



The Insulating Function of Sleep for Well-being: Daily Sleep Quality Attenuates the Link Between Current Affect and Global Life Satisfaction

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Abstract

Transient affect can be tightly linked with people's global life satisfaction (i.e., *affect globalizing*). This volatile judgment style leaves life satisfaction vulnerable to the inevitable highs and lows of everyday life, and has been associated with lower psychological health. The present study examines a potentially fundamental but untested regulatory role of sleep: insulating people's global life satisfaction from the affective highs and lows of daily life. We tested this hypothesis in two daily diary samples ($N_1 = 3,011$ daily diary observations of 274 participants and $N_2 = 12,740$ daily diary observations of 811 participants). Consistent with preregistered hypotheses, following nights of reported high-quality sleep, the link between current affect and global life satisfaction was attenuated (i.e., lower affect globalizing). Sleep-based interventions are broadly useful for improving psychological health and the current findings suggest another avenue by which such interventions may improve well-being: by providing crucial protection against the risks associated with affect globalizing.

Keywords Affect · Affect globalizing · Life satisfaction · Sleep · Well-being

Introduction

Sleep helps regulate many psychological processes, including affective experiences. For example, high-quality sleep has been associated with greater positive affect and lower negative affect and is implicated in affective memory and regulation (Kahn et al., 2013; Palmer & Alfano, 2017; Walker, 2009). The present research examined a potentially fundamental but untested regulatory role of sleep: insulating people's global life satisfaction from the affective highs and lows of daily life. Transient affective experiences (i.e., how one feels in a given moment) can sometimes be tightly linked with global life satisfaction (i.e., how satisfied one is with their life as a whole). For example, positive affect during a joyful outing with friends can lead to a temporary

boost in global life satisfaction, but negative affect during a frustrating long drive home can lead to a temporary dip in global life satisfaction. When transient affective states are too tightly linked with overall life satisfaction, however, it reflects a volatile judgment style, called *affect globalizing* (Willroth et al., 2020). Given the importance of sleep for improving cognitive and affective processes more broadly (Walker, 2009), sleep may play an important role in reducing affect globalizing—helping people's life satisfaction remain resilient to transitory affective experiences.

Although *average* affect across time is expected to be associated with life satisfaction (Diener et al., 1999), life satisfaction should not necessarily vary in the short-term along with *transient* affective ups and downs. Instead, life satisfaction should be relatively stable, reflecting overall quality of life. When life satisfaction reflects the overall quality of one's life, it can be used as an important barometer for how one's life is going. Low life satisfaction signals that action is needed to improve the quality of one's life, whereas high life satisfaction signals that no action is needed. Yet, prior research has shown that global life satisfaction can and does vary from day to day for many people, due in part to affect globalizing (Willroth et al., 2020). Affect globalizing drives dramatic short-term fluctuations in life satisfaction, rendering this signal system dysfunctional, which may be

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detrimental for psychological health. Although it may seem good to get a life satisfaction boost from positive affect, the transient nature of affect means that this boost will be short-lived and when positive affect is low, life satisfaction will decrease. Thus, both negative and positive affect globalizing lead to greater short-term variability in life satisfaction, which in turn, has been associated with worse psychological health (e.g., higher depressive symptoms and lower psychological well-being; Willroth et al., 2020).

Identifying the factors that predict affect globalizing is an important step in understanding why affect globalizing occurs and how to reduce it. Sleep is a promising predictor of affect globalizing given sleep's importance for many affective and cognitive processes (Walker, 2009). For example, high-quality sleep has been associated with greater positive affect and lower negative affect (Kahn et al., 2013) and with higher life satisfaction (Howell et al., 2008; Ness & Saksvik-Lehouillier, 2018; Pilcher & Ott, 1998; Piper, 2016; Shin & Kim, 2018). Above and beyond these main effects of sleep on affect and life satisfaction, high-quality sleep may attenuate the link between current affect — either negative or positive — and life satisfaction in at least three ways. First, high-quality sleep may support the complex cognitive task of differentiating between transient affective experiences and how well one's life is going overall. Indeed, prior work has shown that sleep deprivation is associated with reduced cognitive functioning (Alhola & Polo-Kantola, 2007) and greater reliance on heuristics (Engle-Friedman et al., 2018). Thus, low-quality sleep or too little sleep may impede cognitive functioning and increase the extent to which individuals rely on their transient affect as a heuristic for their global life satisfaction. In contrast, high-quality sleep may support the relatively more complex cognitive task of evaluating the stable characteristics of one's life, in turn reducing affect globalizing.

Second, high-quality sleep supports affective memory processes that are likely important for maintaining stable life satisfaction. When people make judgments about their life satisfaction, they can use different processes: For example, direct retrieval processes involve retrieving a stable sense of life satisfaction directly from memory, whereas constructive processes involve constructing life satisfaction from currently accessible information (Robinson & Klein 2018). Affect globalizing reflects constructivist processes, as it involves constructing one's life satisfaction at least in part from current affect, but high-quality sleep may shift people away from these constructivist processes by facilitating direct retrieval processes. Specifically, given that high-quality sleep is important for affective memory encoding and consolidation (van der Helm & Walker, 2010), sleep may play an important role in facilitating the development and retrieval of a stable sense of life satisfaction, in turn reducing affect globalizing.

Third, high-quality sleep may support next-day emotional specificity and sensitivity. REM sleep in particular may serve an overnight “emotional resetting” function (Goldstein & Walker, 2014), supporting differentiation between salient and non-salient affective information. This recalibration function has been proposed to guide appropriate decision making and action (Goldstein & Walker, 2014), and in this case may guide appropriate evaluations of one's life satisfaction. In sum, there are multiple accounts suggesting sleep may serve the psychologically-beneficial role of insulating global life satisfaction from transient affective highs and lows, but this role has not yet been tested.

