



Sleep, Emotions, and Sense of Belonging: A Daily Experience Study

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Abstract

Sleep has strong influences on affective and social experiences. However, less is known about the reciprocal effects of sleep, affect, and social experiences at a daily level, and little work has considered racial/ethnic minorities at high risk for social disconnection and discrimination. A 7-day daily experience study assessed the bidirectional relationships between daily sleep quality, affect, social experiences, and overall well-being among a sample of Latinx undergraduates ($N = 109$). Each morning, participants reported on their previous night's sleep. Each evening, they reported their positive and negative affect, experiences of belonging and unfair treatment, and overall well-being that day. Results indicate that, at a daily level, sleep quality predicts next-day affect, belonging, and well-being. Reciprocally, only daily well-being predicts sleep quality. Findings highlight sleep as a potentially powerful antecedent of affective and social experiences likely to be particularly potent for underrepresented minority groups.

Keywords Sleep · Affect · Belonging · Unfair treatment · Daily experience study · Daily diary · Latinx

College can be a stressful experience for many students. For those who are members of underrepresented groups, such as students who are low SES, first generation to college, or ethnic minorities, the usual stresses of college are often accompanied by additional social stressors associated with a marginalized identity, including concerns about whether they belong or “fit in” and experiences of being treated unfairly or discriminated against (Crocker et al., 1998; Walton & Cohen, 2007). Importantly, both of these social processes are also linked to poorer sleep (e.g., Gordon et al., 2020; Huynh & Gillen-O’Neel, 2016; John-Henderson et al., 2019; Lewis et al., 2013; Ong & Williams, 2019; for a review, see Slopen et al., 2016). Sleep is increasingly recognized as an important contributor to risk versus resilience in the presence of life stressors (Wang & Yip, 2020), academic performance

(Asarnow et al., 2014), and health disparities (Jackson et al., 2015), among other important outcomes.

Belonging and unfair treatment are potent social experiences with strong influences on affect, well-being, and health (Baumeister & Leary, 1995; Major et al., 2018). Experiences of belonging are central to maintaining positive self-regard, whereas ostracism and rejection evoke strong negative emotions, rumination, and self-doubt. Similarly, experiencing injustice or unfair treatment is almost universally aversive, and emotional responses to injustice have important behavioral and health implications (Murphy & Tyler, 2008). Experiences of not belonging and of being treated unfairly predict not only poorer mental and physical health (Pascoe & Smart Richman, 2009; Thoits, 2011; Williams & Mohammed, 2009), but also reduced motivation and academic underachievement (Walton & Cohen, 2011; Walton et al., 2012).

Burgeoning evidence highlights links between sleep, affect, and social experiences (e.g., see, Beattie et al., 2015; Gordon et al., 2017, 2021; Konjarski et al., 2018, for reviews). Focusing on just sleep and social processes, prior research has established associations between sleep and rejection as well as discrimination. Although this work has primarily focused on between-person differences using cross-sectional or longitudinal designs (e.g., Gordon et al., 2020; Hisler & Brenner, 2019; Ong & Williams, 2019), attention is increasingly being paid to the ways in which

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rejection-related social processes are linked to sleep in daily life. For example, researchers examining adolescents and young adults have found that daily experiences of discrimination are associated with that night's sleep and next-day sleepiness and dysfunction (Fuller-Rowell et al., 2021; Yip, Cham, et al., 2020; Yip, Cheon, et al., 2020). Although these diary studies examine only one direction, recent work (mostly cross-sectional or longitudinal) suggests these links may be bidirectional: while rejection experiences forecast poorer sleep, poor sleep also forecasts greater perceived discrimination and stronger affective reactions to social rejections (e.g., Gordon et al., 2019, 2020; Hisler & Brenner, 2019; Lewis et al., 2013). Other work has found that daily fluctuations in sleep are linked to relevant social experiences, including conflict (e.g., daily conflict predicts sleep, Brissette & Cohen, 2002; sleep predicts daily conflict, Gordon & Chen, 2014). Thus, it seems likely that meaningful social experiences such as being treated unfairly or feeling a lack of belonging may not only predict, but may also be predicted by, daily fluctuations in sleep.

The research on daily associations between sleep and emotional well-being is more robust, with the strongest evidence for links between self-reported sleep and affect (Konjarski et al., 2018). Although both positive and negative emotions have been linked to sleep, they typically have been examined separately, and there is stronger evidence that sleep influences next-day affect than the reverse, particularly negative affect (e.g., Sin et al., 2017; for a review, see Konjarski et al., 2018). Importantly, emotions can have reciprocal effects on experiences of injustice and belonging as well (Sechrist et al., 2003; van den Bos, 2003). Thus, not only may individuals who experience a lack of belonging or unfair treatment and accompanying negative affect sleep more poorly, poor sleepers may also experience more negative affect and perceive less belonging and more unfair treatment.

