential moderators of these links. Are certain people robust to the negative effects of poorer sleep? Or particularly susceptible to them? One study found trait cynical hostility exacerbated the effects of interpersonal conflict on sleep [22]. Some others have looked at attachment style [79], another potential moderator is type of sleep. Our literature search retrieved studies that measured typical sleep and compared better and worse sleepers as well as research that measured nightly sleep and looked at acute changes in sleep from one day to the next. The links between sleep and social relationships may differ depending on whether one is considering acute or chronic sleep problems. Thus, more research of this nature is needed to determine how, and for whom, sleep and social relationships are most strongly linked.

A few studies of both adults and children indicate that sleep and social support are protective factors for downstream health consequences. Health risks appear to be especially enhanced when older adults and adolescence have both poor sleep and poor relationship quality. This is a promising area of research that needs more attention.

This review brought to light a few areas of research ripe for exploration. The studies we found focused on the links between sleep and processes in ongoing relationships; there was very little work on how sleep is related to the initiation or dissolution of relationships. To fully understand the links between sleep and social relationships, researchers need to take a lifespan perspective and study relationships from beginning to end. We did find a handful of studies on sleep disturbances following breakups and bereavement, but work on sleep and motivation suggests that sleep may also play a role in the formation of new relationships. Does sleep affect the likelihood of initiating new relationships? For example, are people less likely to seek out new relationships when they are tired? In the other direction, how is sleep affected by the beginning of a new relationship? There are a handful of studies among adolescents and young adults suggesting early love can affect sleep [41,42], but we found very little work on this topic.

Related to the work on sleep and motivation, we believe it is an important and open question whether sleep's influence on social processes is mainly due to changes in motivation versus ability. Researchers have shown that monetary incentives can reduce the effects of sleep deprivation on some brain activities, but not necessarily tasks that require high-level cognitive–control processes [99]. Are people experiencing more conflict in their relationships and engaging in more abusive behavior at work because of impairments in executive functioning that render them unable to regulate their emotions or are they still able to regulate when properly motivated? This is a key area of inquiry that will guide intervention research.

Technology-mediated social interactions are another topic in need of research. Social interactions are increasingly taking place via technology and this mode of communication may have direct impacts on sleep, given evidence linking screen use to sleep quality [100]. Research also shows that people interact differently online than they do in-person [101]. For example, people are more willing to insult each other online than in person [102]. On the other hand, social media and online relationships may act as an avenue to

alleviate loneliness for isolated individuals. Thus, technology-mediated social interactions may be uniquely related to sleep, both in terms of the ways that sleep influence relationships and the effects of relationships on sleep. This area of research also opens other questions, such as whether people's prior sleep and current fatigue influence their preferences to interact with others via technology versus in-person.

Our initial search revealed a handful of articles on topics outside the scope of our review. We found research on sleep-timing, showing that shift workers tend to have more difficulty with social relationships [103] and couples with mismatched chronotypes report more relationship difficulties [104]. Co-sleeping and synchrony of sleep in couples and families was another research topic that appeared in our initial search [105]. We also captured articles showing that close interpersonal relationships are one of the most common features of dreams [106]. Considering these topics in future empirical work and reviews on sleep and social relationships will be important. We also focused on healthy populations, excluding research on disordered sleep and sleep in the context of other disorders and chronic conditions. Thus, this review is specific to typical sleep in healthy populations and the extent to which these findings generalize to disordered sleep is an important question for future research.

There is, of course, the possibility that the set of findings we review represent a positive publication bias, with significant findings more likely to be published. This may be particularly true given that this is a relatively new area of research that is still being established (the oldest relevant article we found was from 1996). However, we do note that studies often looked at multiple dimensions of sleep (e.g., duration, fragmentation, sleep onset latency) and some studies assessed sleep in different ways (e.g., polysomnography, actigraphy, self-report). Because of this, researchers often found effects for some dimensions of sleep but not others, creating a literature that does contain null findings. Nonetheless, this possibility of publication bias makes it even more critical to review the literature in order to identify which effects are consistent across studies and which are not.

