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Sleep, emotional supportiveness, and socially straining behavior: A multidimensional approach

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ABSTRACT

Objective: To determine the associations of emotional supportiveness toward others and engagement in socially straining (negative) behavior toward others across close relationships with multiple dimensions of sleep health.

Design: Cross-sectional.

Setting: Community sample from the Midlife in the United States study (MIDUS).

Participants: Four-hundred and thirty-five participants from the MIDUS II Biomarker Project aged 35–85.

Measurements: Self-report assessments of being emotionally supportive and engaging in socially straining behavior toward friends, family, and romantic partners; self-report assessments of demographic and other psychological and health variables; 7 nights of wrist actigraphy and sleep diary.

Results: Being emotionally supportive and engagement in socially straining behavior were associated with multiple dimensions of sleep health. The inclusion of demographic, health, and psychological covariates reduced but did not eliminate these associations. Based on analyses adjusting for these covariates, being more emotionally supportive toward close others was most robustly related to higher daytime alertness, and engaging in more socially straining behavior was most robustly related to less sleep regularity, quality, and efficiency.

Conclusions: These findings implicate sleep health as a substantive correlate of being emotionally supportive toward and imposing social strain on others. They show that both daytime and nighttime dimensions of sleep health are important for social functioning across close relationships and highlight the need to examine both positive and negative aspects of relationships in relation to sleep.

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Sleep may play an important role in the association between relationship quality and health.¹ Social support and conflict processes are critical to individual health and well-being and to the promotion and maintenance of satisfying relationships.² Thus, social support and conflict are two specific relationship processes likely involved in these associations.

Overall, receiving support and perceiving that close others are caring, understanding, and available to provide support is associated with better sleep and better health.^{3–7} However, in order for people to reap the benefits of being supported, close others must first be willing, able, and have the capacity to *be supportive*. Moreover, support providers' *own* supportiveness of close others may shape their perceptions of close others' supportiveness toward them. In a series of studies, participants "projected" their own levels of supportiveness toward their romantic partners onto their judgments of their

partners' supportiveness toward them.⁸ Finally, providing support to others, independent of receiving or perceiving it, also benefits the provider's health^{9,10} and relationship quality.^{2,8,11} To our knowledge, one study has reported the association between emotional support provision and providers' sleep (as a covariate in the primary analyses).⁶ In this study, using Midlife in the United States (MIDUS) data, the amount of emotional support provided was positively related to sleep duration, but not sleep quality or sleep efficiency.⁶ Therefore, there is a need to understand how sleep is related to being emotionally supportive of close others.

As all relationships involve supportive *and* straining interactions, it is also important to examine how negative interactions relate to distinct aspects of sleep. A growing literature links greater socially-straining relationship behavior (i.e., negativity toward and conflict with close others) with poorer sleep.^{4,5,12,13} However, prior research rarely examines multiple close relationships and often does not include both positive and negative relationship interactions together. Accordingly, the primary goal of the present report was to systematically examine the associations between multiple dimensions of sleep

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health and emotional supportiveness toward others (i.e., the provision of social support), as well as engagement in socially straining behavior toward close others across multiple relationships (i.e., friendships, family relationships, and romantic relationships).

Sleep and emotional supportiveness

Being emotionally supportive toward others and sleep are likely related for a number of reasons, with bidirectional causal influences. Being supportive of close others may foster feelings of safety and security that are conducive to restorative sleep by promoting relational well-being and reducing loneliness,^{2,8,11,14} which are associated with better sleep.^{15,16} Similarly, providing emotional support and being there for others may also reduce stress, anxiety, and negative affect that can interfere with sleep among those being supportive.^{10,17} For example, being emotionally supportive toward friends predicted lower daily stress and anxiety and higher positive mood.¹⁴ Supporting others may also buffer the negative effects of stress on sleep. In one study, writing an emotionally supportive note that indicated a high degree of validation and understanding to a friend buffered the effect of a laboratory stress task on sympathetic stress responses that heighten vigilance and arousal.¹⁸ In sum, supporting close others may contribute to better sleep among those in the supporting role by enhancing their sense of security and closeness, reducing negative emotional states that interfere with their sleep, and buffering the negative effects of stress on sleep.

Sleep may also contribute to the ability and motivation to be supportive of close others. High-quality social support is responsive to the needs of the recipient, demonstrates understanding and caring, and does not engender feelings of indebtedness or weakness on part of the recipient.² Thus, the provision of high quality support and creation of a supportive atmosphere requires interpersonal skills and abilities such as empathy and perspective taking,^{2,19} emotion regulation,^{2,20} and cognitive resources for flexible attention to another's needs, the context, and problem solving strategizing.^{2,21} Poor or insufficient sleep may diminish cognitive resources and the capacity to utilize these interpersonal skills and abilities.^{22,23} As a result, the ability to be emotionally supportive may be compromised among those with poor sleep. Moreover, even if support providers have the ability and capacity to provide support, fatigue from poor sleep may impede a support provider's motivation and willingness to be supportive.²⁴