Current Research

Building on this important and emerging literature, the current study takes a daily experience approach to explore the reciprocal relationships among sleep, social processes, and emotions. Using new data from a longitudinal study of predominantly low SES, first-generation Latinx college students, we examine daily associations between self-reported sleep quality, social experiences (unfair treatment and belonging), emotional well-being (positive and negative affect), and overall well-being across 7 days during the academic year. We focus on unfair treatment and sense of belonging because these social experiences are particularly relevant to this sample, have been previously linked to sleep, and have important implications for mental health, quality of life, and academic success. We extend prior work by examining positive and negative

emotions alongside positive and negative social processes in daily life and consider how they influence and are influenced by sleep. Further, we include positive and negative emotions as simultaneous predictors to determine their unique effects on sleep. Within the context of a week in the life of an under-represented minority student at college, we ask how sleep quality the night before influences students' emotions, social experiences, and overall well-being the following day and how emotions, social experiences, and overall well-being during the day influence students' sleep quality that night.

Method

Participants

Participants were a sample of self-identified Latinx college students who were part of a larger study investigating low-SES and first-generation college students' transition to college (Dover et al., 2020; Gordon et al., 2020). All students who participated in the first time point (beginning of college) and last time point (end of third year of college) were invited to participate in this daily diary substudy. Of the 166 eligible students, 130 were recruited, and 129 completed at least one diary entry (either AM or PM). The final sample included 109 participants who completed at least three PM diaries: 79.8% female (20.2% male); M age = 20.67, SD = 0.49, age range = 20 to 22.

Given that our sample size was constrained by the larger study, we conducted a sensitivity analysis to address statistical power. Assuming α = 0.05, two-tailed, power $(1-\beta)$ = 0.80, and N = 109, the analysis revealed the minimum detectable effect size (under the most conservative assumptions) is Cohen's f^2 = .073 (corresponding to an R^2 = .068). This indicates that our sample afforded adequate statistical power for detecting small to moderate effects of our focal variables. (See [Supplemental Materials](#) for further information regarding statistical power considerations.)

Procedures

All eligible participants were invited to participate in the daily diary substudy. They were asked to complete an online sleep diary each morning and a daily experience survey each evening for 1 week (7 days). Each student's diary week began the day after they participated in the final wave of data collection for the main study. As such, diary day 1 might be a Tuesday for some students but a Saturday for other students.

Daily sleep quality was assessed in an AM survey each morning. Participants were sent an email with a link to the AM survey at 4:00 AM and were asked to complete it as soon as they woke up. A reminder was sent to incomplete respondents at 1:00 PM. Daily affective and social experiences were assessed with a PM survey

Table 1 Summary Statistics and Psychometric Information for the Daily Measures

Variable	<i>M</i>	<i>SD</i>	Range	ICC	α or <i>r</i> mean	α or <i>r</i> range
Sleep quality score	0.00	0.58	−2.55–1.04	.22	.50	.42–.58
Duration (hours)	7.19	1.84	0–12			
Latency (minutes)	19.98	26.84	0–240			
Disturbances	0.86	1.32	0–10			
Wake after sleep onset (minutes)	6.29	13.48	0–120			
Subjective sleep quality	2.94	0.74	1–4			
Negative affect	1.95	0.84	1–5	.43	.86	.83–.89
Anxious/nervous	2.20	1.24	1–5			
Angry/irritated/frustrated	1.97	1.12	1–5			
Guilty/embarrassed/ashamed	1.61	0.97	1–5			
Sad/depressed/down	1.90	1.16	1–5			
Powerless/helpless	1.55	0.99	1–5			
Lonely/alone	1.71	1.14	1–5			
Stressed/overwhelmed/tense	2.71	1.28	1–5			
Positive affect	3.19	0.94	1–5	.46	.85	.80–.87
Proud/good about myself	3.15	1.15	1–5			
Happy/pleased/joyful	3.47	1.08	1–5			
Grateful/thankful/appreciative	3.36	1.24	1–5			
Interested/alert/engaged	3.11	1.20	1–5			
Compassionate/sympathetic	2.87	1.26	1–5			
Belonging	3.66	1.00	1–5	.61	.55	.42–.63
Belonged on campus	3.60	1.13	1–5			
Socially connected	3.72	1.15	1–5			
Unfair treatment	0.07	0.26	0–1	.30		
Overall well-being	3.83	0.88	1–5	.51		

Note. ICC = Intraclass correlation. Summary statistics (*M*, *SD*, and Range) and ICC values were computed across all 670 observations. Psychometric information (Cronbach's α or *r*) was computed within each diary day (1 to 7). α or *r* mean = average within-day alpha or correlation. α or *r* range = range of within-day alphas or correlations

each evening. Participants were sent an email with a link to the PM survey at 6:00 PM and were asked to complete it right before bed. A reminder was sent to incomplete respondents at 1:00 AM.