As a final note for directions for future research, our review highlights how there can be opportunities for extending knowledge across disciplines. For example, some of the leadership research from the literature on sleep and work likely suggests analogous effects in other non-work relationships. As noted above, workplace leaders can devalue sleep, undermining the sleep of subordinates. Similarly, it may be that a romantic partner or a friend devalues sleep in a similar manner, yielding similarly harmful effects. In the other direction, the social psychological findings linking sleep to the frequency, nature, and resolution of conflict could have analogous effects in work relationships, beyond just the expression of hostility already indicated in that literature.

Conclusion

In all, nearly two hundred studies have examined associations between sleep and social relationships. These studies utilize a variety of methods and measures and employ large samples from across the globe to provide evidence that sleep is correlated with both the quantity and quality of social relationships. High quality, mutually supportive relationships are associated with better sleep both in the moment and over time, whereas low quality, distressing relationships, social isolation, and loneliness are associated with poorer sleep. We need more studies with experimental and mechanistic methods to move this field forward.

Practice points

1. Both the quality and quantity of social relationships are associated with sleep.
2. Positive (e.g., social support, intimacy) and negative (e.g., conflict, abuse) aspects of relationships are uniquely associated with sleep.
3. Results are not always consistent in terms of the type of sleep associated with social relationships.
4. Most work on sleep and social relationships has focused on romantic, family (particularly parent-child) and work relationships.
5. People are affected by the sleep of their close others (romantic partner, parent, child, boss).

Research agenda

1. Conduct more experimental work to elucidate causal links between sleep and social relationships and confirm the bidirectional nature of these associations.
2. Identify mechanistic pathways through which sleep and social relationships consistently influence each other.
3. Identify contextual and individual difference moderators.
4. Conduct more research utilizing behavioral and psycho-physiological methods to assess social relationship processes.
5. Systematically measure and compare different dimensions of sleep within and across studies.

Conflicts of interest

The authors do not have any conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.smrv.2021.101428.

References

[1] Nieminen T, Prättälä R, Martelin T, Härkänen T, Hyyppä MT, Alanen E, et al. Social capital, health behaviours and health: a population-based associational study. BMC Publ Health 2013 Jun 27;13:613.

[2] Jin Y, Ding Z, Fei Y, Jin W, Liu H, Chen Z, et al. Social relationships play a role in sleep status in Chinese undergraduate students. Psychiatr Res 2014 Dec 15;220(1–2):631–8.

[3] Nordin M, Knutsson A, Sundbom E, Stegmayr B. Psychosocial factors, gender, and sleep. J Occup Health Psychol 2005;10(1):54–63.

*[4] Tavernier R, Willoughby T. A longitudinal examination of the bidirectional association between sleep problems and social ties at university: the mediating role of emotion regulation. J Youth Adolesc 2015 Feb;44(2):317–30.

[5] Cheng GH-L, Malhotra R, Østbye T, Lo JC, Østbye T, Lo JC. Weak social networks and restless sleep interrelate through depressed mood among elderly. Qual Life Res 2018 Jun 4;27(10):2517–24.

[6] Chen J-H, Lauderdale DS, Waite LJ. Social participation and older adults' sleep. Soc Sci Med 2016 Jan 1;149:164–73.

[7] Kurina LM, Knutson KL, Hawkley LC, Cacioppo JT, Lauderdale DS, Ober C. Loneliness is associated with sleep fragmentation in a communal society. Sleep 2011;34(11):1519–26.

[8] Hawkley LC, Preacher KJ, Cacioppo JT. Loneliness impairs daytime functioning but not sleep duration. Health Psychol 2010;29(2):124.

[9] Jacobs JM, Cohen A, Hammerman-Rozenberg R, Stessman J. Global sleep satisfaction of older people: the jerusalem cohort study. J Am Geriatr Soc 2006;54(2):325–9.

*[10] Simon EB, Walker MP. Sleep loss causes social withdrawal and loneliness. Nat Commun 2018;9(1):3146.

[11] Sladek MR, Doane LD. Daily diary reports of social connection, objective sleep, and the cortisol awakening response during adolescents' first year of college. J Youth Adolesc 2015 Feb;44(2):298–316.

[12] Aanes MM, Hetland J, Pallesen S, Mittelmark MB. Does loneliness mediate the stress-sleep quality relation? The Hordaland Health Study. Int Psychogeriatr 2011 Aug;23(6):994–1002.