Sleep and socially straining behavior

Social strain, negative relationship behavior and conflict, is also linked with poor sleep.^{4,5,12,13} Perceptions of partners' socially straining behavior (e.g., criticizing or making too many demands) is associated with worse self-reported sleep problems in romantic couples,⁵ and with less sleep efficiency and regularity in family and friend relationships.⁴ However, these studies focused on people's perceptions of friends, family, and romantic partners' socially straining behavior in these relationships, rather than people's own social straining behavior toward close others. Both perceptions of close others' negative behavior and one's own negative behavior contribute to relationship distress and are likely related to poor sleep. For example, one's own transgressions in a relationship may induce specific emotions such as guilt and undermine relationship security and closeness which are related to sleep problems.^{12,25}

Poor sleep itself also predicts greater conflict and aggression. For example, among romantic partners, poor sleep the night before predicts greater likelihood of conflict, more hostility during a conflict, and decreased likelihood of conflict resolution the next day.¹³ Poor sleep quality also predicts greater aggression and hostility toward others.²⁶ During negative social interactions it takes cognitive and emotional

resources to regulate one's behavior and inhibit destructive impulses.²⁷ Thus, similar to social support, sleep-related deficits in emotional regulation and self-control may explain these associations.²⁶

The present study

The present study utilized cross-sectional data from the second wave of the MIDUS study (MIDUS II) Biomarker Project to estimate the associations of social support provision and socially straining behavior with various sleep health dimensions.³ For this report, we construed social support provision in terms of creating an emotionally supportive atmosphere within one's relationships by being caring, understanding, and available to others when needed; we refer to this as "emotional supportiveness." Sleep health is a multidimensional construct involving several different features of sleep.²⁹ As captured by the acronym "RU-SATED,"²⁹ we assessed six dimensions of sleep health including: (1) sleep regularity (consistency in sleep timing), (2) satisfaction with sleep (feeling sleep is good and restorative), (3) being alert while awake (feeling engaged and vigilant), (4) sleep timing (when sleep occurs), (5) sleep efficiency (continuity of sleep throughout the night), and (6) sleep duration (length of typical sleep). Because sleep health is multidimensional, it is important to determine which dimensions are particularly relevant for being emotionally supportive and engaging in socially straining behavior. We hypothesized that being more emotionally supportive will generally be associated with better sleep across dimensions, and that greater use of socially straining behavior will generally be associated with sleeping worse. However, we did not have specific hypotheses about which sleep health dimensions may be most relevant.

Method

Participants

The Biomarker Project included a subset of MIDUS II participants ($N = 1255$; $n = 1054$ from MIDUS I and $n = 201$ participants recruited to increase racial diversity).³⁰ One Biomarker project site collected sleep (actigraphy and sleep diary) data. The analytic sample included participants with actigraphy data, sleep diary data, and self-reports of emotional supportiveness and socially straining behavior ($N = 435$; age $M = 56.93$ years, $SD = 11.50$, Range = 35–85). Sixty percent of the sample identified as female (40% male), and 66% of the sample ($n = 286$) were married or cohabitating with a romantic partner. The sample was primarily White (69%) and Black and/or African American (28%). Seven percent of the sample did not have a degree, 46% had a high school or equivalent degree, 29% had an associates or bachelor's degree, and 17% had a postgraduate degree (~1% was missing).

Procedure and measures

Participants completed questionnaires assessing their emotional supportiveness toward others and socially straining behavior. An average of 5.03 days later ($SD = 3.41$, Range = 1–35), participants completed 7 days of sleep diaries and actigraphy.

Emotional supportiveness and socially straining behavior

Participants completed Support/Strain Given to Friends, Family, and Partner/Spouse scales. The items were reworded from similar scales used in MIDUS I/II to focus on the participants' behavior rather than participants' perceptions of close others' behavior.³¹

^a Prior studies utilizing MIDUS sleep data examined being the target (not the source) of supportive or straining relationship behaviors within specific types of relationships and focused on few dimensions of sleep health.^{4,6,28}

Emotional supportiveness. These scales assessed participants' emotional supportiveness toward close others and the degree to which participants contribute to an emotionally supportive atmosphere within their interpersonal relationships. In regards to *friends*, participants responded to four items ($\alpha = 0.70$) asking how much participants care about their friends, understand their friends' feelings, believe their friends rely on them for help with serious problems, and believe their friends open up to them to talk about their worries. In regards to *family members* (not including one's romantic partner), participants responded to two items ($r = 0.49$) asking how much they believed their family relies on them for help with serious problems and opens up to them to talk about their worries. In regards to *partners*, participants in relationships responded to the same four items as friends but with respect to a romantic partner and to two additional items asking how much participants appreciate their partners and believe their partners can relax and be themselves when together ($\alpha = 0.76$). All responses were made on a four-point scale from 1 (*a lot*) to 4 (*not at all*) and were reverse scored so that higher scores reflect higher emotional supportiveness. An index of overall *emotional supportiveness* was created by averaging the composites for friends, family, and partners together ($\alpha = 0.78$).^b