Measures

Table 1 reports the summary statistics and psychometric information for each daily measure. We provide the means, standard deviations, and ranges across all observations (over participants throughout the 7-day diary period). For each measure, we provide the intraclass correlation (Hox et al., 2017; Sommet & Morselli, 2017); for each multi-item measure, we provide the mean within-day reliability coefficient (Cronbach's alpha or correlation) along with the range across days.

Daily Sleep Quality Score

Each morning, participants reported on their previous night's sleep in the AM diary. Drawing upon standard assessments of self-reported sleep (e.g., Pittsburgh Sleep Quality Index, Buysse et al., 1989; Pittsburgh Sleep Diary, Monk et al.,

1994), we assessed daily sleep quality with five common sleep components: *sleep duration* ("How many hours did you sleep last night? [hours and minutes]"), *sleep latency* ("How long did it take you to fall asleep last night? [minutes]"), *sleep disturbances* ("How many times did you wake up last night after falling asleep?"), *wake after sleep onset* ("How long were you awake last night after falling asleep? [minutes]"), and *subjective sleep quality* ("How would you describe your quality of sleep last night? [*very bad* (1)–*very good* (4)]").¹ The five items were standardized (see King et al., 2020, for a similar method), and items were reverse scored when applicable so that higher values indicated better sleep. These standard scores were then averaged to create a daily sleep quality score (Gordon & Chen, 2014). The average within-day reliability ($\alpha = .50$) is modest, as would be

¹ We also measured daytime dysfunction by assessing tiredness/fatigue in each PM diary. However, because this item was assessed at the same time as our emotion and belonging variables, we felt it was more conservative to maintain the temporal distance between our key variables and thus chose to not include it in our sleep score.

expected given that each item assesses a distinct component of sleep. In addition, the ICC (.22) indicates relatively low within-person stability (individual differences) in sleep quality across days, with the majority (78%) of the overall variability arising from day-to-day fluctuations in sleep quality.

We took this aggregated approach and assessed overall global sleep quality because we did not have hypotheses about differences between sleep components and wanted to limit the number of analyses to reduce the possibility of spurious results (see Gordon & Chen, 2014 and King et al., 2020 for similar methods). However, we ran two additional sets of supplemental analyses: (1) we ran analyses with the global sleep score restricting sleep duration to 10 hours or less, to remove the possibility that extremely long sleep may be detrimental, not beneficial (this removed only 22 observations with last night's sleep as the predictor and 16 observations with tonight's sleep as the outcome), and (2) we conducted analyses separately for subjective sleep quality and duration (two commonly reported components of sleep). We report highlights of these analyses in the results and full details in the [Supplemental Materials](#).

Daily Affect

Each evening, participants reported their positive and negative affective experiences that day in the PM diary. These items were adapted from the modified Differential Emotions Scale (m-DES; Fredrickson et al., 2003). An exploratory principal components analysis (PCA) resulted in two components reflecting negative and positive affect, which reflects the two subscales provided by Fredrickson (2013).

Negative Affect Seven items assessed negative affect. Participants reported how much they felt the following emotions on a scale from 1 (*Not at all*) to 5 (*Extremely*): “Anxious/Nervous,” “Angry/Irritated/Frustrated,” “Guilty/Embarrassed/Ashamed,” “Sad/Depressed/Down,” “Powerless/Helpless,” “Lonely/Alone,” and “Stressed/Overwhelmed/Tense.” We averaged these items to create a composite of daily negative affect. The average within-day reliability ($\alpha = .86$) was strong. In addition, the ICC (.43) indicates relatively high within-person stability (individual differences) in negative affect, but the majority (57%) of the total variability reflects participants' day-to-day fluctuations in negative affect.

Positive Affect Five items assessed positive affect. Participants reported how much they felt the following emotions on a scale from 1 (*Not at all*) to 5 (*Extremely*): “Proud/Good about myself,” “Happy/Pleased/Joyful,” “Grateful/Thankful/Appreciative,” “Interested/Alert/Engaged,” and “Compassionate/Sympathetic.” To create a composite of daily

positive affect, we computed the mean of these items. The average within-day reliability ($\alpha = .85$) was strong. In addition, the ICC (.46) indicates relatively high within-person stability (individual differences) in positive affect, but the majority (54%) of the overall variability arises from day-to-day fluctuations in positive affect.