[13] Steptoe A, O'Donnell K, Wardle J. Positive affect, psychological well-being, and good sleep. J Psychosom Res 2008 Apr;64(4):409–15.

[14] Cho JH-J, Olmstead R, Choi H, Carrillo C, Seeman TE, Irwin MR. Associations of objective versus subjective social isolation with sleep disturbance, depression, and fatigue in community-dwelling older adults. Aging Ment Health 2019 Sep;23(9):1130–8.

[15] Yu B, Steptoe A, Niu K, Ku P-W, Chen L-J. Prospective associations of social isolation and loneliness with poor sleep quality in older adults. Quality of Life Research: an International Journal of Quality of Life Aspects of Treatment. Care & Rehabilitation 2018 Mar;27(3):683–91.

[16] Kent de Grey RG, Uchino BN, Trettevik R, Cronan S, Hogan JN. Social support and sleep: a meta-analysis. Health Psychol 2018 Aug;37(8):787–98.

*[17] Williams NJ, Grandner MA, Wallace DM, Cuffee Y, Airhihenbuwa C, Okuyemi K, et al. Social and behavioral predictors of insufficient sleep among African Americans and Caucasians. Sleep Med 2016 Feb;18:103–7.

[18] Stafford M, Bendayan R, Tymoszuk U, Tymoszuk U, Kuh D. Social support from the closest person and sleep quality in later life: evidence from a British birth cohort study. J Psychosom Res 2017 Jul;98:1–9.

[19] Gosling JA, Batterham PJ, Glozier N, Christensen H. The influence of job stress, social support and health status on intermittent and chronic sleep disturbance: an 8-year longitudinal analysis. Sleep Med 2014 Aug 1;15(8):979–85.

[20] Mesas AE, Peppard PE, Hale L, Friedman EM, Nieto FJ, Hagen EW. Individuals' perceptions of social support from family and friends are associated with lower risk of sleep complaints and short sleep duration. Sleep Health 2020 Feb;6(1):110–6.

[21] Friedman EM, Hayney MS, Love GD, Urry HL, Rosenkranz MA, Davidson RJ, et al. Social relationships, sleep quality, and interleukin-6 in aging women. Proc Natl Acad Sci USA 2005 Dec 20;102(51):18757–62.

[22] Brissette I, Cohen S. The contribution of individual differences in hostility to the associations between daily interpersonal conflict, affect, and sleep. Pers Soc Psychol Bull 2002 Sep 1;28(9):1265–74.

[23] Birditt KS, Sherman CW, Polenick CA, Becker L, Webster NJ, Ajrouch KJ, et al. So close and yet so irritating: negative relations and implications for well-being by age and closeness. J Gerontol: Series B 2020;75(2):327–37.

[24] Cheng GH-L, Chan A, Lo JC. Importance of social relationships in the association between sleep duration and cognitive function: data from community-dwelling older Singaporeans. Int Psychogeriatr 2018 Jun;30(6):893–901.

[25] Cho HJ, Seeman TE, Lauderdale DS, Irwin MR. Sleep disturbance and longitudinal risk of inflammation: moderating influences of social integration and social isolation in the Coronary Artery Risk Development in Young Adults (CARDIA) study. Brain Behav Immun 2015 May;46:319–26.

[26] Friedman EM. Sleep quality, social well-being, gender, and inflammation: an integrative analysis in a national sample. Ann N Y Acad Sci 2011 Aug;1231:23–34.

[27] Chung J. Social support, social strain, sleep quality, and actigraphic sleep characteristics: evidence from a national survey of US adults. Sleep Health 2017 Feb;3(1):22–7.

[28] Li X, Kawachi I, Haneuse S, Onnela J-P. Social network analysis of group position, popularity, and sleep behaviors among U.S. adolescents. Soc Sci Med 2019 Jul;232:417–26.

[29] Doane LD, Thurston EC. Associations among sleep, daily experiences, and loneliness in adolescence: evidence of moderating and bidirectional pathways. J Adolesc 2014 Feb 1;37(2):145–54.