Socially straining behavior. These scales assessed participants' engagement in socially straining behavior toward close others. In regards to *friends*, participants responded to four items ($\alpha = 0.61$) asking how often participants make too many demands on their friends, criticize their friends, let their friends down, and get on their friends' nerves. In regards to *family members*, participants responded to the same four items as friends but in reference to their family without including romantic partners ($\alpha = 0.67$). In regards to *partners*, participants in relationships responded to the same four items as friends and family but with respect to a romantic partner and to two additional items asking how much participants make their partners feel tense and how often they argue with their partner ($\alpha = 0.76$). All responses were made on a four-point scale from 1 (*a lot*) to 4 (*not at all*), and were reverse scored so that higher scores reflect higher socially straining behavior. An index of overall *socially straining behavior* was created by averaging the composites for friends, family, and partners together ($\alpha = 0.74$).²

Sleep

Participants completed sleep diaries every morning to report bed times, rise times, and subjective sleep quality, and every evening to report sleep-related daytime behavior (e.g., alertness). To collect actigraphy data, participants continuously wore the Mini Mitter Actiwatch-64 on their nondominant wrist which recorded wrist movement in 30-second epochs. Epochs were scored as "wake" if the activity count during the epoch breached a threshold value of 40, and were scored as "sleep" if the activity count was below this threshold. To increase accuracy, bed and rise times from the sleep diaries were used in conjunction with Philips Respironics Actiware 5 software to specify the sleep intervals. Participants, on average, completed 6.86 out of 7 days (range: 3–7 days, 93% completed 7 days) of actigraphy assessments.

Dimensions of sleep health

We estimated six core dimensions of sleep health ("RU-SATED") from actigraphy and sleep diary assessments.²⁹

Regularity. Because wake times are often constrained by work and family obligations and can be restricted in variance,³² sleep regularity was estimated via the standard deviation of sleep onset times across the 7 days. Sleep onset times were transformed by adding 24:00 to

each value as to preserve rank-ordering of times across midnight. Higher standard deviations indicated *less* sleep regularity (greater variability) in times participants went to sleep.

Sleep quality. We measured sleep quality with a composite of four items from the morning diary assessing perceptions of sleep quality the prior night, how deeply participants slept the prior night, and how alert and rested participants felt in the morning. The items were z-scored and reversed coded so that higher scores reflect better sleep quality (daily α 's ranged from 0.85 to 0.92) and averaged across the seven nights ($\alpha = 0.86$).

Alertness. We measured daytime alertness with a single item from the evening diary assessing alertness that day on a scale from 1 (*most alert*) to 5 (*not alert at all*). This item was reverse coded and averaged across the seven days ($\alpha = 0.84$).

Timing. To estimate typical sleep timing, sleep onset times for each night were averaged across the seven days (with higher values representing later sleep time). While timing of sleep can also be indexed using wake-times (or mid-point of sleep), we again focused on sleep-onset times with less range restriction ($\alpha = 0.88$).

Efficiency. Sleep efficiency, the percentage of time asleep relative to total time in bed, was used as a composite metric of sleep continuity because it incorporates both sleep onset latency and waking after sleep onset. Sleep efficiency was assessed with actigraphy data and averaged across the seven nights ($\alpha = 0.91$).

Duration. Sleep duration was measured by the total number of minutes scored as sleep at night via actigraphy and did not include minutes of sleep onset latency or wakefulness after sleep onset. Sleep duration was averaged across the seven nights and rescaled to hours ($\alpha = 0.85$).

Covariates and demographics

Demographics were assessed in both the Biomarker Project and MIDUS II surveys. Psychological health covariates (i.e., depression symptoms and stress) and health conditions were assessed in the Biomarker project.

Demographics. Participants reported their gender (male or female), race/ethnicity, and education (highest degree earned) in the MIDUS II survey. Age was computed using Biomarker Project completion dates and participants' birthdays.

Psychological health covariates. To assess *depression symptoms*, participants completed the 20-item Center for Epidemiological Studies–Depression scale ($\alpha = 0.88$).³³ Participants indicated the degree to which they experienced a variety of depression symptoms in the past week on a scale from 0 (*Rarely or none of the time*) to 3 (*Most or all of the time*). Items were coded so that higher scores reflect greater depression symptoms and summed. To assess *perceived stress*, participants completed the 10-item version of the Perceived Stress Scale ($\alpha = 0.86$).³⁴ Participants indicated the degree to which they felt upset, stressed, and overwhelmed in the last month on a scale from 1 (*Never*) to 5 (*Very often*). Items were coded so that higher scores reflect higher perceived stress and summed.

Number of physical conditions and symptoms. Participants reported if they had ever had any of 23 symptoms and conditions (e.g., cancer, high blood pressure, asthma, diabetes) and reported additional relevant conditions. The total number of reported conditions was utilized to index physical health.

Analytic plan

We first computed bivariate correlations between each sleep health dimension and participants' emotional supportiveness and socially straining behavior. Next, we conducted two covariate analyses using multiple regression to determine the robustness of these associations. In the first analysis, we adjusted for demographic (i.e., age, gender, socioeconomic status, and marital/cohabiting status)

^b Intercorrelations between the emotional supportiveness scales ranged from $r = 0.35$ to $r = 0.40$, and intercorrelations between the socially straining behavior scales ranged from $r = 0.41$ to $r = 0.59$.