Daily Social Experiences

Daily social experiences (belonging and unfair treatment) were assessed in the PM diary.

Belonging Two items assessed feelings of belonging. One item explicitly asked about feelings of belonging at college that day on a scale from 1 (*Not at all*) to 5 (*Quite a Bit*): “Today, how much did you feel like you belong at [university]?” (see Gillen-O’Neel, 2019 for a similar item). The other item tapped into feelings of belonging and connection within the participants' social networks on a scale from 1 (*Not at all*) to 5 (*Quite a Bit*). Specifically, participants were asked, “Today, how much did you feel close and connected to other people?” (see Inagaki & Human, 2019 for a similar item). These two items were strongly correlated (mean within-day $r = .55$) and were averaged to create a daily measure of belonging. The ICC (.61) indicates high within-person stability (individual differences) in belonging, but still a substantial (39%) amount of variability arises from day-to-day fluctuations in belonging.

Unfair Treatment Six items assessed daily experiences of unfair treatment. Participants were asked, “Did you experience any unfair treatment based on any of the following?” They responded yes or no to each of the following options: gender, social class/background, race/ethnicity, weight, sexual orientation, and personality. Thus, participants could report experiencing unfair treatment from as little as 0 times each day to as much as 6 times each day. These items were adapted from previous scales that measure daily discrimination and unfair treatment across a variety of identity dimensions (e.g., Sternthal et al., 2011; Williams et al., 1997). They reflect attributions for unfair treatment as opposed to the exact content/quality of the unfair treatment, which likely vary depending on the identity dimension (Williams & Mohammed, 2009). The ICC (.30) indicates low within-person stability (individual differences) in unfair treatment, with the majority (70%) of the overall variability arising from day-to-day fluctuations.

Across the 7 days, participants reported relatively low levels of unfair treatment. This is consistent with other studies using daily diary methods to assess experiences of unfair treatment (e.g., Wang & Yip, 2020; Yip, Cham, et al., 2020; Zeiders, 2017). In total, participants reported experiencing unfair treatment based on personality 22 times, gender 20

Table 2 Within-person (below diagonal) and Between-person (above diagonal) Correlations for Daily Experiences and Sleep Quality Score

Variable	Negative affect	Positive affect	Belonging	Unfair treatment	Overall well-being	Last night's sleep	Tonight's sleep	Gender
Negative affect		-.31**	-.39***	.44***	-.58***	-.32***	-.29**	.16
Positive affect	-.45***		.65***	-.04	.74***	.27**	.23*	-.14
Belonging	-.36***	.49***		-.11	.71***	.27**	.26**	-.11
Unfair treatment	.05	-.03	.01		-.17†	-.18†	-.18†	.25*
Overall well-being	-.47***	.52***	.46***	.03		.29**	.26**	-.17†
Last night's sleep	-.23***	.11*	.09*	.03	.10*		.94***	-.03
Tonight's sleep	-.08†	.02	.02	.05	.11*	-.08†		-.05
Weekend	-.19***	.18***	.08†	.01	.21***	.09*	.00	
Mean	1.97	3.17	3.62	0.08	3.79	0.01	0.02	0.80
SD	0.61	0.68	0.82	0.15	0.67	0.34	0.36	0.40
N	109	109	109	109	109	107	108	109

Note. Within-person correlations are based on $N_{\text{days}}=670$ observations. Unfair treatment is coded 0 = *No unfair treatment*, 1 = *Unfair treatment*. Gender is coded 0 = *Male*, 1 = *Female*. Weekend is coded 0 = *Weekday*, 1 = *Weekend*. Means and SDs are between-persons. Because Gender varies only at level 2, it appears only in the between-person correlations (above diagonal). Because Weekend is relevant only at level 1, it appears only in the within-person correlations (below diagonal)

*** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$

times, social class/background 12 times, race/ethnicity 12 times, weight 4 times, and sexual orientation 3 times. On most days (92.50% of total observations), participants did not report any unfair treatment; on 35 days (5.20%), participants reported experiencing unfair treatment based on one dimension; on 9 days (1.30%), participants felt unfairly treated based on two dimensions; on 4 days (0.60%), people reported unfair treatment based on three dimensions; and on 2 days (0.30%), people experienced unfair treatment based on four dimensions. Because of the low base rate of specific unfair experiences, participants were assigned a score of 1 if they experienced any unfair treatment that day, and a score of 0 if they did not experience any unfair treatment that day. Consequently, there are 50 days in which people reported experiencing unfair treatment at least once and 31 people (28.44%) who reported experiencing any unfair treatment.