[30] Liu X, Sun Z, Uchiyama M, Shibui K, Kim K, Okawa M. Prevalence and correlates of sleep problems in Chinese schoolchildren. Sleep 2000 Dec 1;23(8):1–10.

*[31] Vaughn BE, Elmore-Staton L, Shin N, El-Sheikh M. Sleep as a support for social competence, peer relations, and cognitive functioning in preschool children. Behav Sleep Med 2015 Mar;13(2):92–106.

[32] Mindell JA, Lee C. Sleep, mood, and development in infants. Infant Behav Dev 2015 Nov;41:102–7.

[33] Maume DJ. Social ties and adolescent sleep disruption. J Health Soc Behav 2013 Dec;54(4):498–515.

[34] Thumann BF, Börnhorst C, Michels N, Veidebaum T, Solea A, Reisch L, et al. Cross-sectional and longitudinal associations between psychosocial well-being and sleep in European children and adolescents. J Sleep Res 2019 Apr;28(2):e12783.

[35] Larose-Grégoire É, Bernier A, Dirks M, Perrier R. Associations between sleep consolidation in infancy and peer relationships in middle childhood. Soc Dev 2018 May;27(2):308–21.

---

* The most important references are denoted by an asterisk.

[36] McMakin DL, Dahl RE, Buysse DJ, Cousins JC, Forbes EE, Silk JS, et al. The impact of experimental sleep restriction on affective functioning in social and nonsocial contexts among adolescents. JCPP (J Child Psychol Psychiatry) 2016 Sep;57(9):1027–37.

[37] Chiang JJ, Cole SW, Irwin MR, Taylor SE, Arevalo J, Fuligni AJ, et al. Daily interpersonal stress, sleep duration, and gene regulation during late adolescence. Psychoneuroendocrinology 2019 May;103:147–55.

[38] Doi Y, Minowa M, Tango T. Impact and correlates of poor sleep quality in Japanese White-collar employees. Sleep. J. Sleep and Sleep Disorders Res. 2003 Jun;26(4):467–71.

[39] Chen J-H, Waite LJ, Lauderdale DS. Marriage, relationship quality, and sleep among U.S. Older adults. J Health Soc Behav 2015 Sep 1;56(3):356–77.

[40] Barclay NL, Eley TC, Buysse DJ, Maughan B, Gregory AM. Nonshared environmental influences on sleep quality: a study of monozygotic twin differences. Behav Genet 2012 Mar;42(2):234–44.

[41] Bajoghli H, Keshavarzi Z, Mohammadi M-R, Schmidt NB, Norton PJ, Holsboer-Trachsler E. "I love you more than I can stand!"—romantic love, symptoms of depression and anxiety, and sleep complaints are related among young adults. Int J Psychiatr Clin Pract 2014 Aug;18(3):169–74.

[42] Bajoghli H, Joshaghani N, Mohammadi MR, Holsboer-Trachsler E, Brand S. In female adolescents, romantic love is related to hypomanic-like stages and increased physical activity, but not to sleep or depressive symptoms. Int J Psychiatr Clin Pract 2011 Sep;15(3):164–70.

*[43] Lee J, Schiamberg L, Chopik W. Longitudinal associations between marital quality and sleep quality in older adulthood. J Behav Med 2017 Oct;40(5):821–31.

[44] Selcuk E, Stanton SC, Slatcher RB, Ong AD. Perceived partner responsiveness predicts better sleep quality through lower anxiety. Soc. Psychol. Personality Sci. 2017;8(1):83–92.

[45] Kane HS, Slatcher RB, Reynolds BM, Repetti RL, Robles TF. Daily self-disclosure and sleep in couples. Health Psychol 2014 Aug;33(8):813–22.

[46] Arpin SN, Starkey AR, Mohr CD, Greenhalgh AMD, Hammer LB. "A well spent day brings happy sleep": a dyadic study of capitalization support in military-connected couples. J Fam Psychol 2018 Oct;32(7):975–85.

[47] Yorgason JB, Godfrey WB, Call VR, Erickson LD, Gustafson KB, Bond AH. Daily sleep predicting marital interactions as mediated through mood. J Gerontol: Series B 2018;73(3):421–31.

[48] Maranges HM, McNulty JK. The rested relationship: sleep benefits marital evaluations. J Fam Psychol 2017;31(1):117.