Table 1
Descriptive statistics for study variables

| | Mean | Standard deviation |
|---|----------|--------------------|
| Sleep regularity (SD sleep time) | 1.09 h | 1.16 h |
| Sleep quality | -0.01 | 0.66 |
| Daily alertness | 3.97 | 0.74 |
| Sleep timing | 11:31 pm | 1.54 h |
| Sleep efficiency | 79.31% | 10.51 |
| Sleep duration | 6.15 h | 1.13 h |
| Emotional supportiveness (across targets) ^c | 3.73 | 0.32 |
| Socially straining behavior (across targets) ^c | 1.74 | 0.39 |
| Depressive symptoms ^a | 8.88 | 7.97 |
| Perceived stress ^b | 22.64 | 6.38 |
| Physical conditions and symptoms (count) | 4.18 | 2.91 |

SD, standard deviation; h, hours.

Note. *N* = 435.^a *N* = 431.^b *N* = 433.^c This composite only utilizes friends and family reports for the 149 people not in a relationship.

and health variables (i.e., physical conditions and symptoms) which are related to both sleep and relationship factors.^{35–37} In the second analysis, we also included psychological health variables (i.e., depression symptoms and perceived stress) which are related to sleep,¹⁷ the ability to provide support,³⁸ and relationship difficulties.³⁹ We included these psychological variables in a separate covariate analysis to provide the most conservative test of our hypotheses. However, this analysis may be overly conservative, as psychological health factors are likely causal mediators of these associations.⁴⁰ Participants with missing covariate data were not included in these analyses. Finally, we examined the joint associations of all sleep health dimensions on emotional supportiveness and socially straining behavior to identify sleep health dimensions most uniquely relevant to each.

We used G*Power⁴¹ to estimate the smallest correlation the study could detect. With a sample of 435 participants available and alpha set at 0.05, the analyses could detect correlations smaller than 0.10 with power over 90%. We focus our interpretation on the magnitude of effect sizes (especially those larger than 0.10) and patterns of association across analyses, with particular attention on how effect sizes change across covariate analyses.

Results

Descriptive statistics for the sleep health dimensions, emotional supportiveness, and socially straining behavior appear in Table 1. Participants reported high levels of emotional supportiveness toward others, and relatively low levels of socially straining behavior. There was a small correlation between emotional supportiveness and socially straining behavior indicating they are distinct relational processes ($r = -0.24$). Overall, the sample exhibited sleep characteristics typical for people that age.³⁵ A significant portion of the sample (40.5%) had 6 or fewer hours of sleep per night on average. The sleep health dimensions were relatively independent with the exception that the two self-reported variables of daytime alertness and sleep quality were highly correlated (Table 2).

Bivariate correlations

Zero-order correlations between sleep health dimensions, emotional supportiveness, and social straining behavior appear in Table 3. Higher sleep regularity, efficiency, quality, consistency, and alertness were related to more emotional supportiveness and less socially straining behavior. Longer sleep duration was only related to less socially straining behavior. Importantly, the correlations between the

Table 2
Bivariate correlations among sleep health dimensions

| | 1. | 2. | 3. | 4. | 5. | 6. |
|---------------------|----------------------|---------------------|----------------------|----------------------|--------------------|----|
| 1. Sleep regularity | – | | | | | |
| 2. Sleep quality | -0.08 ⁱ | – | | | | |
| 3. Daily alertness | -0.17 ^{***} | 0.72 ^{***} | – | | | |
| 4. Sleep timing | 0.22 ^{***} | -0.13 ^{**} | -0.18 ^{***} | – | | |
| 5. Sleep efficiency | -0.38 ^{***} | 0.13 ^{**} | 0.15 ^{**} | -0.19 ^{***} | – | |
| 6. Sleep duration | -0.37 ^{***} | 0.04 | 0.08 ⁱ | -0.31 ^{***} | .61 ^{***} | – |

Note. *N* = 435.

Values are Pearson's zero-order correlations.

ⁱ $P < .10$.^{*} $P < .05$.^{**} $P < .01$.^{***} $P < .001$.**Table 3**

Associations between sleep health dimensions and emotional supportiveness and socially straining behavior

| | Emotional supportiveness | Socially straining behavior |
|------------------|--------------------------|-----------------------------|
| Sleep regularity | -0.10 [*] | 0.16 ^{**} |
| Sleep quality | 0.15 ^{**} | -0.21 ^{***} |
| Daily alertness | 0.21 ^{***} | -0.20 ^{***} |
| Sleep timing | 0.03 | 0.02 |
| Sleep efficiency | 0.15 ^{**} | -0.21 ^{***} |
| Sleep duration | 0.06 | -0.10 [*] |

Note. *N* = 435.

Values are Pearson's zero-order correlations.