The Current Investigation

The current investigation examined whether higher-quality sleep attenuates the link between current affect and global life satisfaction (i.e., affect globalizing) at both the within- and between-person levels (see Fig. 1). At the within-person level, the quality of people's sleep fluctuates across days: Person A might sleep poorly on Tuesday night but sleep well on Wednesday night. In turn, Person A's good sleep on Wednesday night might attenuate the link between their current affect and their global life satisfaction on Thursday. At the between-person level, people differ from one another in the average quality of their sleep: Person A might get higher-quality sleep on average than Person B. In turn, Person A's better average sleep quality might lead to a weaker average link between their current affect and their global life satisfaction (compared to Person B). At both levels of analysis, we examined whether sleep weakens the link between current negative affect and life satisfaction (i.e., negative affect globalizing) and between current positive affect and life satisfaction (i.e., positive affect globalizing).

After conducting exploratory analyses in one sample (Sample A, $N=274$), we preregistered two sets of hypotheses in a larger second sample (Sample B, $N=811$). The preregistration is available on OSF [<https://osf.io/vdr7s/>]. See Table 1 for definitions of key study constructs and the relationships between those constructs and the preregistered study hypotheses.

The first set of hypotheses concerns within-person effects of sleep quality on affect globalizing: (H1a) Following nights of higher-quality sleep, the association between current negative affect and life satisfaction will be weaker (i.e., lower negative affect globalizing); (H1b) Following nights of higher-quality sleep, the association between current positive affect and life satisfaction will be weaker (i.e., lower positive affect globalizing). The second set of hypotheses concerns between-person effects of sleep quality on affect globalizing: (H2a) People with higher average sleep quality will have a weaker association between their current negative affect and life satisfaction (i.e., lower negative affect

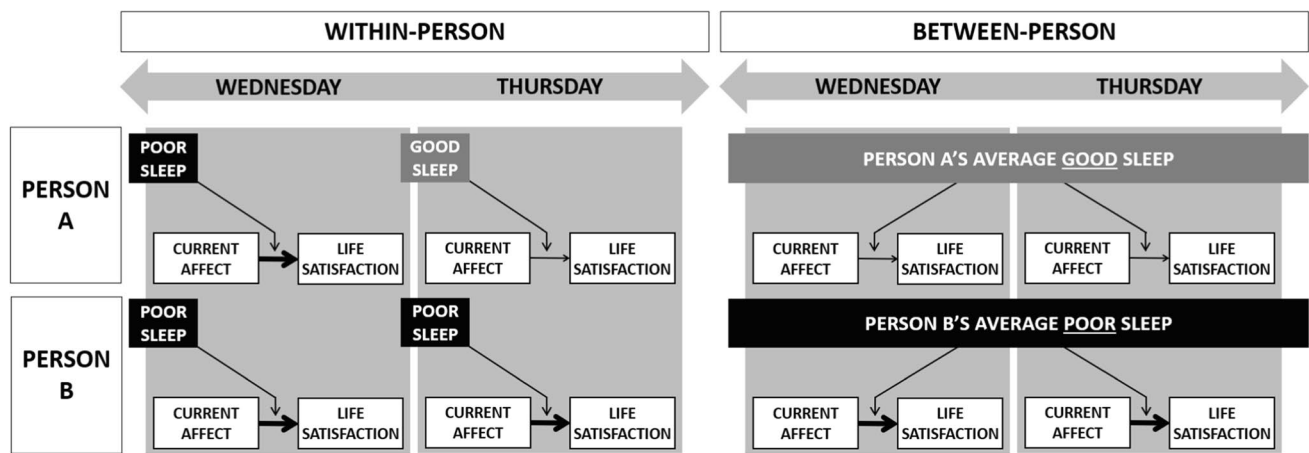


Fig. 1 Visual depiction of how higher sleep quality (at the within- and between-person level) could attenuate affect globalizing. Affect globalizing is operationalized as the within-person link between current affect and life satisfaction, both measured at the daily level (see white boxes within figure), with attenuated affect globalizing denoted as a thinner vs. thicker arrow between current affect and life satisfac-

tion. Within-person sleep quality fluctuates across days and a night of good sleep could attenuate affect globalizing the next day (see Thursday for Person “A”). Between-person sleep quality differs between people on average and good sleep on average could attenuate affect globalizing in daily life (see Wednesday and Thursday for Person “A”)

globalizing); (H2b) People with higher average sleep quality will have a weaker association between their current positive affect and life satisfaction (i.e., lower positive affect globalizing).

We focused our hypotheses on sleep quality based on initial exploratory findings in Sample A and based on prior research suggesting that sleep quality (compared to sleep quantity) has stronger effects on affect and life satisfaction (Ness & Saksvik-Lehouillier, 2018; Pilcher & Ott, 1998; Pilcher et al., 1997). However, we also conducted exploratory analyses to test whether sleep interval (i.e., the interval between sleep time and wake time) was associated with a weaker link between current affect and global life satisfaction (i.e., lower affect globalizing). To provide a strong test of the link between sleep and affect globalizing, we controlled for main effects of both sleep variables and affect variables on life satisfaction.

Method

Participants

Participants provided informed consent and all procedures were approved by the institutional ethics review board. Two socioeconomically diverse (Sample A: M income = 4.99 on a 1–9 scale where 5 = \$50,000–\$75,000, SD = 1.74 scale points; Sample B: M income = 4.65 on a 1–9 scale where 4 = \$35,000–\$50,000 and 5 = \$50,000–\$75,000, SD = 1.74 scale points) and politically diverse (Sample A: 65% Democrat, 35% Republican; Sample B: 43% Democrat, 30% Republican, 27%

Independent) samples of U.S. participants were collected as part of two larger studies. After completing a baseline questionnaire in Qualtrics, participants then downloaded a smartphone app (ExperienceSampler; Thai & Page-Gould, 2018) used to administer 2 weeks (Sample A) or 3 weeks (Sample B) of daily surveys. For each daily survey, participants received a notification on their phone at 8PM (participant’s local time) that their survey was ready. Reminder notifications were sent at 10PM to participants who had not completed their survey. After midnight, the survey was no longer available, and was considered missed.