[49] Hasler BP, Troxel WM. Couples' nighttime sleep efficiency and concordance: evidence for bidirectional associations with daytime relationship functioning. Psychosom Med 2010 Oct;72(8):794–801.

[50] Troxel WM, Braithwaite SR, Sandberg JG, Holt-Lunstad J. Does improving marital quality improve sleep? Results from a marital therapy trial. Behav Sleep Med 2017;15(4):330–43.

[51] El-Sheikh M, Kelly R, Rauer A. Quick to berate, slow to sleep: interpartner psychological conflict, mental health, and sleep. Health Psychol 2013;32(10):1057–66.

[52] El-Sheikh M, Kelly RJ, Koss KJ, Rauer AJ. Longitudinal relations between constructive and destructive conflict and couples' sleep. J Fam Psychol 2015;29(3):349–59.

*[53] Gordon AM, Chen S. The role of sleep in interpersonal conflict: do sleepless nights mean worse fights? Soc. Psychol. Personality Sci. 2014 Mar;5(2):168–75.

[54] Fillo J, Holliday SB, DeSantis A, Germain A, Buysse DJ, Matthews KA, et al. Observed relationship behaviors and sleep in military veterans and their partners. Ann Behav Med 2017;51(6):879–89.

[55] Rauer AJ, El-Sheikh M. Reciprocal pathways between intimate partner violence and sleep in men and women. J Fam Psychol 2012;26(3):470–7.

[56] Lalley-Chareczko L, Segal A, Perlis ML, Nowakowski S, Tal JZ, Grandner MA. Sleep disturbance partially mediates the relationship between intimate partner violence and physical/mental health in women and men. J Interpers Violence 2017;32(16):2471–95.

[57] Field T, Diego M, Pelaez M, Deeds O, Delgado J. Breakup distress in university students. Adolescence 2009 Jan;44(176):705–27.

[58] Richardson SJ, Lund DA, Caserta MS, Dudley WN, Obray SJ. Sleep patterns in older bereaved spouses. Omega J Death Dying 2003;47(4):361–83.

[59] Monk TH, Germain A, Reynolds CF. Sleep disturbances in bereavement. Psychiatr Ann 2008 Oct;38(10):671–8.

[60] Reynolds CF, Hoch CC, Buysse DJ, Houck PR, Schlernitzauer M, Pasternak RE, et al. Sleep after spousal bereavement: a study of recovery from stress. Biol Psychiatr 1993 Dec;34(11):791–7.

[61] Christian LM, Carroll JE, Teti DM, Hall MH. Maternal sleep in pregnancy and postpartum Part I: mental, physical, and interpersonal consequences. Curr Psychiatr Rep 2019 Mar 1;21(3):20.

[62] Ko S-H, Chen C-H, Wang H-H, Su Y. Postpartum women's sleep quality and its predictors in taiwan. J Nurs Scholarsh 2014;46(2):74–81.

[63] Insana SP, Costello CR, Montgomery-Downs HE. Perception of partner sleep and mood: postpartum couples' relationship satisfaction. J Sex Marital Ther 2011 Oct;37(5):428–40.

[64] El-Sheikh M, Buckhalt JA, Mize J, Acebo C. Marital conflict and disruption of children's sleep. Child Dev 2006 Jan;77(1):31–43.

[65] Bernier A, Bélanger M-È, Bordeleau S, Carrier J. Mothers, fathers, and toddlers: parental psychosocial functioning as a context for young children's sleep. Dev Psychol 2013 Jul;49(7):1375–84.

[66] Kelly RJ, El-Sheikh M. Longitudinal relations between marital aggression and children's sleep: the role of emotional insecurity. J Fam Psychol 2013 Apr;27(2):282–92.

[67] Breitenstein RS, Doane LD, Lemery-Chalfant K. Children's sleep and daytime functioning: increasing heritability and environmental associations with sibling conflict. Soc Dev 2018 Nov;27(4):967–83.

*[68] Bordeleau S, Bernier A, Carrier J. Longitudinal associations between the quality of parent–child interactions and children's sleep at preschool age. J Fam Psychol 2012;26(2):254–62.