^{*} $P < .05$.^{**} $P < .01$.^{***} $P < .001$.

sleep health dimensions and emotional supportiveness and socially straining behavior within each type of relationship were largely similar to the present results with the exception that sleep duration was negatively correlated with socially straining behavior toward family ($r = -0.19$, $P < .001$), but not toward friends or romantic partners (r 's = -0.08 , 0.03 , respectively) (sTable 1).^c

Covariate analyses

In the first set of covariate analyses, we adjusted for health and demographic variables. In these analyses, sleep quality and alertness still predicted emotional supportiveness (Table 4), and sleep regularity, quality, efficiency, and alertness still predicted socially straining behavior (Table 5). In a second set of covariate analyses, we adjusted for health, demographic, and psychological health variables that may act as confounding variables (requiring statistical adjustment), but also mediators (prohibiting such adjustment). In these analyses, alertness, but not sleep quality, predicted emotional supportiveness (Table 4). Conversely, sleep regularity, quality, and efficiency, but not alertness, predicted socially straining behavior (Table 5). See sTables 4 and 5 for complete models.

Combined associations of sleep health dimensions

To estimate the overall predictive value of sleep health dimensions as well as their unique associations with emotional supportiveness and socially straining behavior, we regressed emotional supportiveness and socially straining behavior (separately) on all dimensions of sleep health simultaneously (Table 6). Sleep dimensions together accounted for 7% of variance in emotional

^c Bivariate correlations stratified by married/cohabitating status and the results of gender moderation analyses are reported in supplementary materials (sTable 2, sTable 3, respectively).

Table 4
Covariate analyses of the associations between each individual sleep health dimension and emotional supportiveness

| Sleep dimension | Emotional supportiveness | | | | | | | |
|-------------------------------|--------------------------|----------|------|---------------|-------------|----------|------|---------------|
| | Covariate 1 | | | | Covariate 2 | | | |
| | β | <i>b</i> | SE | 95% CI | β | <i>b</i> | SE | 95% CI |
| Sleep regularity | -0.02 | -0.01 | 0.01 | [-0.03, 0.02] | -0.004 | -0.001 | 0.01 | [-0.03, 0.03] |
| Sleep quality | 0.13** | 0.06** | 0.02 | [0.02, 0.11] | 0.07 | 0.03 | 0.03 | [-0.02, 0.08] |
| Daily alertness | 0.18*** | 0.08*** | 0.02 | [0.04, 0.12] | 0.12* | 0.05* | 0.02 | [0.01, 0.10] |
| Sleep timing | 0.05 | 0.01 | 0.01 | [-0.01, 0.03] | 0.06 | 0.01 | 0.01 | [-0.01, 0.03] |
| Sleep efficiency ^a | 0.02 | 0.003 | 0.01 | [-0.01, 0.02] | -0.01 | -0.001 | 0.01 | [-0.02, 0.02] |
| Sleep duration | -0.04 | -0.01 | 0.01 | [-0.04, 0.02] | -0.04 | -0.01 | 0.01 | [-0.04, 0.02] |

Note. N = 428.

[†]P < .10.

*P < .05.

**P < .01.

***P < .001.

^a To increase readability of the table, sleep efficiency was scaled so that a 1 unit increase in sleep efficiency = 5%. Values are from a multiple regression that included the listed sleep dimension, demographic variables (age, gender, education, race, marital/cohabiting status), health variables (number of physical symptoms and conditions) for covariate test 1, and also included psychological variables (perceived stress and depression symptoms) for covariate test 2.

Table 5
Covariate analyses of the associations between each individual sleep health dimension and socially straining behavior

| Sleep dimension | Socially straining behavior | | | | | | | |
|-------------------------------|-----------------------------|----------|------|----------------|--------------------|--------------------|------|----------------|
| | Covariate 1 | | | | Covariate 2 | | | |
| | β | <i>b</i> | SE | 95% CI | β | <i>b</i> | SE | 95% CI |
| Sleep regularity | 0.14** | 0.05** | 0.02 | [0.01, 0.08] | 0.12* | 0.04* | 0.02 | [0.01, 0.07] |
| Sleep quality | -0.19*** | -0.11*** | 0.03 | [-0.17, -0.06] | -0.11* | -0.07* | 0.03 | [-0.13, -0.01] |
| Daily alertness | -0.19*** | -0.10*** | 0.03 | [-0.15, -0.05] | -0.09 | -0.05 | 0.03 | [-0.10, 0.01] |
| Sleep timing | 0.0001 | 0.0004 | 0.01 | [-0.02, 0.03] | -0.01 | -0.002 | 0.01 | [-0.03, 0.02] |
| Sleep efficiency ^a | -0.18** | -0.03** | 0.01 | [-0.05, -0.01] | -0.14** | -0.03** | 0.01 | [-0.05, -0.01] |
| Sleep duration | -0.08 | -0.03 | 0.02 | [-0.06, 0.01] | -0.08 [†] | -0.03 [†] | 0.02 | [-0.06, 0.01] |

Note. N = 428.

[†]P < .10.

*P < .05.

**P < .01.

***P < .001.

^a To increase readability of the table, sleep efficiency was scaled so that a 1 unit increase in sleep efficiency = 5%. Values are from a multiple regression that included the listed sleep dimension, demographic variables (age, gender, education, race, marital/cohabiting status), health variables (number of physical symptoms and conditions) for covariate test 1, and also included psychological variables (perceived stress and depression symptoms) for covariate test 2.