Sample A includes 3,011 daily diary observations of 274 U.S. adults recruited from Amazon’s Mechanical Turk (19–74 years of age, M_{age} = 38 years, SD_{age} = 11 years; 64% women; 77% European American/White/Caucasian, 9% African or African American, 5% Asian or Asian American, 6% Middle Eastern American, 1% Native American, < 1% Latino/Hispanic/Mexican American, 1% other racial or ethnic identity, 1% did not report their racial or ethnic identity). Sample B includes 12,740 daily diary observations of 811 US adults recruited from Amazon’s Mechanical Turk (19–78 years of age, M_{age} = 37 years, SD_{age} = 11 years; 57% women; 80% European American/White/Caucasian, 7% African or African American, 6% Asian or Asian American, 5% Latin/Hispanic/Mexican American, < 1% Middle Eastern or Middle Eastern American, < 1% Native American, and 1% other racial or ethnic identity). Following published guidelines (McCabe et al., 2012), we excluded from analysis all item-level responses made in 300 ms or less. If more than 50% of items within a nightly survey had response times less than or equal to 300 ms, the entire survey was excluded.

Table 1 Definitions of key constructs and preregistered study hypotheses

	Negative affect globalizing: Within-person association between <i>current</i> negative affect and <i>daily</i> judgments of <i>global</i> life satisfaction	Positive affect globalizing: Within-person association between <i>current</i> positive affect and <i>daily</i> judgments of <i>global</i> life satisfaction
Within-person effects of sleep quality: Better or worse quality sleep on any given night compared to one's average sleep quality	Hypothesis 1a: Following nights of higher-quality sleep (compared to nights of lower-quality sleep), the association between current negative affect and life satisfaction will be weaker (i.e., lower negative affect globalizing)	Hypothesis 1b: Following nights of higher-quality sleep (compared to nights of lower-quality sleep), the association between current positive affect and life satisfaction will be weaker (i.e., lower positive affect globalizing)
Between-person effects of sleep quality: Average sleep quality across nights compared to other people	Hypothesis 2a: People with higher-quality sleep on average (compared to people with lower-quality sleep) will have a weaker association between their current negative affect and life satisfaction (i.e., lower negative affect globalizing)	Hypothesis 2b: People with higher-quality sleep (compared to people with lower-quality sleep) on average will have a weaker association between their current positive affect and life satisfaction (i.e., lower positive affect globalizing)

Procedures

In each daily survey, participants reported their current negative and positive affect, then their life satisfaction, and finally sleep quality and sleep interval for the previous night. Current affect was assessed at the beginning of the daily survey, followed by a single item about depression and then the life satisfaction item. Then, participants completed several items about psychological and physical health and work/relationship satisfaction before responding to the sleep items. After all of the items used in the present investigation were assessed, each daily survey also included additional items related to the aims of the larger studies. Descriptive statistics are displayed in text and in Table S1 in the supplementary online materials. Bivariate correlations among study variables are displayed in Table S2.

Measures

Sleep Quality

To assess sleep quality, participants responded to the question “How was your sleep last night?”. In Sample A, response options ranged from 1 (very poor) to 5 (excellent) with a mean of 3.48 ($SD = 1.11$). In Sample B, response options ranged from 0 (very poor) to 5 (excellent)¹ with a mean of 2.76 ($SD = 1.20$). The intraclass correlation coefficient (ICC) for sleep quality was 0.36 in Sample A and 0.46 in Sample B, indicating somewhat more within-person variance than between-person variance.

Sleep Interval

To assess sleep interval, participants responded to the questions “What time did you fall asleep last night?” and “What time did you wake up this morning?”. We calculated the difference between these two values to obtain a measure of sleep interval. However, some values were outside of the expected range, likely because participants entered their sleep or wake times incorrectly (e.g., AM rather than PM or vice versa). We preregistered that we would exclude or recode all sleep interval values less than 2 h and greater than 12 h (10.9% in Sample A, 10.5% in Sample B). If changing the AM/PM designation for the sleep or wake time

¹ After collecting data from Sample A, we changed the response scales of all sleep quality, current affect, and life satisfaction items in Sample B. For all measures, we changed the lower anchor from 1 to 0. For the life satisfaction measure, we replaced the scale anchors of “strongly disagree” to “strongly agree” with “not at all” to “very strongly” descriptors. By equating the lowest point of the scale with an absolute value (i.e., “0=not at all”), this revised scale enhances the interpretability of absolute mean level variables.

brought the sleep interval value within the 2- to 12-h range, we recoded the value (9.8% of the total values in Sample A; 9.1% of the total values in Sample B). If recoding the value did not bring the value within the 2- to 12-h range, we excluded the observation (1.1% of the total values in Sample A; 1.4% of the total values in Sample B). The recoded sleep interval variable had a mean of 7.77 h (SD = 1.55 h) in Sample A and a mean of 7.51 h (SD = 1.67 h) in Sample B. In sensitivity analyses, we checked whether results remained the same when excluding rather than recoding all extreme sleep interval values. Excluding rather than recoding these extreme values resulted in a change to the statistical significance of one effect, which we note in Footnote 4. The ICC for sleep interval was 0.29 in Sample A and 0.30 in Sample B, indicating more within-person variance than between-person variance.

Affect Globalizing

We operationalized affect globalizing as the within-person association between current affect and life satisfaction.² Current negative affect was assessed with the item “We’re interested in how you’re feeling right now. How negative do you feel?”. In Sample A, response options ranged from 1 (not at all negative) to 5 (extremely negative) with a mean of 1.83 (SD = 1.04). In Sample B, response options ranged from 0 (not at all negative) to 6 (extremely negative) with a mean of 1.00 (SD = 1.39). The ICC for negative affect was 0.31 in Sample A and 0.37 in Sample B, indicating more within-person variance as between-person variance.

