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Leader sleep devaluation, employee sleep, and unethical behavior

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ABSTRACT

Objectives: The objectives of this study is to examine the effect of leader sleep devaluation (which we define as leader behaviors that signal to employees that sleep should be sacrificed for work) on the sleep and unethical behavior of subordinates.
Design: Across 2 studies (with 3 total samples of participants), we use a cross-sectional survey, a diary study completed by employees, and a diary study completed by employees and their leaders.
Setting: Study 1 — a convenience sample of working adults in Italy, including 575 subordinates nested under 140 leaders. Study 2A — 135 working adults recruited from Amazon's Mechanical Turk. Study 2B — 127 employee-supervisor dyads recruited from the Study Response project.
Measurements: Survey measures of leader behaviors, subordinates sleep, and subordinate unethical behavior.
Results: Sleep devaluing leader behavior has harmful effects on employee sleep, and that these effects occur above and beyond the effects of abusive supervision and other alternative explanations. Subordinate sleep quality has a mediating role between leader sleep devaluation and subordinate unethical behavior. Effects for sleep quantity were inconsistent.
Conclusions: Leaders can adversely influence the sleep and work experience of their subordinates. Specifically, sleep devaluing leader behavior undermines subordinate sleep, which in turn is associated with higher levels of subordinate unethical behavior.

Introduction

A growing body of research indicates that sleep deprivation and poor quality sleep are associated with a litany of negative work outcomes, such as negative mood, poor self-control, work injuries, unethical behavior, cyberloafing at work, work disengagement, and abusive supervision.[1–6] Recent reviews of this literature highlight the considerable breadth and depth of the effects of employee sleep on work outcomes.[7–9] These effects are particularly worrisome, given the clearly documented trend of reduced sleep hours for workers in the developed world.[10,11]

Historically, the literature has typically treated sleep as something each employee manages individually, such that they choose how to allocate hours of sleep amidst work demands, family commitments, and personal interests.[12] However, recent research contends that sleep patterns occur in the context of work groups as well,[13] and that leaders can be an important factor in influencing employee sleep.[14,15] However, there is currently no theoretical framework for this recommendation to focus on how leaders influence sleep, as well as a dearth of empirical evidence.

We build on the idea that leaders can influence the sleep of their subordinates by investigating specifically what behaviors leaders engage in that can impair (or when they avoid certain behaviors, not impair) the sleep of their subordinates. Specifically, we draw from social learning theory[16,17] to develop a framework for how leaders influence the sleep of subordinates. We develop a new construct that we label as leader sleep devaluation, which we define as leader behaviors that signal to employees that sleep should be sacrificed for work. We contend that when leaders exhibit more of these behaviors, the sleep quantity, and quality of their subordinates will suffer, which may lead to downstream negative consequences for subordinate work outcomes.

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Social learning theory[16,17] indicates that role modeling and behavioral shaping (either directly or through vicarious learning) can influence the behavior of people in a social context. People tend to imitate role models such as leaders, engaging in similar behavior. Moreover, people tend to imitate behavior of others when those others receive rewards for a given behavior. In short, leaders can influence subordinates through role modeling and behavioral shaping.[18,19]

We draw from social learning theory to build a framework for how leader behavior can influence subordinate sleep. Specifically, we examine leader sleep devaluation, which we define as leader behaviors that signal to employees that sleep should be sacrificed for work. Leader sleep devaluation entails both role modeling and behavior shaping. The role modeling component entails statements and activities of the leader that, if imitated by the leader's followers, will cause those followers to sacrifice sleep for work. For example, a leader may openly brag about not sleeping much, and how sleep gets in the way of doing important work. The implication is that the subordinate should similarly be deprioritizing sleep to work more. Behavior shaping processes entail statements and activities of the leader that seek to intentionally alter the leader's followers' behavior to sacrifice sleep for work. For example, a leader may praise a subordinate for responding to an email at 3 AM, or ostracize or punish a subordinate who did not do so. We consider these two components of role modeling and behavior shaping to be two parts of the overall construct of leader sleep devaluation. Moreover, we expect that leaders high on one aspect will also be high on the other, such that considering overall leader sleep devaluation is also a meaningful and parsimonious approach. If for a given research question, researchers have theoretically grounded differential predictions for relationship between the two dimensions and other constructs, then it makes sense for such researchers to use a two-dimensional depiction of this construct (we do indicate which item would load onto which dimension). If for a given research question researchers do not have theoretically grounded differential predictions for the relationship between the two dimensions and other constructs, then it makes sense to use the more conceptually parsimonious unidimensional approach. We proceed in this article with the more parsimonious perspective of treating the construct unidimensionally.

We contend that leader sleep devaluation will undermine subordinate sleep. Specifically, for the reasons delineated by social learning theory, leaders high in leader sleep devaluation will have a harmful effect on the sleep quantity and sleep quality of their subordinates. By role modeling and behavioral shaping in a manner that promotes work behavior during typical sleep hours, leaders create time-based conflict. These leaders can create a context in which work time crowds out sleep time, even during the time of day most suitable for sleep. This time-based conflict is especially relevant to sleep quantity. If an employee must follow the example of a leader working late at night, this is time in which the employee is not sleeping. Moreover, it typically takes time to fall asleep even after the work is carried out and the employee is trying to fall asleep (i.e., sleep latency[20]). Overall, this can come at the cost of time spent sleeping.

Similarly, such leaders can create strain-based conflict, in which employees are constantly ruminating about work and anxious about checking email frequently. As indicated by previous research, strain-based conflict is especially relevant to sleep quality.[21] High levels of leader sleep devaluation leave employees in a position in which they must diligently monitor for signals that they should be working during typical sleep hours. This diligence will be anxiety-provoking, in that employees will worry about letting a work message go undetected for too long. Research has clearly established the harmful effect of anxiety on sleep quality.[21,22] Moreover, checking electronic devices exposes employees to light (blue light in particular) that undermines the production of melatonin.[5,23] Melatonin is crucial in helping people fall asleep and stay asleep. Indeed, previous research indicates that pressure to continually monitor electronic devices for messages about work experience low sleep quality.[24] In short, we expect leader sleep devaluation to have a negative effect on subordinate sleep quantity and quality.