[69] Adam EK, Snell EK, Pendry P. Sleep timing and quantity in ecological and family context: a nationally representative time-diary study. J Fam Psychol 2007;21(1):4–19.

[70] Brand S, Hatzinger M, Beck J, Holsboer-Trachsler E. Perceived parenting styles, personality traits and sleep patterns in adolescents. J Adolesc 2009 Oct 1;32(5):1189–207.

[71] Tomisaki E, Tanaka E, Watanabe T, Shinohara R, Hirano M, Onda Y, et al. The relationship between the development of social competence and sleep in infants: a longitudinal study. Child Adolesc Psychiatr Ment Health 2018 Dec 18;12:53.

[72] Mueller CE, Bridges SK, Goddard MS. Sleep and parent-family connectedness: links, relationships and implications for adolescent depression. J Fam Stud 2011 Apr;17(1):9–23.

[73] Wakefield JRH. Link to external site this link will open in a new window, Bowe M, Link to external site this link will open in a new window, Kellezi B, Link to external site this link will open in a new window, et al. Longitudinal associations between family identification, loneliness, depression, and sleep quality. Br J Health Psychol 2020 Feb;25(1):1–16.

[74] Patterson CJ, Potter EC. Sexual orientation and sleep difficulties: a review of research. Sleep Health 2019 Jun 1;5(3):227–35.

[75] Poon CYM, Knight BG. Impact of childhood parental abuse and neglect on sleep problems in old age. J Gerontol B Psychol Sci Soc Sci 2011 May;66(3):307–10.

*[76] King LS, Rangel E, Simpson N, Tikotzky L, Manber R. Mothers' postpartum sleep disturbance is associated with the ability to sustain sensitivity toward infants. Sleep Med 2020 Jan;65:74–83.

[77] Seidel AJ, Yorgason JB, Polenick CA, Fingerman KL. Are you sleeping? Dyadic associations of support, stress, and worries regarding adult children on sleep. Gerontol 2018 Apr;58(2):341–52.

[78] Lukowski AF, Liu X, Peirano P, Odio M, Bauer PJ. Disposable diaper use promotes consolidated nighttime sleep and positive mother-infant interactions in Chinese 6-month-olds. J Fam Psychol 2015 Jun;29(3):371–81.

[79] Adams GC, Stoops MA, Skomro RP. Sleep tight: exploring the relationship between sleep and attachment style across the life span. Sleep Med Rev 2014;18(6):495–507.

[80] Åkerstedt T, Garefelt J, Richter A, Westerlund H, Hanson LLM, Sverke M, et al. Work and sleep—a prospective study of psychosocial work factors, physical work factors, and work scheduling. Sleep. J. Sleep and Sleep Disorders Res. 2015 Jul 1;38(7):1129–36.

[81] Barnes CM, Ghumman S, Scott BA. Sleep and organizational citizenship behavior: the mediating role of job satisfaction. J Occup Health Psychol 2013 Jan;18(1):16–26.

[82] Pereira D, Elfering A. Social stressors at work, sleep quality and psychosomatic health complaints—a longitudinal ambulatory field study. Stress Health: J Int Soc Invest Stress 2014 Feb;30(1):43–52.

[83] Pereira D, Meier LL, Elfering A. Short-term effects of social exclusion at work and worries on sleep. Stress Health: J Int Soc Invest Stress 2013 Aug;29(3):240–52.

[84] Pereira D, Gross S, Elfering A. Social stressors at work, sleep, and recovery. Appl Psychophysiol Biofeedback 2016 Mar;41(1):93–101.

[85] Chen Y, Li S. The relationship between workplace ostracism and sleep quality: a mediated moderation model. Front Psychol 2019;10:319.

[86] Niedhammer I, David S, Degioanni S, Drummond A, Philip P. Workplace bullying and sleep disturbances: findings from a large scale cross-sectional survey in the French working population. Sleep. J. Sleep and Sleep Disorders Res. 2009 Sep;32(9):1211–9.

*[87] Barnes CM, Lucianetti L, Bhave DP, Christian MS. "You wouldn't like me when I'm sleepy": leaders' sleep, daily abusive supervision, and work unit engagement. Australas Mark J 2015 Oct;58(5):1419–37.