Current positive affect was assessed with the item “We’re interested in how you’re feeling right now. How positive do you feel?”. In Sample A, response options ranged from 1 (not at all positive) to 5 (extremely positive) with a mean of 3.58 (SD = 1.14). In Sample B, response options ranged from 0 (not at all positive) to 6 (extremely positive) with a mean of 3.73 (SD = 1.55). In Sample A, the ICC for positive affect was 0.43 in Sample A and 0.51 in Sample B, indicating approximately equal within-person and between-person variance.

In both samples, participants were prompted to rate their daily judgments of their global life satisfaction. Global life satisfaction was assessed with the item “How much do you agree with this statement: Today, I felt satisfied with life.” Thus, satisfaction refers to satisfaction experienced that day

² In line with prior work on affect globalizing (Willroth et al., 2020), we focused our hypotheses on life satisfaction. However, we also conducted planned exploratory analyses to test whether sleep quality and interval were associated with a weaker link between current affect and other types of well-being (i.e., sense of purpose, optimism, and romantic relationship satisfaction). Results for these other types of well-being are reported in Supplementary Online Materials.

but the *target* of that satisfaction (one’s life) is global. In Sample A, response options ranged from 1 (strongly disagree) to 7 (strongly agree) with a mean of 5.09 (SD = 1.66). In Sample B, response options ranged from 0 (not at all) to 6 (very strongly) with a mean of 3.51 (SD = 1.73). The ICC for life satisfaction was 0.51 in Sample A and 0.63 in Sample B, indicating somewhat more between-person variance than within-person variance.

Analytic Approach

We tested our hypotheses with multilevel models, using an unstructured covariance matrix. Before running analyses, we first grand-mean centered sleep quality, sleep interval, negative affect, and positive affect by subtracting the sample mean from each daily value. Next, to examine between-person effects, we calculated each person’s mean sleep quality, mean sleep interval, mean negative affect, and mean positive affect across all of the diary days. Then, to examine within-person effects, we computed person-centered sleep quality, person-centered sleep interval, person-centered negative affect, and person-centered positive affect, by subtracting each person’s individual mean from their daily values. To quantify the size of interaction effects, we calculated simple slopes at two values of sleep quality: “poor” sleep (the response anchor for “2” in Sample A and for “1” in Sample B) and “good” sleep (the response anchor for “4” in both samples); and at two values of sleep interval: 6 h and 9 h (Preacher et al., 2006). We chose these values because they are close to +1 and –1 SD from the mean, but provide more interpretable simple slopes. Notably, 9 h may be considered maladaptively long sleep duration (Patel et al., 2006), but because we assessed sleep interval and did not account for sleep disturbances throughout the night, it is likely that a 9-h sleep interval reflects somewhat shorter and closer to ideal sleep duration.

To examine the effects of sleep quality on negative affect globalizing, we modeled random-intercept, random-slope multilevel models predicting daily ratings of global life satisfaction. To control for the main effects of sleep quality and affect on life satisfaction at both the between- and within-person levels, we included person-mean sleep quality, person-centered sleep quality, person-mean negative affect, and person-centered negative affect as predictors. We included a random intercept and random slopes of person-centered sleep quality and person-centered negative affect. We also controlled for fixed and random effects of diary day (Bolger & Laurenceau, 2013).³ To examine the *within-person* effect of sleep quality on negative affect globalizing (Hypothesis

³ The random effect of day was dropped from one model to achieve convergence.

Table 2 Within-person effects of sleep quality on affect globalizing

	Sample A (<i>N</i> = 274 participants, 3,002 observations)			Sample B (<i>N</i> = 811 participants, 12,686 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Negative affect globalizing (H1a) (outcome = life satisfaction)						
Intercept	5.10	4.99, 5.20	< .001	3.51	3.44, 3.59	< .001
Diary day	−0.01	−0.02, −0.00	.007	−0.00	−0.00, 0.00	.559
Person-mean sleep quality	0.38	0.22, 0.53	< .001	0.59	0.50, 0.68	< .001
Person-centered sleep quality	0.15	0.10, 0.19	< .001	0.18	0.15, 0.20	< .001
Person-mean negative affect	−1.11	−1.28, −0.94	< .001	−0.68	−0.76, −0.60	< .001
Person-centered negative affect	−0.60	−0.66, −0.53	< .001	−0.39	−0.41, −0.37	< .001
Person-centered sleep quality*	0.07	0.02, 0.12	.005	0.02	0.01, 0.04	.007
Person-centered negative affect						
Positive affect globalizing (H1b) (outcome = life satisfaction)						
	Sample A (<i>N</i> = 274 participants, 2,999 observations)			Sample B (<i>N</i> = 811 participants, 12,685 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Intercept	5.09	5.02, 5.16	< .001	3.52	3.47, 3.57	< .001
Diary day	−0.01	−0.02, −0.00	.016	−0.00	−0.01, 0.00	.150
Person-mean sleep quality	0.15	0.04, 0.27	.009	0.12	0.05, 0.19	< .001
Person-centered sleep quality	0.12	0.07, 0.16	< .001	0.12	0.10, 0.14	< .001
Person-mean positive affect	1.29	1.18, 1.39	< .001	1.01	0.96, 1.07	< .001
Person-centered positive affect	0.64	0.58, 0.70	< .001	0.51	0.49, 0.53	< .001
Person-centered sleep quality*	−0.05	−0.10, −0.00	.040	−0.02	−0.03, −0.00	.022
Person-centered positive affect						

The parameter corresponding to the key hypothesis test in each model is in bold

1a), we additionally modeled an interaction between person-centered sleep quality and person-centered negative affect. In a separate set of models, to examine the *between-person* effect of sleep quality on negative affect globalizing (Hypothesis 2a), we additionally modeled an interaction between person-mean sleep quality and person-centered negative affect. To examine the effects of sleep quality on positive affect globalizing (Hypotheses 1b and 2b), we used the same modeling approach but with positive affect rather than negative affect.