The sleep and self-regulation model[7] notes that low sleep quantity and poor sleep quality impair self-regulation, which leads to unethical behavior. In short, sleep deprivation and poor sleep quality lead to impairments in the manner in which the prefrontal cortex functions. The prefrontal cortex is the region of the brain most responsible for the exercise of self-control, so undermining this activity leads to decrements in self-control. This decrement in self-control leaves employees less able to resist various temptations they face to engage in unethical behavior.[25] Several empirical studies have provided support for this effect of sleep on unethical behavior, through the mediator of self-control.[2,26–28]

An integration of our overall conceptual model indicates that leader sleep devaluation will be positively associated with subordinate unethical behavior, and that decrements to subordinate sleep quantity and quality will mediate this effect. In Study 1, we evaluate the relationship between leader sleep devaluation and subordinate sleep in a multiorganization and multirater sample which allows for an evaluation of the shared perceptions of a given leader's sleep devaluation. Study 2 uses two independent samples, a more robust diary survey design, a more precise measure of sleep, and tests the full model (which includes employee unethical behavior). For every study in this article, the research protocol and informed consent were approved by the institutional review board, and all subjects gave informed consent. There was no financial support for any of these studies.

Study 1: Effect of sleep devaluing leader behavior on subordinate sleep

Participants and methods

We recruited a convenience sample of adults working full-time day shifts in Italy to take a survey detailing their impressions of their supervisor, their work experiences, and their sleep. Five hundred seventy-two individuals nested within 140 leaders from more than 100 Italian organizations across several different industries responded to our survey request. Web-based surveys were provided in Italian, the native language of the participants, following the translation-back translation procedures.[29] Participants were asked to consider their working situation over the last three months. Almost all of the respondents were employed full-time (97%) when the survey was completed. Median age of the sample was 39 years, with 81% identifying as male and 100% identifying as Caucasian.

Table 1
Study 1 raw correlation matrix

	M	SD	1	2	3	4	5	6
1. Abusive supervision	1.56	0.44	*.93*					
2. Supervisor work demands	2.95	0.54	.01	*.73*				
3. Negative affect	2.45	0.57	.17	.08	*.78*			
4. Sleep quality	2.60	0.59	−.24	−.05	−.21	*.89*		
5. Sleep quantity (hours)	7.11	0.91	−.09	.09	−.12	.18	-	
6. Leader sleep devaluation	1.86	0.55	.24	−.08	−.13	−.14	−.21	*.92*

N = 572 employees nested in 140 supervisors; *r* greater than .09 are $p < .05$.
Scale alpha shown italicized on diagonal.

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Table 2
Study 1 Level 1 and Level 2 correlation matrix

	1	2	3	4	5	6
1. Abusive supervision	-	-	.07	−.16	−.06	.15
2. Supervisor work demands	.02	-	-	-	-	-
3. Negative affect	.33	.11	-	−.06	−.18	−.10
4. Sleep quality	−.40	−.09	−.43	-	.28	−.14
5. Sleep quantity (hours)	−.17	.18	−.02	−.06	-	−.23
6. Leader sleep devaluation	.39	−.12	−.17	−.15	−.20	-

N = 572 employees nested in 140 supervisors.
Level 1 correlations shown above the diagonal; r greater than .09 are $p < .05$.
Level 2 correlations shown below the diagonal; r greater than .17 are $p < .05$.

To measures leader sleep devaluation, we used the scale we developed as documented in Appendices B and C. The items for the scale are listed in Appendix B, and in this study coefficient alpha was .92. We measured sleep quantity with one item asking the respondent to estimate how much they slept each night on average over the last three months. We measured sleep quality using the 4-item insomnia scale,[30] with the items referring to the same three-month period. The insomnia measure was reverse-coded to represent sleep quality (rather than lack of sleep quality), consistent with the approach in previous research.[2] We also included a measure of abusive supervision[31] to allow us to examine additional variance in sleep accounted for by leader sleep devaluation above and beyond the effect of abusive supervision. To control for negative affectivity as a confound, we measured negative affect using the negative affect portion of the 12-item Positive And Negative Affect Scale.[32] Finally, we controlled for supervisor workload (which could affect both treatment of employees, as well as employee sleep) by having supervisors rate their own work levels.[33]

Analysis

For sleep impairing leader behavior, the intraclass correlation (ICC) is 0.24, indicating that 24% of the variance in sleep impairing leader behavior for this sample was attributable to a shared supervisor. To account for the nested nature of the data (subordinates nested within supervisors), we used a mixed-effects model to estimate regressions coefficients and standard errors. We conducted the analyses using the *lmer* package in R.

Results

The correlations from this study are shown in Tables 1 and 2. The results of our mixed-effects models are shown in Table 3. Regarding sleep quantity, Model 1 (controls only) shows a non-significant relationship with abusive supervision and significant relationships with both supervisor workload and employee negative affect. After adding leader sleep devaluation in Model 2, the pattern of control variables remains the same and indicates a significant negative effect of leader sleep devaluation ($b = -0.37$, $p < .001$).

Regarding sleep quality, Model 1 finds a significant and negative relationship with both abusive supervision and employee negative affect and a non-significant relationship with supervisor workload. When leader sleep devaluation is added in Model 2, the pattern of control variable relationships is consistent, and leader sleep devaluation shows a negative significant relationship with sleep quality ($b = -0.13$ $p < .05$).

Studies 2A/B: Full model

Although Study 1 had the strength of evaluating leader behavior and sleep using multiple raters of leader behavior, it also used a one-time, retrospective sleep quantity and quality measure that may be limited in reliability. To improve upon this and to attempt replication of the predictive findings from Study 1, we conducted two independent multiday diary studies. Of particular importance in these studies is the use of a more robust study design, using a repeated-measures approach to evaluating sleep quality and quantity each morning.

Participants and methods

For Study 2A, participants (N = 135) were full-time employees recruited via Mechanical Turk (MTurk) for a study on workplace behaviors. Of these subjects, 79% identified as Caucasian, 54% identified as male, and their median age was 32 years. Participants were given a monetary bonus for full participation over the five-day study, and only participants who completed two or more studies

Table 3
Study 1 mixed-effects regression models

	DV: Sleep quantity (hours)					
	Model 1			Model 2		
	b	SE		b	SE	
Intercept	7.33	(0.28)	***	8.04	(0.30)	***
Supervisor workload	0.16	(0.07)	*	0.14	(0.07)	*
Abusive supervision	−0.15	(0.09)	†	−0.02	(0.09)	
Employee negative affect	−0.19	(0.07)	**	−0.25	(0.07)	***
Leader sleep devaluation				−0.37	(0.07)	***
	DV: Sleep quality					
	Model 1			Model 2		
	b	SE		*b*	SE	
Intercept	−1.47	(0.19)	***	−1.20	(0.21)	***
Supervisor workload	−0.04	(0.05)		−0.05	(0.05)	
Abusive supervision	−0.27	(0.06)	***	−0.23	(0.06)	***
Employee negative affect	−0.15	(0.04)	***	−0.17	(0.04)	***
Leader sleep devaluation				−0.13	(0.05)	**

N=572 individuals nested within 140 supervisors.
Unstandardized coefficients are shown, standard errors in parentheses.
p values (via Satterthwaite estimation): † = $p < .10$, * < .05, ** < .01, *** < .001.