Table 6
Unique associations between individual sleep health dimensions and emotional supportiveness and socially straining behavior

| Sleep dimension | Emotional supportiveness | | | | Socially straining behavior | | | |
|-------------------------------|--------------------------|-------------------|------|----------------|-----------------------------|-------------------|------|-----------------|
| | β | <i>b</i> | SE | 95% CI | β | <i>b</i> | SE | 95% CI |
| Sleep regularity | -0.04 | -0.01 | 0.01 | [-0.04, 0.02] | 0.10 [†] | 0.03 [†] | 0.02 | [-0.001, 0.07] |
| Sleep quality | -0.003 | -0.001 | 0.03 | [-0.07, 0.06] | -0.13* | -0.08* | 0.04 | [-0.16, -0.001] |
| Daily alertness | 0.20** | 0.09** | 0.03 | [0.03, 0.14] | -0.08 | -0.04 | 0.04 | [-0.11, 0.03] |
| Sleep timing | 0.09 [†] | 0.02 [†] | 0.01 | [-0.002, 0.04] | -0.06 | -0.02 | 0.01 | [-0.04, 0.01] |
| Sleep efficiency ^a | 0.13* | 0.02* | 0.01 | [0.002, 0.04] | -0.18** | -0.03** | 0.01 | [-0.06, -0.01] |
| Sleep duration | -0.03 | -0.01 | 0.02 | [-0.04, 0.03] | 0.04 | 0.01 | 0.02 | [-0.03, 0.06] |
| R ² | 7% | | | | 9% | | | |

Note. N = 435.

[†]P < .10.

*P < .05.

**P < .01.

^a To increase readability of the table, sleep efficiency was scaled so that a 1 unit increase in sleep efficiency = 5%. The bottom row list total variance explained by combining all sleep health dimensions as predictors.

supportiveness, with sleep efficiency and alertness showing the largest contributions, and 9% of variance in socially straining behavior, with sleep efficiency and quality showing the largest contributions.^{d, e}

Discussion

Being more emotionally supportive toward close others was associated with more sleep regularity, better sleep quality, higher sleep efficiency, and greater daytime alertness, while engaging in more socially straining behavior was associated with poorer sleep across all sleep health dimensions with the exception of sleep timing. Based on covariate analyses, emotional supportiveness was most robustly related to daytime alertness, while socially straining behavior was most robustly related to sleep regularity, quality, and efficiency. Together, the sleep health dimensions explained a substantive portion of variance in both emotional supportiveness and socially straining behavior.

The results for emotional supportiveness are consistent with research showing that poor sleep impairs the ability to empathize with others, a critical component of emotional supportiveness.^{2,22} The covariate analyses suggest that perceived stress and depression symptoms may help explain why poorer sleep quality is related to being less supportive of others, but the direction of these effects is unknown. Poor sleep quality may cause increases in psychological distress which can interfere with being supportive,³⁸ or being less supportive of others may cause increases psychological distress¹⁴ which can interfere with sleep quality.^{6,17} The covariate analyses are also consistent with the premise that being less alert and attentive during day, irrespective of psychological distress, impairs the ability or motivation to be emotionally supportive toward close others. Daytime alertness may be a more proximal predictor of emotional supportiveness than sleep quality as only alertness predicted emotional supportiveness when both were included in the model. Future research should examine if the ability or motivation to be emotionally supportive is primarily compromised by daytime dysfunction.

The present report focused on emotional supportiveness toward close others, a critical component of health and relational well-being.^{2,8,9} However, future studies need to incorporate other forms of emotional support provision (e.g., the frequency of supportive behavior and support provision within specific interactions). Similar to distinctions made about perceived and received support from others,^{2,7} different forms of emotional support provision can be associated with different processes and outcomes. For example, perceiving oneself as emotionally supportive of others may be tied to personality, the frequency of emotionally supportive behavior has the potential to become burdensome, and the outcomes of providing emotional support within specific interpersonal interactions may depend upon the response of the support recipient.² Such differences may explain why the present results are inconsistent with the prior study showing that greater amounts of emotional support provision predict longer sleep duration (although that study assessed sleep duration two years later and within romantic relationships).⁶ Finally, instrumental support provision should also be examined.

Consistent with prior studies on perceptions of interpersonal strain,^{4,5} participants' own socially straining behavior in their close relationships was most robustly related to sleep regularity, quality, and efficiency and psychological distress did not fully account for these associations. Causing disruption in one's social relationships may lead to guilt, ruminative thoughts, or reduced relational security and increased loneliness that may interfere with sleep stability both

across sleep episodes (sleep regularity) and within sleep episodes (discontinuity).^{12,16,25} Furthermore, deficits in self-regulation due to poor sleep may increase socially straining behavior and further compromise sleep.