Daily Overall Well-Being

One item assessed overall well-being that day. We borrowed this single item assessment of daily well-being from prior diary studies in the close relationships literature (Gable & Poore, 2008; Girme et al., 2018). At the end of the PM diary, participants reflected on their day and responded to the item, “Today, I would say that my life is...” on a scale from 1 (*Terrible*) to 5 (*Terrific*). The ICC (.51) indicates relatively high within-person stability (individual differences) across

the diary period but still sizable day-to-day fluctuations (49% of the overall variability).

Results

Descriptive Statistics

In total, the PM diary dataset contained 670 observations (87.81% of possible reports). On average, participants completed 6.15 PM diaries (range 3 to 7, $SD = 1.35$). The AM diary dataset included 636 observations (83.36% of possible reports). Participants completed an average of 5.83 AM diaries (range 0 to 7, $SD = 1.79$).

Table 2 shows descriptive statistics, between-person correlations, and within-person correlations for all primary study variables. To determine the between-person correlations, we began by computing mean scores for each variable across the seven diary days for each person. These mean values were then correlated with one another. To compute the within-person correlations, we used the R package *rmcorr* (Bakdash & Marusich, 2017).

As shown in Table 2, the within-person correlations revealed that on days when participants felt greater belonging, they experienced more positive affect, less negative affect, and greater overall well-being that same day. Further, last night's sleep was positively associated with today's belonging, though tonight's sleep was not. Daily unfair

treatment was not significantly correlated with sleep or any of the daily social and emotional experiences. The between-person correlations show a similar pattern for belonging: people who experienced more belonging across the 7 days experienced less negative affect, more positive affect, higher overall well-being, and better sleep. In addition, unfair treatment at the between-person level revealed that students who experienced more unfair treatment across the diary week also experienced more negative affect. Unfair treatment was also marginally associated with overall well-being and sleep, suggesting that participants who experienced more unfair treatment tended to experience lower well-being and had poorer average sleep that week. Finally, we note that gender was significantly related to unfair treatment, suggesting that women, on average, experienced more unfair treatment than men (although our sample consisted of mostly women).

Data Analysis Strategy

Due to the nested structure of the data (i.e., days are nested within person), we conducted our primary analyses using multilevel modeling with SPSS 28.0 MIXED for all continuous outcomes and GENLIMIXED for the one model predicting the binary outcome (unfair treatment). In all analyses, we estimated *within-person* and *between-person* effects simultaneously. To accomplish this, we computed two new variables for each predictor. For the within-person effects, we centered each predictor around each person's mean (their average score across the 7 days). For the between-person effects, we centered each person's average around the grand mean. In addition, we controlled for day of the week (weekend vs. weekday) given that participants experienced improved affect, felt more socially connected, and got better sleep on the weekends versus school days (see Table 2; Bolger et al., 2003; Fuller-Rowell et al., 2021). Controlling for this variable also accounted for the fact that students do not attend classes on the weekends, which may affect their social interactions and sense of belonging. In these ways, we could determine how daily outcomes change as people fluctuate around their own baseline (*within-person slopes*), controlling for individual differences (*between-person slopes*) as well as weekend effects. (See [Supplemental Materials](#) for the multilevel linear equations for the key analyses.)

We estimated each initial model with random intercepts and within-person slopes. We applied a first-order autoregressive model to correct for autocorrelation of residuals, and we specified an unstructured (UN) covariance matrix for the random effects. However, some models would not converge due to lack of variance in the within-person

slopes (i.e., a lack of *between-person variability* in the *within-person slopes*.) In these cases, we estimated the model with fixed slopes. (See [Supplemental Materials](#) for elaboration.)

Bidirectional Effects Between Sleep Quality and Daily Experiences

The main goal of this study was to test the bidirectional links between sleep quality and daily affect, social experiences, and overall well-being. As such, we first examined whether sleep quality the night before (reported in the AM diary) predicted people's experiences that day (reported in the PM diary). We then assessed whether people's experiences that day (reported in the PM diary) affected their sleep quality that night (reported in the next day's AM diary).

Does Last Night's Sleep Quality Predict Today's Experiences?