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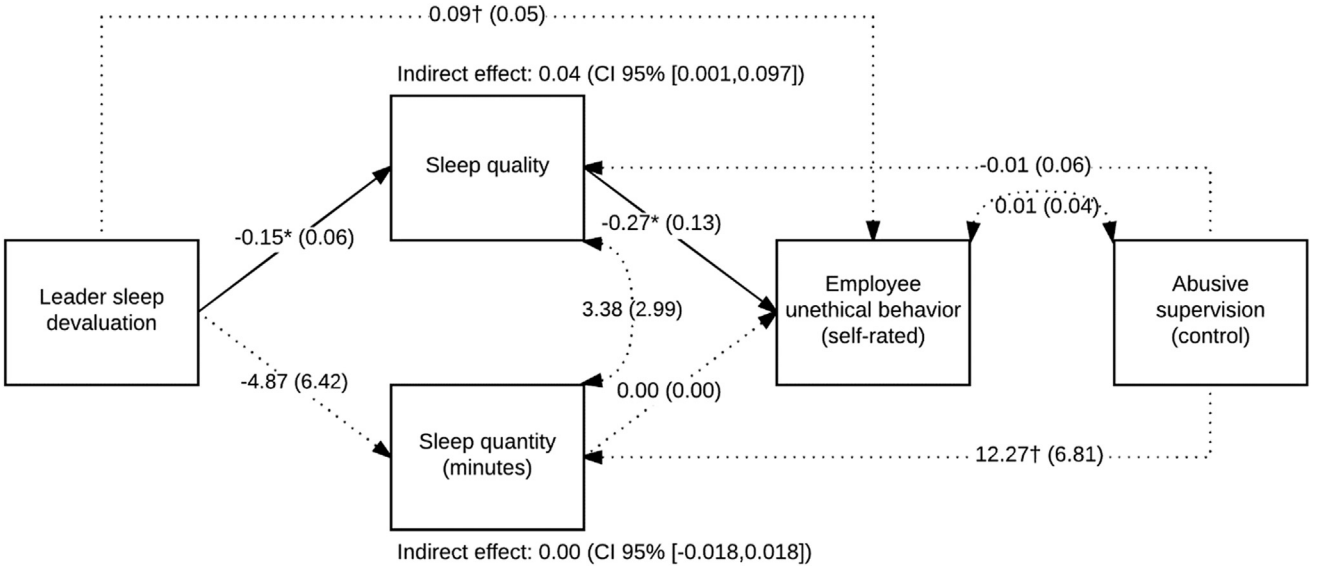

Figure 1. Study 2A empirical model. N = 673 observations nested in 135 participants. Unstandardized coefficients shown, standard errors in parentheses. * = $p < .05$, † = $p < .10$

during the five-day diary period were retained. Remaining subjects participated in an average of 4.98 days of the study.

For Study 2B, a sample of US employee-supervisor dyads were recruited by the Study Response Project, a non-profit organization that hosts a panel designed for use in social science research.[34] First, subjects with full-time employment were recruited from the existing Study Response pool of subjects and asked to supply the name and email address of their direct supervisor. Supervisors were then contacted and asked to participate. Both parties were compensated after successful completion of the procedure described in the following context, and only complete dyads were retained for analysis. The final sample included 581 observations nested within 127 employee-supervisor dyads. Eighty-six % of the participants were Caucasian, 61% were male, and their average age was 37 years.

Participants in Study 2A took part in a two-week process. On Wednesday of Week 1 of the study, an initial survey was posted to MTurk that asked participants about their general workplace environment and their direct supervisor, including the leader sleep devaluation scale. People who completed this survey were invited to Week 2 of the study, in which participants completed short prework surveys which had them evaluate their sleep quality and quantity from the prior evening. They also completed postwork surveys which had them rate their workplace unethical behavior.

Surveys for Study 2B covered a three-week span. In Week 1, employees were asked to fill out a survey which asked questions about their work environment and their leader, including our leader sleep devaluation scale. In Week 2, employees filled out daily surveys that outlined their sleep patterns from the previous night. In Week 3, supervisors filled out a survey documenting their subordinate's behavior in the prior week (Week 2). All surveys were conducted online, with participants receiving links via email from the Study Response Project.

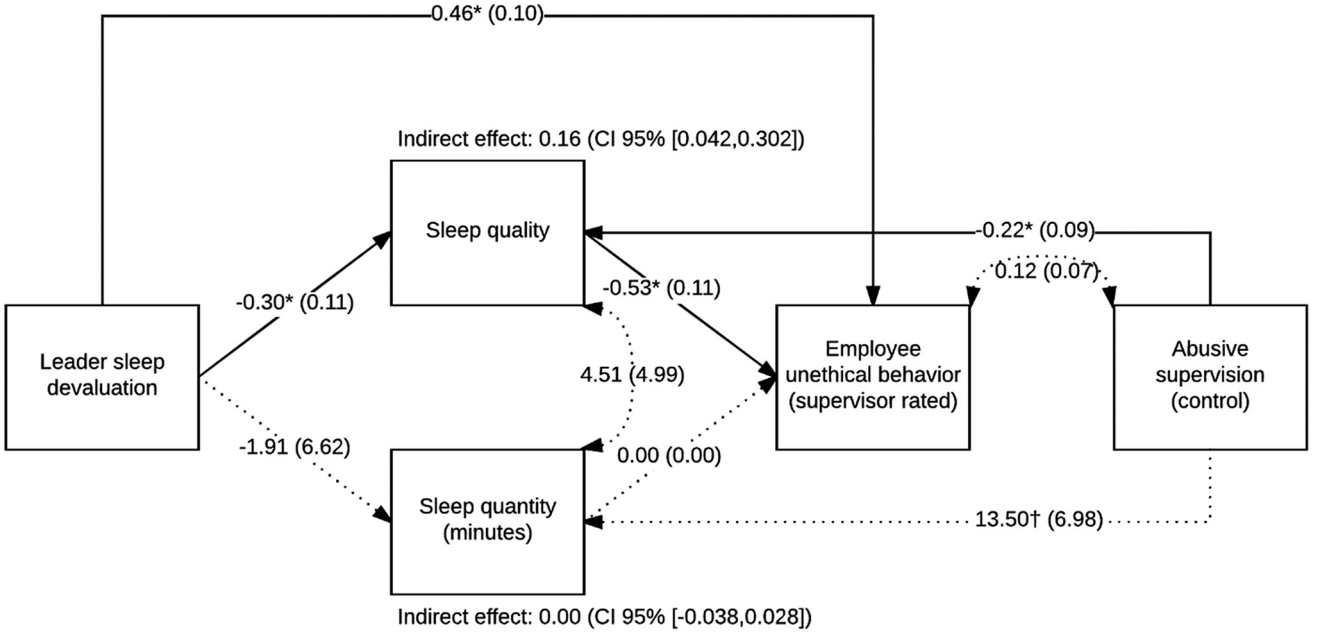

Figure 2. Study 2B empirical model. N = 581 observations nested in 127 dyads. Unstandardized coefficients shown, standard errors in parentheses. * = $p < .05$, † = $p < .10$