This study had a number of limitations. Although the large sample size of the study was a strength, the cross-sectional nature of the study precluded the ability to draw causal or mediational inferences about these associations. The sample included older adults in established relationships so the findings may not generalize to younger individuals in shorter-term relationships. Moreover, reports of emotional supportiveness and socially straining behavior in this sample were restricted in range; people reported relatively high levels of emotional supportiveness and low levels of causing strain. The reported associations may be stronger in samples with greater variability in these social processes. Future research should examine these associations at different times across the life span in which greater variability may occur such as the postpartum period when both the opportunities for emotional supportiveness and social strain are high. Still, the restricted range may also reflect social desirability pressures to report more positive behaviors toward close others. Accordingly, future research should include informant reports and/or objective assessments of behavior. It was not possible to examine perceptions of available support from close others in the present report as they were not assessed in the Biomarker Project. However, in other studies providing support and receiving or perceiving it were independently linked to health.⁹ Finally, although the effect sizes of the associations were relatively small, over time their impact is likely to be substantial.⁴²

This is the first study to our knowledge to systematically examine the associations between being emotionally supportive toward others and sleep health using a multidimensional approach with behavioral and subjective assessments of sleep. The results showed that sleep health is an important predictor of supportiveness toward close others. They replicated and extended prior work on social strain and sleep by showing that engaging in interpersonally straining behavior toward close others is broadly related to sleep health across relationships. Taken together, these findings show that both daytime and nighttime dimensions of sleep health are important for relationship functioning, suggest that positive and negative aspects of relationship functioning may be related to different dimensions of sleep health, and highlight the need to examine both positive and negative aspects of relationships in relation to sleep.

Declaration of conflict of interest

The authors have no conflicts of interest to declare.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.sleh.2020.06.010.

^d We ran models with each sleep dimension regressed on emotional supportiveness and socially straining behavior together verifying they are independent predictors (sTable 6).

^e The variance inflation factor of sleep quality and alertness were acceptable (VIFs < 2.2).