In both the within- and between-person models, the fixed effect of person-centered affect indicates the average degree of affect globalizing: a stronger negative coefficient for person-centered negative affect suggests that people's life satisfaction is lower when they are currently experiencing more negative affect (relative to when they are currently experiencing less negative affect). Similarly, a stronger positive coefficient for person-centered positive affect suggests that people's life satisfaction is higher when they are currently experiencing more positive affect (relative to when they are currently experiencing less positive affect). The key hypothesis test in each model is the interaction between sleep quality and person-centered affect. Across models, we expected higher-quality sleep to be associated with lower affect globalizing. In the *within-person*

models, we expected a significant interaction between person-centered sleep quality and person-centered affect, such that following nights of higher-quality sleep, the link between current affect and life satisfaction is weaker (lower affect globalizing). In the *between-person* models, we expected a significant interaction between person-mean sleep quality and person-centered affect, such that for people who sleep better on average, the link between current affect and life satisfaction is weaker (lower affect globalizing).

In exploratory analyses, we repeated the analyses described above using sleep interval as the predictor rather than sleep quality.

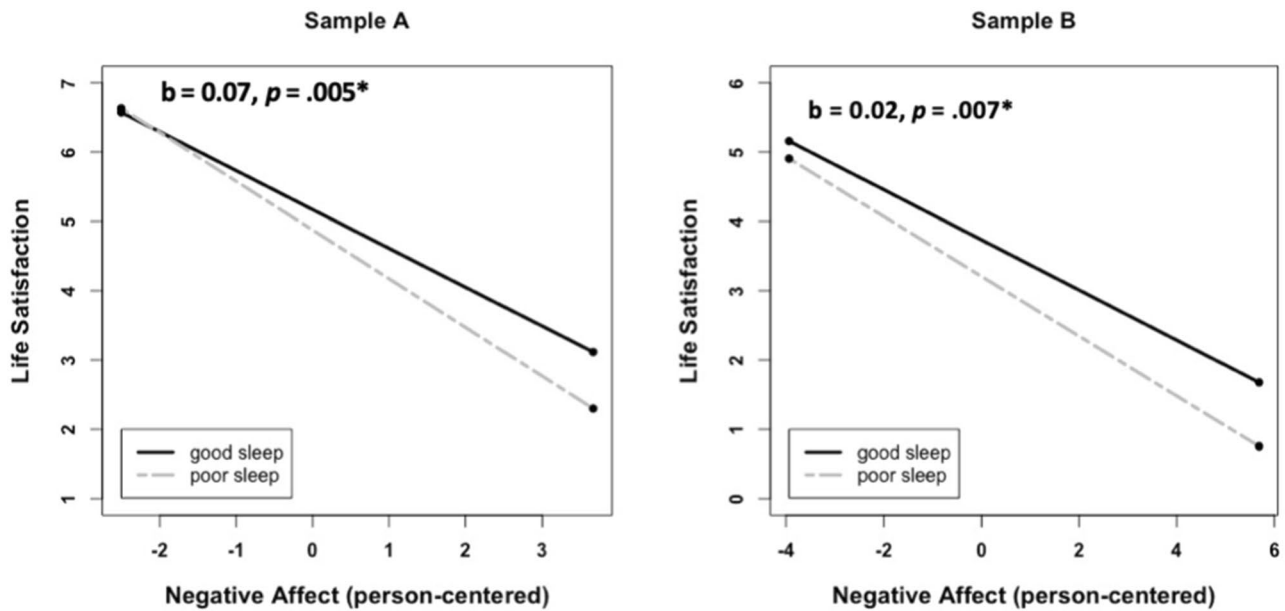
Results

All analyses were conducted in R Version 3.6 using the nlme (Pinheiro et al., 2021), chron (James & Hornik, 2020), and hms (Müller, 2019) packages.

Within-Person Effects of Sleep Quality on Affect Globalizing (Hypothesis 1)

Table 2 displays the full results from Hypothesis Tests 1a and 1b. Consistent with Hypothesis 1a, following nights

A Within-person Effects of Sleep Quality on Negative Affect Globalizing (H1a)



B Within-person Effects of Sleep Quality on Positive Affect Globalizing (H1b)

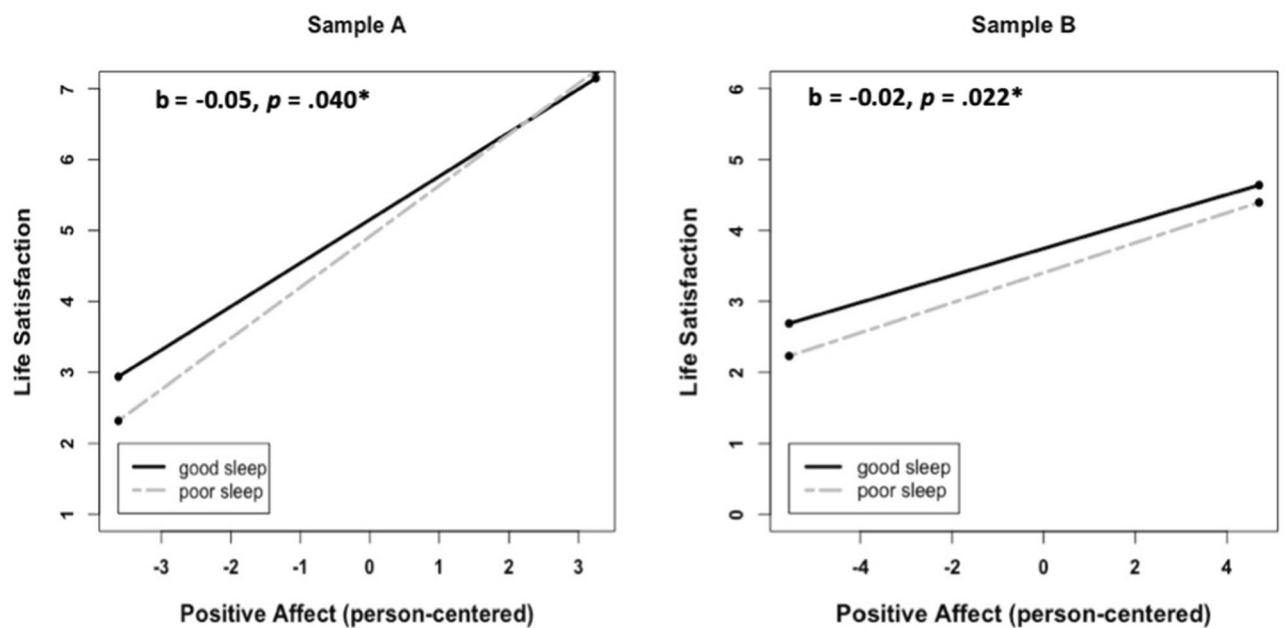


Fig. 2 Interactions between person-centered sleep quality and person-centered current affect predicting life satisfaction. Simple slopes are plotted for “poor sleep” (the response anchor for “2” in Sample