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Table 4
Study 2A raw correlation matrix

	M	SD	1	2	3	4	5
1. Abusive supervision	1.80	0.84	*.96*				
2. Sleep quantity (minutes)	414.14	81.86	.10	–			
3. Sleep quality	4.05	0.87	−.09	.37	*.76*		
4. Leader sleep devaluation	2.26	0.88	.48	.00	−.15	*.92*	
5. Unethical behavior (self-rated)	1.16	0.42	.16	−.05	−.16	.27	*.87*

N = 673 observations nested in 135 participants.
Scale alpha shown italicized on diagonal.

Table 6
Study 2B raw correlation matrix

	M	SD	1	2	3	4	5
1. Abusive supervision	2.13	1.07	*.98*				
2. Sleep quantity (minutes)	434.96	79.40	.14	–			
3. Sleep quality	3.66	1.11	−.37	.09	*.92*		
4. Leader sleep devaluation	2.90	0.96	.64	.09	−.40	*93*	
5. Unethical behavior (supervisor-rated)	2.02	1.14	.53	.10	−.51	.67	*.96*

N = 581 observations nested in 127 dyads.
Scale alpha shown italicized on diagonal.

Leader sleep devaluation and abusive supervision were measured with the same scales used in Study 1 (the items for leader sleep devaluation are listed in Appendix B). As in Study 1, abusive supervision is included as a control in this analysis because of its empirical and conceptual proximity to leader sleep devaluation. As in Study 1, we measured sleep quality using the same 4-item insomnia scale. However, in this study the items refer only to the prior night's sleep. The insomnia measure was reverse-coded to represent sleep quality (rather than lack of sleep quality), consistent with Study 1. Sleep quantity was evaluated using the Pittsburgh Sleep Diary.[35] Unethical behavior was measured using a five item from scale used in previous research examining the effect of sleep on unethical behavior.[2,36] This measure of unethical behavior was given to the focal employee in Study 2A and to the focal employee's supervisor (for rating the focal employee) in Study 2B. Cronbach's alpha for this scale was .87 in Study 5A and .96 in Study 2B.

Analysis

We analyzed all relationships (i.e. direct effects and mediated indirect effects) in MPlus with a multilevel path analysis, following the multilevel structural equation model framework.[37,38] This technique allows for all paths to be tested simultaneously, and thus the indirect mediation effect to be calculated in conjunction with the direct effect of leader sleep devaluation on unethical behavior. Confidence intervals (CIs) for the indirect effect were derived with a Monte Carlo bootstrap approach (100,000 iterations), given the strong likelihood for the standard error of the indirect path to be not normally distributed.

Results

Tables 4-6 provide the correlations for Study 2a. Table 7 provides the correlations for Study 2b. As in Study 1, we computed ICCs for variables measured at lower levels of analysis—in this case, daily sleep quality and quantity. The ICC(1) for sleep quality was .24 in Study 2A and .63 in Study 2B. The same value for sleep quantity was .39 in Study 1A and .58 for Study 5B. All of these values suggest that there is ample variance at the between-individual level to use a mixed-effects or multilevel analysis.

The results of the multilevel path analyses are shown in Figures 1 and 2. In these figures, solid lines indicate significant relationships, whereas dotted lines are not statistically significant. To indicate mediation, we provide indirect effect information next to a given mediator of interest. These models show a significant and negative relationship between leader sleep devaluation and subordinate sleep quality (Study 2A: $b = -0.15$, $p < .05$; Study 2B: $b = -0.30$, $p < .05$). Sleep quality also has a subsequent negative relationship with employee unethical behavior (Study 2A: $b = -0.27$, $p < .05$; Study 2B: $b = -0.53$, $p < .05$). Finally, sleep quality mediates the relationship between leader sleep devaluation and employee unethical behavior (Study 2A: $b = 0.04$, 95% CI: [0.001, 0.097]; Study 2B: $b = 0.16$, 95% CI: [0.042, 0.302]). However, none of the direct relationships involving sleep quantity are significant, and the mediated relationship between leader sleep devaluation and employee unethical behavior is also non-significant (Study 2A: $b = 0.00$, 95% CI: [−0.018, 0.018]; Study 2B: $b = 0.00$, 95% CI: [−0.038, 0.028]).

Discussion

Over the span of three distinct samples including participants from a broad variety of contexts, we provided evidence of specific leader behaviors which impact the sleep of their subordinates. In Study 1, we demonstrated that leader sleep devaluation predicts worse sleep outcomes as reported by the subordinates. In Studies 2A and 2B, we extended this investigation using research designs which temporally separate the measurement of leader sleep devaluation and employee sleep, using daily measurement of employee sleep. Moreover, Studies 2A and 2B extended the model to look at employee unethical behavior as an outcome (even using a supervisor rating of this behavior in Study 2B).

Our theoretical advance highlights the general social nature of sleep. People watch and respond to the behaviors of others in setting their own sleep patterns. This goes not only for following the examples of role models but also responding to rewards and punishments that people experience with regards to priorities around sleep.

Table 5
Study 2A Level 1 and Level 2 correlation matrix

	1	2	3	4	5
1. Abusive supervision					
2. Sleep quantity (minutes)	.13		.48		−.13
3. Sleep quality	−.11	.24			−.09
4. Leader sleep devaluation	.47	.02	−.23		
5. Unethical behavior (self-rated)	.20	−.02	−.33	.33	

N = 673 observations nested in 135 participants.
Level 1 correlations (within persons) shown above the diagonal; r greater than .08 are $p < .05$.
Level 2 correlations (between persons) shown below the diagonal; r greater than .17 are $p < .05$.

Table 7
Study 2B Level 1 and Level 2 correlation matrix

	1	2	3	4	5
1. Abusive supervision					
2. Sleep quantity (minutes)	.17		.21		
3. Sleep quality	−.44	.04			
4. Leader sleep devaluation	.64	.11	−.47		
5. Unethical behavior (supervisor-rated)	.53	.12	−.61	.67	

N = 581 observations nested in 127 dyads.
Level 1 correlations (within persons) shown above the diagonal; r greater than .09 are $p < .05$.
Level 2 correlations (between persons) shown below the diagonal; r greater than .18 are $p < .05$.