To examine whether fluctuations in sleep quality the night before predicted fluctuations in outcomes the next day, we conducted a series of multilevel analyses in which we predicted daily affect, social experiences, and overall well-being (reported in today's PM diary) from sleep quality the night before (reported in today's AM diary; see Table 3). In all analyses, we controlled for individual differences in sleep quality as well as whether it was a weekday or weekend. First, we predicted today's positive and negative affect. We found that the prior night's sleep quality significantly predicted today's negative ($b = -0.249, p < .001$) and positive ($b = 0.123, p = .032$) affect. That is, participants reported less negative and more positive affect when they slept better than usual the night before.

Next, we turned to the daily social experiences. We found that last night's sleep quality marginally predicted today's belonging ($b = 0.095, p = .076$) but was unrelated to unfair treatment ($b = 0.188, p = .548$). In other words, although not significant, there was a marginal effect suggesting that when participants got better sleep than usual the night before, they also tended to feel more socially connected and a greater sense of belonging on campus. Finally, we found that the previous night's sleep predicted daily overall well-being ($b = 0.100, p = .049$). On days when participants slept better than usual the night before, they reported greater overall well-being.

In summary, prior night's sleep quality significantly predicted the next day's affect and overall well-being and marginally predicted belonging. When participants slept better the night before, they reported less negative affect, more positive affect, slightly more belonging, and greater overall well-being the next day.

Table 3 Last Night's Sleep Quality Score as a Predictor of Today's Daily Experiences

Variable	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI
Negative affect ^a					
Intercept	2.027	.06	<i>t</i> (117.41) = 34.76	< .001	[1.912, 2.143]
Sleep quality _{within}	-.249	.06	<i>t</i> (56.36) = -3.83	< .001	[-.379, -.118]
Sleep quality _{between}	-.596	.17	<i>t</i> (102.33) = -3.53	< .001	[-.930, -.261]
Weekend	-.234	.06	<i>t</i> (420.48) = -4.04	< .001	[-.348, -.120]
Positive affect					
Intercept	3.117	.07	<i>t</i> (122.14) = 45.94	< .001	[2.982, 3.251]
Sleep quality _{within}	.123	.06	<i>t</i> (525.82) = 2.16	.032	[.011, .236]
Sleep quality _{between}	.547	.20	<i>t</i> (108.34) = 2.78	.006	[.157, .938]
Weekend	.234	.06	<i>t</i> (354.43) = 3.78	< .001	[.112, .355]
Belonging					
Intercept	3.597	.08	<i>t</i> (114.54) = 45.89	< .001	[3.442, 3.753]
Sleep quality _{within}	.095	.05	<i>t</i> (527.30) = 1.78	.076	[-.010, .200]
Sleep quality _{between}	.659	.23	<i>t</i> (105.70) = 2.87	.005	[.203, 1.115]
Weekend	.104	.06	<i>t</i> (382.61) = 1.76	.080	[-.012, .219]
Unfair treatment ^b Log odds					
Intercept	-2.816	.33	<i>t</i> (110) = -8.41	< .001	[-3.474, -2.159]
Sleep quality _{within}	.188	.31	<i>t</i> (632) = 0.60	.548	[-.427, .804]
Sleep quality _{between}	-1.003	.57	<i>t</i> (110) = -1.77	.080	[-2.128, .123]
Weekend	.122	.36	<i>t</i> (632) = 0.34	.734	[-.585, .829]
Overall well-being					
Intercept	3.738	.07	<i>t</i> (117.49) = 57.24	< .001	[3.609, 3.867]
Sleep quality _{within}	.100	.05	<i>t</i> (523.27) = 1.97	.049	[.000, .200]
Sleep quality _{between}	.571	.19	<i>t</i> (106.19) = 3.00	.003	[.193, .948]
Weekend	.270	.05	<i>t</i> (375.00) = 4.94	< .001	[.162, .377]

Note. Coefficients are unstandardized. *SE* = Standard error. *CI* = Confidence interval. Weekend is coded 0 = *Weekday*, 1 = *Weekend*. Due to a lack of variance in the within-person slopes, all analyses were modeled with fixed slopes, unless otherwise noted

^aThis analysis was modeled with a random within-person slope and unconstrained covariance structure

^bBecause this outcome variable is binary, we conducted a multilevel logistic regression analysis via generalized linear mixed models

Do Today's Experiences Predict Tonight's Sleep Quality?

In our second set of analyses, we investigated whether changes in daily affect, social experiences, and overall well-being (reported in today's PM diary) were associated with changes in daily sleep quality that night (reported in the next day's AM diary), controlling for individual differences in each predictor and whether or not it was the weekend.² Results of these models are shown in Table 4.