A and the response anchor for “1” in Sample B) and “good sleep” (the response anchor for “4” in both samples). The interaction b and p value are displayed in the upper left-hand corner of each plot

of higher-quality sleep, people engaged in less negative affect globalizing (see Fig. 2 Panel A). The interaction between person-centered negative affect and person-centered sleep quality was statistically significant in both samples (Sample A: $b = 0.07, p = .005$; Sample B: $b = 0.02, p = .007$), such that the link between negative

affect and lower life satisfaction was weaker following nights of higher-quality sleep. In Sample A, following nights of poor sleep, a one-unit increase in negative affect was associated with a 0.70 scale-point reduction in life satisfaction ($b = -0.70, SE = 0.05, p < .001$). Following nights of good sleep, this was attenuated to a 0.56

Table 3 Between-person effects of sleep quality on affect globalizing

	Sample A (N = 274 participants, 3,002 observations)			Sample B (N = 811 participants, 12,686 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Negative affect globalizing (H2a) (outcome = life satisfaction)						
Intercept	5.09	4.99, 5.19	< .001	3.51	3.44, 3.58	< .001
Diary day	−0.01	−0.02, −0.00	.011	−0.00	−0.00, 0.00	.542
Person-mean sleep quality	0.39	0.23, 0.54	< .001	0.59	0.50, 0.68	< .001
Person-centered sleep quality	0.15	0.11, 0.19	< .001	0.17	0.15, 0.20	< .001
Person-mean negative affect	−1.12	−1.29, −0.95	< .001	−0.68	−0.76, −0.60	< .001
Person-centered negative affect	−0.60	−0.66, −0.53	< .001	−0.39	−0.42, −0.37	< .001
Person-mean sleep quality*	0.04	−0.05, 0.13	.353	0.01	−0.02, 0.04	.644
Person-centered negative affect						
Positive affect globalizing (H2b) (outcome = life satisfaction)						
	Sample A (N = 274 participants, 2,999 observations)			Sample B (N = 811 participants, 12,685 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Intercept	5.09	5.01, 5.16	< .001	3.52	3.47, 3.56	< .001
Diary day	−0.01	−0.02, −0.00	.014	−0.00	−0.01, 0.00	.169
Person-mean sleep quality	0.16	0.05, 0.28	.005	0.12	0.05, 0.19	< .001
Person-centered sleep quality	0.12	0.07, 0.16	< .001	0.12	0.10, 0.14	< .001
Person-mean positive affect	1.29	1.18, 1.39	< .001	1.01	0.96, 1.07	< .001
Person-centered positive affect	0.64	0.58, 0.70	< .001	0.51	0.49, 0.53	< .001
Person-mean sleep quality*	−0.07	−0.15, 0.01	.093	−0.02	−0.05, 0.01	.200
Person-centered positive affect						

The parameter corresponding to the key hypothesis test in each model is in bold

scale-point reduction ($b = -0.56$, $SE = 0.04$, $p < .001$). Similarly, in Sample B, following nights of poor sleep, a one-unit increase in negative affect was associated with a 0.43 scale-point reduction in life satisfaction ($b = -0.43$, $SE = 0.02$, $p < .001$). Following nights of good sleep, this was attenuated to a 0.36 scale-point reduction ($b = -0.36$, $SE = 0.02$, $p < .001$).

Consistent with Hypothesis 1b, following nights of higher-quality sleep, people engaged in less positive affect globalizing (see Fig. 2 Panel B). The interaction between person-centered positive affect and person-centered sleep quality was statistically significant in both samples (Sample A: $b = -0.05$, $p = .040$; Sample B: $b = -0.02$, $p = .022$), such that the link between positive affect and higher life satisfaction was weaker following nights of higher-quality sleep. In Sample A, following nights of poor sleep, a one-unit increase in positive affect was associated with a 0.72 scale-point increase in life satisfaction ($b = 0.72$, $SE = 0.05$, $p < .001$). Following nights of good sleep, this was attenuated to a 0.61 scale-point increase ($b = 0.61$, $SE = 0.03$, $p < .001$). In Sample B, following nights of poor sleep, a one-unit increase in positive affect was associated with

a 0.54 scale-point increase in life satisfaction ($b = 0.54$, $SE = 0.02$, $p < .001$). Following nights of good sleep, this was attenuated to a 0.49 scale-point increase ($b = 0.49$, $SE = 0.02$, $p < .001$). The pattern of results (see Fig. 2 Panel B) is consistent with the idea that positive affect globalizing reflects greater life satisfaction dips when positive affect is low, and thus may be similarly maladaptive to negative affect globalizing.

Between-Person Effects of Sleep Quality on Affect Globalizing (Hypothesis 2)

Table 3 displays the full results from Hypothesis Tests 2a and 2b. Counter to our hypotheses, we did not find evidence that average sleep quality was associated with affect globalizing. The interaction between person-mean sleep quality and person-centered negative affect was statistically non-significant in both samples (Sample A: $b = 0.04$, $p = .353$; Sample B: $b = 0.01$, $p = .644$). The interaction between person-mean sleep quality and person-centered positive affect was also statistically non-significant in both samples (Sample A: $b = -0.07$, $p = .093$; Sample B: $b = -0.02$, $p = .200$).