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The most important practical implication of our contribution is that there are specific behaviors that leaders engage in which influence the sleep and work outcomes of their subordinates. Many leaders may have the admirable goal of being good citizens who are willing to work at any time of day, and the desire to encourage their subordinates to do the same. However, by doing so, many leaders are likely unintentionally creating the harmful consequences of undermining employee well-being, as well as promoting unethical behavior as an unanticipated side effect.

However, this is likely good news in disguise. Our research has uncovered a hidden lever in making workplaces healthier and more ethical. If leaders can be trained to role model healthy priorities with regards to sleep, and behaviorally shape employees to similarly value sleep, this provides an avenue for positive change in organizations. The real difficulty would be in convincing leaders to abandon lay-theories which emphasize sleep devaluation and instead recognize that a healthy prioritization of sleep is actually consistent with being a good employee and a good leader.

It is worth noting that all of our studies measured sleep by self-report. Although self-report measures tend to be positively correlated with other more physiologically based means of measuring sleep, they can also contain errors that likely add noise to our data. Indeed, this may be one reason that we did not find a more consistent relationship between sleep devaluing leader behavior and subordinate sleep quantity. We hope that future researchers seeking to replicate and extend our research will use more physiologically based measures of sleep. Moreover, we suspect that future researchers will potentially find value in examining what influences sleep devaluing leader behavior, and how to intervene in a manner which increases the degree to which leaders value sleep.

Finally, it is worth noting that we did not examine the effects of different cultures, industries, occupations on either employee sleep or on the relationship between sleep devaluing leader behavior and employee sleep. Similarly, we did not examine follower demographics, leader demographics as potential moderators of such effects. We hope that future research will dig into these intricacies to further enlighten the potential for differential effects across different contexts.

Disclosure

The authors have no conflicts of interest to report.

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Appendix A. Description of Appendices

In these Appendices, we describe the measure development and construct validation we went through to establish the validity of our measure. This includes the following:

Appendix B: Measure development study – item generation and reduction

We used an author-generated list of items that cover the defined domain space, and then evaluated these items for their inter-item correlation in an online sample.

Item generation

Using our definition of leader sleep devaluation and its theorized mechanisms via social learning theory (behavior shaping and role modeling), two of the authors created seventeen initial items for evaluation. We followed the deductive method described by Hinkin,[39] which is a top-down process that uses domain and theoretical knowledge of the defined construct to guide the initial item generation process. Two of the authors each created independently generated list of items. Each item was designed to not only map to the construct but also describe a single behavior. Items were generated from both theoretical mechanisms to ensure broad coverage of the domain space.

Sample and procedure

To provide an empirical assessment our items, we recruited an initial sample of adults with full-time jobs (N = 197) via Amazon's Mechanical Turk (MTurk) for a paid study on workplace behaviors. MTurk is a service which provides access to a gig economy labor pool which many researchers have used as a pool of research participants. Methods researchers have found that MTurk samples often produce data of better quality than university subject pools,[40] and which yields similar results as data from other more traditional studies[41]. Many MTurk workers have full-time employment outside of MTurk. Our study was limited to such participants who had full-time employment outside of MTurk.

Because (a) online samples can suffer from inattentiveness and (b) our primary interest in this analysis examines inter-item correlations, respondents were removed for evidence of satisficing behavior such as straight-lining answers.[42] The median age of respondents in the final sample was 31 years; 57% of were female, and 78% were Caucasian. Respondents were asked to take a brief descriptive survey about their primary supervisor at work. The survey consisted of demographic questions and a preliminary 17-item leader sleep devaluation scale.

Analysis and results

Inter-item correlation and reduction. We evaluated inter-item correlations for the original 17-item scale to determine scale cohesion and initial candidates for elimination (Table 2). Items were evaluated in an iterative process by dropping the lowest ones and then recalculating inter-item correlations until all average inter-item correlations were more than a .40 threshold.[39] Reverse-coded items (3, 7, and 9) showed low average inter-item correlation (well below .40), which could indicate that leader behaviors which improve employee sleep are different than the simple opposite of leader sleep devaluation. In addition, the caffeine-related items (6 and 11) and the nap item (15) showed lower average inter-item correlations, possibly indicating that these behaviors were possibly too specific or not closely related to the theoretical definition of leader sleep devaluation. Finally, the item referring to all-nighters (10) was dropped as it was still lower than the correlation threshold of .40. After this removal, the remaining ten items displayed average correlations higher than .40 and were retained for further analysis in Study 2.

Items for leader sleep devaluation scale

Instructions: Please indicate the degree to which you agree with each of the following statements about your primary supervisor:

Response options: 1= Strongly Disagree, 2=Disagree, 3=Neither Agree nor Disagree, 4=Agree, 5=Strongly Agree

1. My supervisor talks about getting by with little sleep (RM)
2. My supervisor suggests that sleep is not very important (RM)
3. My supervisor's actions suggest that sleep is a lower priority than work (RM)
4. My supervisor says that he/she does not need much sleep (RM)
5. My supervisor often sends out messages at times when most other people with his/her work schedule would be asleep (RM)
6. My supervisor rewards people for prioritizing work over sleep (BS)
7. My supervisor punishes people for prioritizing sleep over work (BS)
8. My supervisor rewards people for responding to work messages during normal sleep hours (BS)
9. My supervisor punishes people for not being willing to work late at night (BS)
10. My supervisor expects me to respond quickly to emails/texts at all hours of the day or night (RM)

Note: None of these items require reverse coding.
RM=Role Modeling
BS=Behavioral Shaping

Appendix C: Measure development study – content adequacy

Demonstration of the content adequacy of a scale ensures that measurement items broadly and evenly cover the defined domain space. In the following study, we use the ANOVA content validity procedure outlined by Hinkin and Tracey[43] and suggested by Mackenzie, Podsakoff and Podsakoff[44] to demonstrate the adherence of items to our theoretical definitions.

Participants and methods

We circulated a survey link via email to management faculty and doctoral students with an interest or expertise in leadership. A total of 84 subjects responded with complete surveys, with 18% being faculty and 82% being doctoral students. Subjects received the overall definition of the construct ("…processes that leaders engage in which send a message to followers that sleep should be sacrificed for work") and then definitions of role modeling and behavior shaping as applied to our construct. Subjects then assessed the degree to which each item fit on our two subdomains of leader sleep devaluation using a 5-point Likert scale ranging from "Not at all" to "Completely". Item sequences were randomized to reduce order effects.