To test how daily affect influenced sleep quality that night, we conducted three separate analyses: (1) only negative affect predicting sleep, (2) only positive affect predicting sleep, and (3) negative and positive affect simultaneously predicting sleep. This way, we could assess how negative and positive affect

relate to sleep quality on their own as well as how both together contribute to sleep. First, today's negative affect on its own did not significantly predict tonight's sleep quality ($b = -0.062$, $p = .118$). Similarly, today's positive affect on its own was not associated with tonight's sleep quality ($b = 0.029$, $p = .421$). When we entered both negative and positive affect into the model simultaneously, we found the same pattern of results. Neither today's negative nor positive affect significantly predicted tonight's sleep quality. In sum, within-person changes in positive and negative affect, whether considered separately or together, did not influence sleep quality from night to night.

We then examined the relationship between social experiences that day and sleep quality that night. Feeling a greater sense of belonging on campus from one day to the next was not associated with sleep quality ($b = 0.024$, $p = .533$). Similarly, today's experiences of unfair treatment did not predict tonight's sleep quality ($b = 0.107$, $p = .355$). Thus, daily fluctuations in belonging and unfair treatment were unrelated to daily fluctuations in sleep quality.

² The number of cases for this set of analyses is reduced ($N_{\text{days}} = 540$) because there is a maximum of 6 days in which the PM diary can predict the next day's AM diary.

Table 4 Today's Daily Experiences as Predictors of Tonight's Sleep Quality Score

Variable	<i>b</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% CI
Sleep quality					
Intercept	.009	.04	$t(152.30)=0.23$	.816	[−.064, .081]
NA _{within}	−.062	.04	$t(442.57)=−1.57$	.118	[−.139, .016]
NA _{between}	−.185	.06	$t(105.55)=−3.37$	.001	[−.295, −.076]
Weekend	−.008	.05	$t(329.79)=−0.16$	.877	[−.104, .089]
Sleep quality					
Intercept	.008	.04	$t(150.27)=0.21$	.834	[−.066, .082]
PA _{within}	.029	.04	$t(447.34)=0.81$	.421	[−.041, .099]
PA _{between}	.123	.05	$t(101.23)=2.51$	.014	[.026, .220]
Weekend	.000	.05	$t(345.51)=0.00$	.997	[−.096, .096]
Sleep quality					
Intercept	.009	.04	$t(152.26)=0.25$	.802	[−.063, .082]
NA _{within}	−.061	.04	$t(438.69)=−1.40$	.161	[−.147, .024]
PA _{within}	.003	.04	$t(448.03)=0.07$	.944	[−.075, .080]
NA _{between}	−.157	.06	$t(104.34)=−2.73$	.007	[−.271, −.043]
PA _{between}	.081	.05	$t(98.81)=1.63$	.106	[−.018, .180]
Weekend	−.008	.05	$t(335.23)=−0.16$	.873	[−.105, .089]
Sleep quality					
Intercept	.008	.04	$t(149.57)=0.20$	.839	[−.066, .081]
Belonging _{within}	.024	.04	$t(448.26)=0.62$	.533	[−.052, .100]
Belonging _{between}	.121	.04	$t(104.31)=2.93$	.004	[.039, .202]
Weekend	.002	.05	$t(332.29)=0.05$	.964	[−.093, .097]
Sleep quality ^a					
Intercept	.008	.04	$t(146.88)=0.22$	.829	[−.066, .082]
UT _{within}	.107	.11	$t(33.61)=0.94$	.355	[−.124, .337]
UT _{between}	−.520	.24	$t(115.47)=−2.20$	.030	[−.990, −.051]
Weekend	.003	.05	$t(317.13)=0.06$	.953	[−.091, .096]
Sleep quality					
Intercept	.011	.04	$t(150.23)=0.30$	.762	[−.062, .084]
Overall WB _{within}	.111	.04	$t(451.99)=2.75$	.006	[.032, .191]
Overall WB _{between}	.145	.05	$t(101.96)=2.93$	.004	[.047, .243]
Weekend	−.021	.05	$t(343.15)=−0.42$	.672	[−.117, .075]

Note. Coefficients are unstandardized. NA = Negative affect. PA = Positive affect. UT = Unfair treatment. Overall WB = Overall well-being. SE = Standard error. CI = Confidence interval. Weekend is coded 0 = Weekday, 1 = Weekend. Due to a lack of variance in the within-person slopes, all analyses were modeled with fixed slopes, unless otherwise noted

^aThis analysis was modeled with a random within-person slope and unconstrained covariance structure

Lastly, we turned to daily overall well-being. Within-person changes in daily well-being significantly predicted within-person changes in daily sleep quality ($b = 0.111$, $p = .006$). That is, on days when participants experienced greater overall well-being, they slept better that night. In sum, today's overall well-being was the only significant within-person predictor of tonight's sleep quality.