References

- Hale L. Sleep as a mechanism through which social relationships affect health. *Sleep*. 2010;33:862–863.
- Feeney BC, Collins NL. A new look at social support: a theoretical perspective on thriving through relationships. *Personal Soc Psychol Rev*. 2015;19:113–147.
- Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: a meta-analytic review. *PLoS Med*. 2010;7: e1000316.
- Chung J. Social support, social strain, sleep quality, and actigraphic sleep characteristics: evidence from a national survey of US adults. *Sleep Health*. 2017;3:22–27. <https://doi.org/10.1016/j.sleh.2016.10.003>.
- Lee JH, Chopik WJ, Schiamburg LB. Longitudinal associations between marital quality and sleep quality in older adulthood. *J Behav Med*. 2017;40:821–831. <https://doi.org/10.1007/s10865-017-9850-2>.
- Selcuk E, Stanton SC, Slatcher RB, Ong AD. Perceived partner responsiveness predicts better sleep quality through lower anxiety. *Soc Psychol Personal Sci*. 2017;8:83–92.
- Kent de Grey RG, Uchino BN, Trettenvik R, Cronan S, Hogan JN. Social support and sleep: a meta-analysis. *Health Psychol*. 2018;37:787–798. <https://doi.org/10.1037/hea0000628>.
- Lemay EP, Clark MS, Feeney BC. Projection of responsiveness to needs and the construction of satisfying communal relationships. *J Pers Soc Psychol*. 2007;92:834–853. <https://doi.org/10.1037/0022-3514.92.5.834>.
- Brown SL, Nesse RM, Vinokur AD, Smith DM. Providing social support may be more beneficial than receiving it: results from a prospective study of mortality. *Psychol Sci*. 2003;14:320–327. <https://doi.org/10.1111/1467-9280.14461>.
- Inagaki TK, Orehek E. On the benefits of giving social support: when, why, and how support providers gain by caring for others. *Curr Dir Psychol Sci*. 2017;26:109–113. <https://doi.org/10.1177/0963721416686212>.
- Belcher AJ, Laurenceau J-P, Graber EC, Cohen LH, Dasch KB, Siegel SD. Daily support in couples coping with early stage breast cancer: maintaining intimacy during adversity. *Health Psychol*. 2011;30:665–673. <https://doi.org/10.1037/a0024705>.
- El-Sheikh M, Kelly RJ, Koss KJ, Rauer AJ. Longitudinal relations between constructive and destructive conflict and couples' sleep. *J Fam Psychol*. 2015;29:349.
- Gordon AM, Chen S. The role of sleep in interpersonal conflict: do sleepless nights mean worse fights? *Soc Psychol Personal Sci*. 2014;5:168–175.
- Morelli SA, Lee IA, Arnst ME, Zaki J. Emotional and instrumental support provision interact to predict well-being. *Emotion*. 2015;15:484–493. <https://doi.org/10.1037/emo0000084>.
- Troxel WM. It's more than sex: exploring the dyadic nature of sleep and implications for health. *Psychosom Med*. 2010;72:578.
- Cacioppo JT, Hawkey LC, Berntson GG, et al. Do lonely days invade the nights? Potential social modulation of sleep efficiency. *Psychol Sci*. 2002;13:384–387.
- Akerstedt T, Kecklund G, Axelsson J. Impaired sleep after bedtime stress and worries. *Biol Psychol*. 2007;76:170–173. <https://doi.org/10.1016/j.biopsycho.2007.07.010>.
- Inagaki TK, Eisenberger NI. Giving support to others reduces sympathetic nervous system-related responses to stress: support giving reduces stress response. *Psychophysiology*. 2016;53:427–435. <https://doi.org/10.1111/psyp.12578>.
- Winczewski LA, Bowen JD, Collins NL. Is empathic accuracy enough to facilitate responsive behavior in dyadic interaction? Distinguishing ability from motivation. *Psychol Sci*. 2016;27:394–404.
- Kent de Grey RG, Uchino BN, Smith TW, Baucom BRW. (Too) Anxious to help? Social support provider anxiety and cardiovascular function. *Int J Psychophysiol*. 2018;123:171–178. <https://doi.org/10.1016/j.ijpsycho.2017.09.014>.
- Gosnell CL, Gable SL. You deplete me: impacts of providing positive and negative event support on self-control: providing support and self-control. *Pers Relatsh*. 2017;24:598–622. <https://doi.org/10.1111/pere.12200>.
- Guadagni V, Burles F, Ferrara M, Iaria G. The effects of sleep deprivation on emotional empathy. *J Sleep Res*. 2014;23:657–663.
- Palmer CA, Alfano CA. Sleep and emotion regulation: an organizing, integrative review. *Sleep Med Rev*. 2017;31:6–16.
- Engle-Friedman M, Young SG. Sleep's role in effortful performance and sociability. In: Krizan Z, ed. *Sleep, Personality, and Social Behavior*. Springer International Publishing; 2019:63–81. https://doi.org/10.1007/978-3-030-30628-1_5.
- Schmidt RE, Van der Linden M. The aftermath of rash action: sleep-interfering counterfactual thoughts and emotions. *Emotion*. 2009;9:549–553. <https://doi.org/10.1037/a0015856>.
- Keller PS, Haak EA, DeWall CN, Renzetti C. Poor sleep is associated with greater marital aggression: the role of self control. *Behav Sleep Med*. 2019;17:174–180.
- Finkel EJ, Campbell WK. Self-control and accommodation in close relationships: an interdependence analysis. *J Pers Soc Psychol*. 2001;81:263–267. <https://doi.org/10.1037/0022-3514.81.2.263>.
- Ailshire JA, Burgard SA. Family relationships and troubled sleep among U.S. adults: examining the influences of contact frequency and relationship quality. *J Health Soc Behav*. 2012;53:248–262. <https://doi.org/10.1177/0022146512446642>.
- Buyse DJ. Sleep health: can we define it? Does it matter? *Sleep*. 2014;37:9–17. <https://doi.org/10.5665/sleep.3298>.
- Dienberg Love G, Seeman TE, Weinstein M, Ryff CD. Bioindicators in the MIDUS national study: protocol, measures, sample, and comparative context. *J Aging Health*. 2010;22:1059–1080.
- Walen HR, Lachman ME. Social support and strain from partner, family, and friends: costs and benefits for men and women in adulthood. *J Soc Pers Relatsh*. 2000;17:5–30. <https://doi.org/10.1177/0265407500171001>.
- Soehner AM, Kennedy KS, Monk TH. Circadian preference and sleep-wake regularity: associations with self-report sleep parameters in daytime-working adults. *Chronobiol Int*. 2011;28:802–809. <https://doi.org/10.3109/07420528.2011.613137>.
- Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1:385–401.
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;24:385–396.
- Bixler E. Sleep and society: an epidemiological perspective. *Sleep Med*. 2009;10:S3–S6. <https://doi.org/10.1016/j.sleep.2009.07.005>.
- Ross JM, Karney BR, Nguyen TP, Bradbury TN. Communication that is maladaptive for middle-class couples is adaptive for socioeconomically disadvantaged couples. *J Pers Soc Psychol*. 2019;116:582–597. <https://doi.org/10.1037/pspi0000158>.
- Koyanagi A, Garin N, Olaya B, et al. Chronic conditions and sleep problems among adults aged 50 years or over in nine countries: a multi-country study. Xia Y, ed. Chronic conditions and sleep problems among adults aged 50 years or over in nine countries: a multi-country study. *PLoS One*. 2014;9:e114742. <https://doi.org/10.1371/journal.pone.0114742>.
- Revenson TA, Majerovitz SD. Spouses' support provision to chronically ill patients. *J Soc Pers Relatsh*. 1990;7:575–586. <https://doi.org/10.1177/0265407590074013>.
- Neff LA, Karney BR. Stress and reactivity to daily relationship experiences: how stress hinders adaptive processes in marriage. *J Pers Soc Psychol*. 2009;97:435–450. <https://doi.org/10.1037/a0015663>.
- Rohrer JM. Thinking clearly about correlations and causation: graphical causal models for observational data. *Adv Methods Pract Psychol Sci*. 2018;1:27–42.
- Faul F, Erdfelder E, Lang A-G, Buchner A. G* Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39:175–191.
- Funder DC, Ozer DJ. Evaluating effect size in psychological research: sense and nonsense. *Adv Methods Pract Psychol Sci*. 2019;2:156–168.