Analysis and results

We performed one-way ANOVAs for each item between the mean ratings on each subdomain to evaluate whether differences between the two ratings were statistically significant. One advantage of this approach is that it provides an objective test of content validity rather than relying solely on subjective evaluations. All ten items retained from Study 1 exhibited statistically significant differences ($p < .05$, two-tailed) between the mean ratings for the two dimensions (role modeling and behavior shaping), and the pattern of these item

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mean ratings matched our theoretical assumptions. Because the items evenly cover the two subdomains of behavior shaping and role modeling, we retained all ten items for use in further analysis. Appendix B lists these items. It is worth noting that not all items will be relevant to every context, so researchers intending to use this scale should only use the items relevant to their context.

Appendix D: Dimensionality, convergent and discriminant validity

With a ten-item measure of leader sleep devaluation that demonstrates content validity, we then sought to determine if our scale distinguishes from other positive and negative leadership constructs. In addition, we use these studies to evaluate the factor structure of our scale.

Method

Sample and procedure

Two independent samples were collected for this study. In the first sample (Sample A), subjects were recruited from MTurk for a paid study on workplace behaviors (N = 204). This sample had a median age of 31 years, 59% identified as male and 78% identified as Caucasian. Again, participants displaying satisficing behaviors were removed from the sample.

For the second sample, (Sample B), subjects were recruited from a Qualtrics-sourced panel for a paid study on workplace behaviors (N = 246). This sample had a median age of 40 years, 52% identified as male and 80% identified as Caucasian. Participants failing any of three attention checks (e.g. "Choose 'Somewhat unlikely' for the answer") were removed from the data.

Measures: *Leader sleep devaluation* was measured in both studies using the ten-item scale from Study 2.

To evaluate the impact of *social desirability* on responses to our scale, we used the 13-item short form of the Marlowe-Crowne social desirability scale[45] in Sample A. Sample items include "I am always courteous, even to people who are disagreeable" and "No matter who I'm talking to, I'm always a good listener."

In Sample A, we also measured related leader-subordinate constructs that might be reasonably expected to impact sleep and thus should be related (but not equivalent) to leader sleep devaluation. *Abusive supervision* was measured with the 15-item scale developed by Tepper.[31] *Ethical leadership* was measured with the 10-item ethical leadership scale.[46] To measure *leader social support*, we used the 5 item scale developed by Eisenberger et al.[47] *Leader-member exchange* was evaluated using the 8-item scale from Liden, Wayne and Stilwell.[48] *Leader satisfaction* was measured with a 4-item subscale of the job satisfaction scale developed by Spector.[49] *Leader trust* was measured with the 11-item scale developed by McAllister.[50] Finally, *leader justice perceptions* were evaluated with the 4-item interpersonal justice subscale developed by Colquitt.[51]

Analysis

For discriminant validity, we analyzed the data in Sample A using the method demonstrated by Shaffer, DeGeest, and Li.[52] With this approach, the focal construct (in this case, sleep devaluing leader behavior) is analyzed in a pairwise fashion with other theoretically related constructs. Two types of criteria are used to determine whether the two sets of items represent similar or different latent constructs—changes in fit indices (χ^2 for absolute fit and CFI for relative fit) and correlations (both raw and disattenuated) between the latent constructs. Changes in fit indices were evaluated with a set of nested CFA models, using the *lavaan* package. In Model 1, the appropriate items were loaded onto two latent constructs (e.g. leader sleep devaluation and abusive supervision), and the latent constructs were allowed to freely covary. In Model 2, the same model was used except that the correlation between the latent constructs was fixed to 1.0. A comparison of fit indices between the two models (and hypothesis testing for the changes in χ^2) provides evidence for the distinctiveness of the two constructs.

Second, construct-level correlations provide additional evidence for or against the discriminant validity of each pairwise comparison. Shaffer and colleagues suggest looking at both raw correlations and disattentuated correlations. The latter accounts for measurement error in the two latent constructs, which can artificially reduce the raw correlations. When determining whether or not two constructs are distinct, attenuation owing to measurement error can mistakenly lead analysts to falsely find discriminant validity where it does not exist. Although the Shaffer et al.[52] approach uses multiple measurements of the same construct to control for measurement error, our research design did not allow for this method. Instead, we use the correction method described by Revelle,[53] dividing raw correlations by the square roots of the reliabilities of each scale.

In addition to discriminant analysis, we also explored the dimensional structure of our scale with confirmatory factor analyses in both samples using the *lavaan* package.

Results

Table 1 shows the raw correlations among all measured constructs for Study 3A. Table 2 shows both the changes in model fits between the nested models, as well as disattenuated and raw correlations between latent constructs. Shaffer et al.[52] suggest that constructs are distinct (i.e. demonstrate discriminant validity) when changes in χ^2 are significant, when changes in CFI exceed .002, and construct correlations are less than .85. Using these thresholds, the results indicate that leader sleep devaluation is empirically distinct from all of the measures included in this study.

In adition, we see that leader sleep devaluation fits in an expected place in the larger nomological network, providing evidence of convergent validity. Leader sleep devaluation is moderately and positively related to other constructs that reduce employee sleep such as abusive supervision ($r = .44$). Conversely, leader sleep devaluation is moderately and negatively related to generally helpful leader-employee constructs such as leader social support ($r = -.21$), ethical leadership ($r = -.21$), leader-member exchange ($r = -.25$), leader satisfaction ($r = -.33$), leader trust ($r = -.23$), and leader justice perceptions ($r = -.27$). Finally, leader sleep devaluation does not demonstrate a significant correlation with social desirability ($r = -.09$).

Regarding dimensionality, we conceptualized leader sleep devaluation as a unidimensional construct with two correlated subdomains (behavior shaping and role modeling). Although the difficulty of determining the "true" number of factors in a scale is well documented,[37,53–55] exploring the factor structure is an important step in the scale development process. To do so, we conducted a confirmatory factor analysis (CFA) with the data from both samples. Specifically, we compared a one-factor model in which all items loaded upon a single latent construct against a two-factor model in which the items split into behavior shaping and role modeling sub-factors. Further, since our measure displays a non-normal distribution, we tested our CFAs with both a maximum likelihood estimator, as well as a diagonally weighted least squares estimator.[56] Model fit is better in the two-factor model, but the latent factor correlation is also exceptionally high ($r = .87$ for Sample A, $r = .81$ for Sample B).