Table 4 Within-person effects of sleep interval on affect globalizing

	Sample A (<i>N</i> = 274 participants, 2,960 observations)			Sample B (<i>N</i> = 811 participants, 12,443 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Negative affect globalizing (H1a) (outcome = life satisfaction)						
Intercept	5.09	4.99, 5.20	< .001	3.52	3.44, 3.60	< .001
Diary day	−0.02	−0.03, −0.00	.006	−0.00	−0.00, 0.00	.529
Person-mean sleep interval	−0.03	−0.14, 0.08	.616	0.09	0.01, 0.16	.021
Person-centered sleep interval	0.03	−0.01, 0.06	.116	0.03	0.02, 0.05	< .001
Person-mean negative affect	−1.31	−1.47, −1.15	< .001	−0.91	−1.00, −0.83	< 0.001
Person-centered negative affect	−0.62	−0.69, −0.56	< .001	−0.42	−0.44, −0.40	< .001
Person-centered sleep interval*	0.04	0.00, 0.08	.028	0.01	−0.00, 0.02	.261
Person-centered negative affect						
Positive affect globalizing (H1b) (outcome = life satisfaction)						
Intercept	5.09	5.02, 5.16	< .001	3.52	3.47, 3.57	< .001
Diary day	−0.01	−0.03, −0.00	.010	−0.00	−0.01, 0.00	.175
Person-mean sleep interval	0.02	−0.05, 0.10	.572	0.01	−0.03, 0.06	.636
Person-centered sleep interval	0.01	−0.03, 0.04	.745	0.02	0.01, 0.03	< .001
Person-mean positive affect	1.35	1.26, 1.44	< .001	1.07	1.02, 1.11	< .001
Person-centered positive affect	0.67	0.61, 0.73	< .001	0.53	0.51, 0.55	< .001
Person-centered sleep interval*	−0.01	−0.05, 0.02	.519	0.00	−0.01, 0.01	.891
Person-centered positive affect						

The parameter corresponding to the key hypothesis test in each model is in bold

Within-person Effects of Sleep Interval on Affect Globalizing (Planned Exploratory Analyses)

Tables 4 and 5 display the full results from the exploratory sleep interval analyses. In Sample A, following nights of more sleep, people engaged in less negative affect globalizing. The interaction between person-centered negative affect and person-centered sleep interval was statistically significant ($b = 0.04$, $p = .028^4$), such that the link between negative affect and lower life satisfaction was weaker following nights of more sleep. However, this interaction did not replicate in Sample B ($b = 0.01$, $p = .261$). We did not find evidence for a within-person effect of sleep interval on positive affect globalizing, as indicated by statistically non-significant interactions between person-centered sleep interval and person-centered positive affect in both samples (Sample A: $b = -0.01$, $p = .519$; Sample B: $b = 0.00$, $p = .891$).

⁴ The interaction between person-centered negative affect and person-centered sleep interval was statistically non-significant in both samples when excluding, rather than recoding, extreme sleep values.

Between-Person Effects of Sleep Interval on Affect Globalizing (Planned Exploratory Analyses)

In Sample A, we did not find evidence that average sleep interval was associated with average affect globalizing. The interaction between person-mean sleep interval and person-centered affect was statistically non-significant for negative affect (Sample A: $b = -0.02$, $p = .684$) and for positive affect (Sample A: $b = -0.03$, $p = .404$). Although we did not find evidence for a between-person effect of sleep interval on affect globalizing in Sample A, we did find evidence for this effect in the preregistered analyses in the larger Sample B: People who slept more on average engaged in less affect globalizing on average. The interaction between person-mean sleep interval and person-centered negative affect was statistically significant (Sample B: $b = 0.03$, $p = .032$), such that the link between negative affect and lower life satisfaction was weaker for people who sleep longer on average. For people who slept 6 h per night on average, a one-unit increase in negative affect was associated with a 0.46 scale-point reduction in life satisfaction ($b = -0.46$, $SE = 0.02$, $p < .001$). For people who slept 9 h on average, this was attenuated to a 0.38-point reduction ($b = -0.38$, $SE = 0.02$,

Table 5 Between-person effects of sleep interval on affect globalizing

	Sample A (<i>N</i> = 274 participants, 2,960 observations)			Sample B (<i>N</i> = 811 participants, 12,443 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Negative affect globalizing (H2a) (outcome = life satisfaction)						
Intercept	5.09	4.98, 5.20	< .001	3.52	3.44, 3.59	< .001
Diary day	−0.02	−0.03, −0.00	.006	−0.00	−0.00, 0.00	.532
Person-mean sleep interval	−0.03	−0.14, 0.08	.595	0.09	0.01, 0.16	.020
Person-centered sleep interval	0.03	−0.01, 0.06	.115	0.03	0.02, 0.05	< .001
Person-mean negative affect	−1.31	−1.47, −1.15	< .001	−0.91	−1.00, −0.83	< .001
Person-centered negative affect	−0.62	−0.69, −0.56	< .001	−0.42	−0.44, −0.39	< .001
Person-mean sleep interval*	−0.02	−0.09, 0.06	.684	0.03	0.00, 0.05	.032
Person-centered negative affect						
Positive affect globalizing (H2b) (outcome = life satisfaction)						
	Sample A (<i>N</i> = 274 participants, 2,957 observations)			Sample B (<i>N</i> = 811 participants, 12,441 observations)		
	<i>b</i>	95% CI	<i>p</i>	<i>b</i>	95% CI	<i>p</i>
Intercept	5.09	5.02, 5.16	< .001	3.52	3.47, 3.57	< .001
Diary day	−0.01	−0.03, −0.00	.009	−0.00	−0.01, 0.00	.182
Person-mean sleep interval	0.03	−0.05, 0.10	.493	0.01	−0.03, 0.06	.596
Person-centered sleep interval	0.00	−0.03, 0.04	.783	0.02	0.01, 0.03	< .001
Person-mean positive affect	1.36	1.26, 1.45	< .001	1.07	1.02, 1.11	< .001
Person-centered positive affect	0.67	0.61, 0.73	< .001	0.53	0.51, 0.55	< .001
Person-mean sleep interval*	−0.03	−0.09, 0.04	.404	−0.04	−0.06, −0.01	.001
Person-centered positive affect						

The parameter corresponding to the key hypothesis test in each model is in bold

$p < .001$). The interaction between person-mean sleep interval and person-centered positive affect was also statistically significant (Sample B: $b = -0.04$, $p = .001$), such that the link between positive affect and higher life satisfaction was weaker for people who sleep longer on average. For people who slept 6 h per night on average, a one-unit increase in positive affect was associated with a 0.58-point increase in life satisfaction ($b = 0.58$, $SE = 0.02$, $p < .001$). For people who slept 9 h on average, this was attenuated to a 0.47-point increase ($b = 0.47$, $SE = 0.02$, $p < .001$).