*[88] Guarana CL, Barnes CM. Lack of sleep and the development of leader-follower relationships over time. Organ Behav Hum Decis Process 2017 Jul;141:57–73.

[89] Han GH, Harms PD, Bai Y. Nightmare bosses: the impact of abusive supervision on employees' sleep, emotions, and creativity. J Bus Ethics 2017 Sep;145(1):21–31.

[90] Barnes CM, Awtrey E, Lucianetti L, Spreitzer G. Leader sleep devaluation, subordinate sleep, and unethical behavior. Sleep Health 2020;6:411–7.

[91] Olsen OK, Pallesen S, Torsheim T, Espevik R. The effect of sleep deprivation on leadership behaviour in military officers: an experimental study. J Sleep Res 2016 Dec;25(6):683–9.

[92] Gunia BC, Sipos ML, LoPresti M, Adler AB. Sleep leadership in high-risk occupations: an investigation of soldiers on peacekeeping and combat missions. Mil Psychol 2015 Jul;27(4):197–211.

[93] Vleeshouwers J, Knardahl S, Christensen JO. Effects of psychological and social work factors on self-reported sleep disturbance and difficulties initiating sleep. Sleep 2016 Apr 1;39(4):833–46.

[94] Olson R, Crain TL, Bodner TE, King R, Hammer LB, Klein LC, et al. A workplace intervention improves sleep: results from the randomized controlled Work, Family, and Health Study. Sleep Health 2015 Mar;1(1): 55–65.

[95] Schilpzand P, Houston L, Cho J. Not too tired to be proactive: daily empowering leadership spurs next-morning employee proactivity as moderated by nightly sleep quality. Australas Mark J 2018 Dec;61(6):2367–87.

[96] Nordmo M, Olsen OK, Hetland J, Espevik R, Bakker AB, Pallesen S. Daily sleep quality and naval work performance: the role of leadership. Int Marit Health 2019;70(4):202–9.

[97] Axelsson J, Ingre M, Kecklund G, Lekander M, Wright KP, Sundelin T. Sleepiness as motivation: a potential mechanism for how sleep deprivation affects behavior. Sleep 2020 Jun 15;43(6).

[98] Gordon AM, Mendes WB, Prather AA. The social side of sleep: elucidating the links between sleep and social processes. Curr Dir Psychol Sci 2017 Oct;26(5):470–5.

[99] Hsieh S, Li T-H, Tsai L-L. Impact of monetary incentives on cognitive performance and error monitoring following sleep deprivation. Sleep 2010 Apr 1;33(4):499–507.

[100] Guarana CL, Barnes CM, Ong WJ. The effects of blue-light filtration on sleep and work outcomes. J Appl Psychol 2020 Jul 13 [Internet].[cited 2020 Aug 6]; Available from: http://search.proquest.com/psycinfo/docview/2425024050/916516378AF24F78PQ/2.

[101] Kross E, Verduyn P, Demiralp E, Park J, Lee DS, Lin N, et al. Facebook use predicts declines in subjective well-being in young adults. PloS One 2013;8(8):e69841.

[102] Lapidot-Lefler N, Barak A. Effects of anonymity, invisibility, and lack of eye-contact on toxic online disinhibition. Comput Hum Behav 2012;28(2): 434–43.

[103] Hossain JL, Shapiro CM. Considerations and possible consequences of shift work. J Psychosom Res 1999 Oct;47(4):293–6.

[104] Larson JH, Crane DR, Smith CW. Morning and night couples: the effect of wake and sleep patterns on marital adjustment*. J Marital Fam Ther 1991;17(1):53–65.

[105] Richter K, Adam S, Geiss L, Peter L, Niklewski G. Two in a bed: the influence of couple sleeping and chronotypes on relationship and sleep. An overview. Chronobiol Int 2016 Nov 25;33(10):1464–72.

[106] McNamara P, Dietrich-Egensteiner L, Teed B. Dreams and attachment. In: Valli K, Hoss RJ, editors. Dreams: understanding biology, psychology, and culture, vol. 1. Santa Barbara, CA, US): Greenwood Press/ABC-CLIO; 2019. p. 112–6. Chapter xxi, 336 Pages.