Given the (a) the sufficiency of the one-factor solution, (b) the extremely high factor correlation in the two-factor solutions, (c) the ambiguity of determining the "correct" number of factors,[37,53–55] and (d) the theoretical emphasis of this manuscript focused on initial scale validation (and not differential predictions between

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Sample A Correlation Matrix

	M	SD	1	2	3	4	5	6	7	8	9
1. Abusive supervision	1.82	0.89	*.96*								
2. Leader social support	3.28	0.86	−.61	*.90*							
3. Ethical leadership	3.58	0.81	−.67	.78	*.93*						
4. LMX	3.55	0.88	−.69	.78	.84	*.93*					
5. Leader satisfaction	3.77	0.96	−.79	.74	.81	.82	*.88*				
6. Leader trust	3.39	0.91	−.66	.79	.87	.86	.85	*.94*			
7. Leader justice perceptions	3.91	0.95	−.70	.72	.84	.80	.82	.83	*.93*		
8. Social desirability	3.03	0.77	−.20	.12	.09	.12	.11	.08	.12	*.88*	
9. Leader sleep devaluation	2.37	0.90	.44	−.21	−.21	−.25	−.33	−.23	−.27	−.09	*.92*

N = 204; $p < .05$ for correlations greater than .14; scale alphas in diagonal.

Sample A discriminant validity analysis:

Construct paired with leader sleep devaluation	Δ χ^2	Δ CFI	Disattenuated correlation	Raw correlation
1. Abusive supervision	45.31	.011	.47	.44
2. Leader social support	76.73	.041	−.23	−.21
3. Ethical leadership	68.45	.025	−.23	−.21
4. LMX	72.38	.029	−.27	−.25
5. Leader satisfaction	57.34	.033	−.37	−.33
6. Leader trust	51.27	.016	−.25	−.23
7. Leader justice perceptions	56.22	.027	−.29	−.27
8. Social desirability	117.24	.053	−.10	−.09

N = 204; all changes in χ^2 were $p < .05$
"Δ" reports fit changes between the unrestricted model and the model where construct correlations were fixed to 1.0.

Sample A & B results of confirmatory factor analysis

Estimator factors	Sample A (N = 204)				Sample B (N = 246)			
	ML		DWLS		ML		DWLS	
	One	Two	One	Two	One	Two	One	Two
df	35	34	35	34	35	34	35	34
χ^2	121.37	78.72	27.73	15.94	216.33	113.08	34.45	18.50
p	.00	.00	.80	1.00	.00	.00	.50	.99
Δ χ^2	-	42.65	-	11.79	-	103.25	-	15.95
CFI	0.93	0.96	1.00	1.00	0.88	0.95	1.00	1.00
TLI	0.91	0.95	1.00	1.01	0.84	0.93	1.00	1.01
SRMR	0.05	0.04	0.05	0.04	0.06	0.05	0.06	0.05
RMSEA	.11 [.09,.13]	.08 [.06,.10]	.00 [.00,.03]	.00 [.00,.00]	.15 [.13,.16]	.10 [.08,.12]	.00 [.00,.05]	.00 [.00,.00]
AIC	5408.39	5367.78	-	-	6161.12	6059.87	-	-
BIC	5474.75	5437.46	-	-	6231.23	6133.48	-	-
AVE	0.54	0.58	-	-	0.52	0.58	-	-
Factor *r*	-	.87	-	-	-	.81	-	-

ML = maximum likelihood; DWLS = diagonally weighted least squares; Δ χ2 = change in chi-square between one- and two-factor models; AVE = average variance extracted; Factor *r* = correlation between latent factors.
NOTE: AIC and BIC depend on ML estimation and are thus unavailable for the DWLS models

subdomains), subsequent analyses in this article take a parsimonious approach and use leader sleep devaluation in a unidimensional fashion. However, we anticipate that future research could explore differential predictions for role modeling and behavior shaping processes.[1]

[1] Whether a construct should be examined from a unidimensional perspective or a multidimensional perspective should depend on the research question being examined in any given article. For example, in the organizational justice literature, some research focuses on the differential impact of subdimensions of justice,[51] which requires a multidimensional approach to the construct. In contrast, other research examines the overall impact of the combined dimensions in an inherently unidimensional approach.[58] Neither is the single right or wrong approach, it is a matter of which is most appropriate for a given research question. Similarly, future researchers examining leader sleep devaluation may differ in their conceptual approach and choose a unidimensional or multidimensional approach, depending on their models.

Appendix E: Further discriminant validity

We sought to demonstrate that our scale measures a different construct than the sleep leadership scale developed by Gunia and colleagues.[57] In this Appendix, we report the results of a study designed for this purpose.

Participants and methods

We recruited a sample of 158 adults from Prolific (www.prolific.co) from primarily English-speaking countries (Australia, Canada, Ireland, New Zealand, United Kingdom, United States of America). All participants in the sample had full-time, day-shift jobs and reported directly to a supervisor. The sample was 45.5% male, with a median age of 38 years. A broad variety of job functions were represented

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Correlation matrix

	M	SD	1	2	3	4	5
1. Leader sleep devaluation	1.82	0.71	(.90)				
2. Sleep leadership	1.52	0.61	.18	(.88)			
3. Abusive supervision	1.51	0.71	.49	.05	(.96)		
4. Sleep quantity (hours)	7.11	0.93	−.09	.10	−.24	-	
5. Sleep quality	3.48	1.06	−.26	.04	−.28	.34	(.83)

N = 158 individuals.
Cronbach's alpha in parentheses.
r equal to or greater than .16 are $p < .05$.

Confirmatory Factor Analysis comparison

Model	χ^2 (*df*)	Δ χ^2 (*df*)	CFI	TLI	AIC	BIC	RMSEA [95% CI]	SRMR
0: One-factor model	2388.30*** (527)		0.54	0.51	12200.2	12411.4	0.15 [0.14,0.15]	0.16
1: Proposed model	1260.98*** (524)	−1127.31*** (3)	0.82	0.80	11078.9	11299.4	0.09 [0.09,0.10]	0.08
2: SL & LSD together	1943.45*** (526)	−444.84*** (1)	0.65	0.63	11757.3	11971.6	0.13 [0.12,0.13]	0.19
3: SL & AS together	1935.37*** (526)	−452.92*** (1)	0.65	0.63	11749.3	11963.6	0.13 [0.12,0.13]	0.14
4: AS & LSD together	1721.76*** (526)	−666.54*** (1)	0.70	0.68	11535.6	11750.0	0.12 [0.11,0.12]	0.12

N = 158 individuals.
Δχ^2 (*df*) is relative to Model 0.
*** = $p < .001$.

in the sample.

Participants filled out two electronic surveys administered on different days. In the initial survey, participants answered questions regarding their direct supervisor, as well as demographic information. In the second survey, participants answered several questions regarding their sleep patterns over the last week.