Discussion

The present research investigated a potentially fundamental but untested regulatory role of sleep: insulating people's global life satisfaction from the affective highs and lows of daily life. Consistent with our pre-registered hypotheses, following nights of high-quality sleep, the link between current affect and global life satisfaction was attenuated for both negative and positive affect and in both samples (i.e., lower affect globalizing). In other words, the transient highs and lows of everyday life had a less powerful influence on people's global life satisfaction following nights of better

sleep. These findings suggest that sleep quality may play an important role in maintaining stable well-being, which in turn may promote better psychological health.

In contrast to the observed within-person effects, we did not find consistent evidence that people who sleep better *on average* engage in less affect globalizing. This is perhaps not surprising given that the benefits of sleep for affective and cognitive processes accrue on a nightly basis. However, it is also possible that we didn't observe consistent between-person effects of sleep quality on affect globalizing because of the nature of our measure of sleep quality as well as the samples used. The present investigation was a relatively conservative test of between-person effects of average sleep on affect globalizing given that we used a relatively broad measure of sleep quality in a general population sample. It is possible that between-person effects of sleep quality on affect globalizing would emerge in a sample with more disordered sleeping where there is greater variability in sleep quality.

In addition to testing the hypothesis that sleep *quality* is associated with reduced affect globalizing, we also examined whether sleep *interval* was associated with reduced affect globalizing. Consistent with prior work examining links between sleep quantity, affect, and life satisfaction (Ness & Saksvik-Lehouillier, 2018; Pilcher et al., 1997; Pilcher and Ott, 1998), results were

generally less consistent for sleep quantity relative to sleep quality. However, this may also be due in part to our use of sleep interval rather than a more precise measure of sleep quantity that accounts for sleep disturbances throughout the night. More work is needed to determine whether sleep quantity is simply less important than sleep quality for affect globalizing or whether the relationship between sleep quantity and affect globalizing is more complex. For example, both too little and too much sleep has been associated with lower well-being (Hamilton et al., 2007; Piper, 2016), suggesting that the relationship between sleep quantity and affect globalizing may also be curvilinear. In addition, other factors related to sleep quantity, such as sleep onset latency or the amount of time spent in particular stages of sleep, may be more important than total sleep interval.

In addition to investigating associations between sleep and affect globalizing, the present research also replicated previous work showing main effects of sleep quality and sleep quantity on life satisfaction (Howell et al., 2008; Ness & Saksvik-Lehouillier, 2018; Pilcher & Ott, 1998; Piper, 2016; Shin & Kim, 2018). In both samples, better sleep quality and longer sleep interval were associated with greater life satisfaction. Beyond replicating prior work at the between-person level, the present results suggest that better sleep quality and longer sleep interval were also associated with greater life satisfaction at the within-person level. That is, people who sleep better and longer on average experience greater life satisfaction, *and* when people sleep better and longer than they typically do, they experience greater life satisfaction the next day. This suggests that the association between sleep and life satisfaction is likely not driven by person-level third variable confounds (e.g., health status, sociodemographic features) because between-person variability in sleep is accounted for in the model. Finally, because the models used in the present research included both sleep and affect variables as simultaneous predictors of life satisfaction, these findings extend prior work by showing the unique associations between sleep and life satisfaction, above and beyond positive and negative affect. This suggests that sleep has a specific association with life satisfaction that cannot be accounted for by generally better affective experiences.

The following limitations should be considered when drawing conclusions from the current investigation. First, the participant samples used in the present investigation were recruited from Mechanical Turk and comprised predominantly White participants. Future research should seek to replicate the present findings in more diverse samples. Because the present research was part of a larger study that was not designed specifically to examine sleep, participants were not screened for sleep disorders or medication use. Second, we used self-report measures of sleep quality and sleep interval. It is possible that third variable confounds influence

both the self-reported recollection of sleep variables and affect globalizing. To partially address time-varying third variable confounds and to eliminate the passage of time as a potential third variable confound, we included time as a covariate in our models. More in-depth and objective measures of sleep quality and quantity, such as polysomnography, may provide insight into potential physiological or psychological mechanisms that underlie the link between sleep quality and lower affect globalizing. Third, the observed effects of sleep quality on affect globalizing were small on average. These small effect sizes are not surprising given that participants in both samples were generally satisfied with their lives on average and reported low negative affect on average. Moreover, given that these effects occur on a nightly basis, even small effects have the potential to accumulate and have a meaningful impact on the stability of life satisfaction and its associated costs to psychological health.

Taken together, the present research provides support for the hypothesis that high-quality sleep plays an important role in insulating global life satisfaction from the affective highs and lows of everyday life. In other words, high-quality sleep may help people maintain stable satisfaction, which in turn is associated with better psychological health. Sleep-based interventions are transdiagnostically useful, providing relief across a variety of psychopathologies (Harvey et al., 2011), and the current findings suggest another avenue by which such interventions may improve well-being: by providing a crucial protection against the risks associated with affect globalizing.

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Author Contribution EW and BF developed the research questions and hypotheses. All authors contributed to the preregistration. AG and EW conducted the literature review. EW and ST conducted the analyses. EW wrote the first draft of the manuscript and all authors made substantive revisions.

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