Measures

Leader sleep devaluation, abusive supervision, and sleep quality were measured with the same scales used in Studies 2A and 2B. However, in this study the items for sleep quality refer to the prior week's sleep. Sleep quantity was measured with a one-item retrospective question asking participants to estimate how much nightly sleep they had on average over the last week. Sleep leadership was measured with nine-item scale from Gunia et al.[57] Items were rated on a five-point frequency scale ranging from "never" to "always". A sample item is "In your organization, your leaders encourage employees to get adequate sleep." Cronbach's alpha for this scale in this sample was .88

Analysis

Confirmatory factor analysis was used to establish the discriminant validity of the three leadership scales. After this, path analysis was used to evaluate the predictive validity for these leadership scales on sleep. All analyses were performed using the *lavaan* package in *R*.

Results

Leader sleep devaluation shows a pattern of results that is similar to prior studies. We were surprised to find that sleep leadership shows a slight positive correlation to leader sleep devaluation, even though these scales have opposite valences. It is possible that this represents some degree of measurement error. It may also reflect the fact that the majority of leaders do not talk much about sleep (sleep devaluing leader behavior: M = 1.82, SD = 0.71; sleep leadership: M = 1.52, SD=0.61), meaning most leaders would score low on both scales.

To evaluate discriminant validity between leader sleep devaluation, sleep leadership, and abusive supervision, a series of nested CFAs were evaluated. Model 0 ($\chi^2 = 2388.30$, $df = 527$, $p < .001$, CFI = 0.54, TLI = 0.51) loaded all scale items onto one omnibus factor, whereas Model 1 ($\chi^2 = 1260.98$, $df = 524$, $p < .001$, CFI = 0.82, TLI = 0.80) separates each scale into corresponding latent constructs. The model fit statistics for Model 1 are superior to Model 0, thus we find support for considering all three measures as representative of different constructs. Further, we evaluated three models that combined two of the constructs together. Model 2 ($\chi^2 = 1943.45$, $df = 526$, $p < .001$, CFI = 0.65, TLI = 0.63) combined sleep leadership and leader sleep devaluation, Model 3 ($\chi^2 = 1935.37$, $df = 526$, $p < .001$, CFI = 0.65, TLI = 0.63) combined sleep leadership and abusive supervision, and Model 4 ($\chi^2 = 1721.76$, $df = 526$, $p < .001$, CFI = 0.70, TLI = 0.68) combined leader sleep devaluation and abusive supervision. None of the fit statistics for these three models were superior to Model 1, supporting the discriminant validity of these three scales.

To evaluate the relative predictive validity of these three scales, we tested their simultaneous effect on sleep quantity and quality with a path analysis. Leader sleep devaluation behaves in the expected fashion regarding sleep quality ($b = -0.26$, $p < .05$) but not sleep quantity ($b = 0.02$, *ns*). In comparison, sleep leadership displays non-significant effects on both outcomes. This may reflect the fact that the sleep leadership scale was developed for use in military samples, but our sample was a general business sample.

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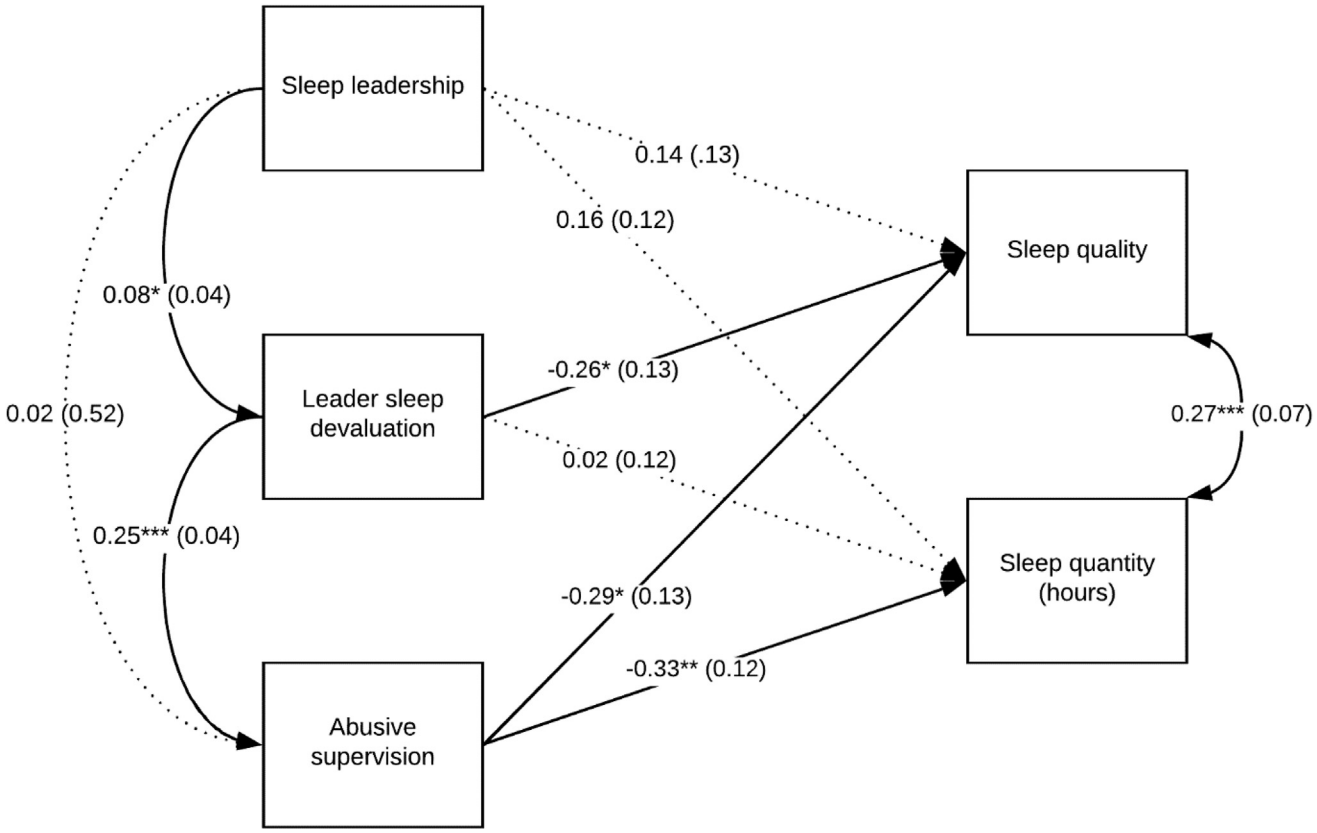

N = 158 individuals. Unstandardized coefficients shown, standard errors in parentheses. *** = $p < .001$, ** = $p < .01$, * = $p < .05$, † = $p < .10$.

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