Between-Person Associations Between Sleep Quality and Daily Experiences

Although this investigation focuses primarily on the within-person associations between sleep and daily life, the between-person

effects are also informative. As shown in Table 3, participants who reported better average morning sleep quality reported less same-day negative affect and greater same-day positive affect. They also reported greater average same-day belonging, marginally less unfair treatment, and higher overall well-being. As shown in Table 4, participants who reported lower average negative affect, greater positive affect, greater belonging, less unfair treatment, and greater overall well-being also reported better average same-night sleep quality. When positive and negative affect were entered together, only negative affect was uniquely associated with sleep: those who reported lower average negative affect reported better average same-night sleep quality. These results reveal that, on average, participants who were

better sleepers had more positive same-day social and affective experiences compared to those who were worse sleepers. Likewise, participants who had more positive social and affective experiences during the week experienced better same-night sleep quality compared to participants who had more negative affective and social experiences that week.

Supplemental Analyses

We ran two additional sets of analyses using alternative measures of sleep. First, we re-ran the multilevel models with an adjusted sleep quality score restricting sleep duration to 10 hours or less to remove the possibility that extremely long sleep may be detrimental. These analyses resulted in findings that were virtually identical to our main analyses (see Tables S1 and S2 in Supplemental Materials), indicating that our results were not unduly influenced by excessive sleep.

Second, because our sleep quality score was a composite of five distinct sleep dimensions, it is possible that our analyses failed to capture important relationships with these specific sleep dimensions. Thus, we conducted analyses separately for two key components of sleep commonly reported in the literature: subjective sleep quality and sleep duration. Results revealed that subjective sleep quality was a robust predictor of daily experiences at the within-person level, including significantly predicting daily positive and negative affect, sense of belonging, and overall well-being (Table S3). For example, on days when participants reported better subjective sleep quality the night before, they experienced a greater sense of belonging that day ($b = 0.131, p = .001$). When subjective sleep quality was treated as the outcome (Table S4), there were no significant within-person effects. There were robust between-person effects (in both directions, Tables S3 and S4) indicating that participants who had greater average emotional well-being and belonging also experienced greater subjective sleep quality. However, between-person differences in unfair treatment were unrelated to subjective sleep quality.

With respect to sleep duration, results were relatively weak overall. On days when participants slept longer (than their own average), they experienced less negative affect that day ($b = -0.056, p = .001$), and on days when participants experienced greater overall well-being (relative to their own average), they slept longer that night ($b = 0.271, p = .046$). However, sleep duration was not significantly linked to any other daily experience, in either direction, at the within- or between-subjects levels (Tables S5 and S6).

Discussion

Utilizing a 7-day diary, we assessed sleep as both an antecedent and consequence of affective and social experiences in a sample of Latinx undergraduate students. At a

between-person level, students who experienced more unfair treatment and lower belonging also reported more negative affect, less positive affect, lower well-being, and worse sleep. These non-directional relationships are consistent with past work and highlight the covariance between sleep, affective processes, and social experiences in an under-studied population at risk for feeling both concerns about fitting in at college and discrimination.

Additionally, within-person analyses allowed us to assess the bidirectional nature of these relationships. Results from these analyses suggest that sleep has a stronger effect on social and emotional experiences than the reverse. That is, whereas last night's sleep predicted today's affect, belonging, and well-being, only today's well-being predicted tonight's sleep. These analyses also allowed us to differentiate between sleep's influence on positive versus negative emotions at the daily level. Prior work has typically focused on either positive or negative emotions, not their unique relationships with sleep (Konjarski et al., 2018; for exceptions, see Kalmbach et al., 2014; Sin et al., 2017). Overall, we found that sleep more strongly predicted daily negative than positive emotions, in line with prior research.

Similarly, our design enabled us to differentiate between types of daily social experiences. Overall, sleep was more predictive of feelings of belonging than unfair treatment, suggesting that sleep may have a stronger influence on general feelings of social connectedness than on specific interpretations of treatment from others. However, prior longitudinal research has identified racial/ethnic discrimination as both an antecedent and outcome of poor sleep (Gordon et al., 2020; Wang & Yip, 2020), and past diary work found significant associations between daily experiences of discrimination and sleep that night and functioning the next day (Fuller-Rowell et al., 2021; Yip, Cham, et al., 2020; Yip, Cheon, et al., 2020).³ These studies included more observations (i.e., larger samples, more diary days) and may have been more sensitive to detecting smaller effects. The diary studies, however, did not assess the reverse direction (sleep to discrimination), so we cannot draw conclusions about the strength of each directional effect from this prior work. Nevertheless, we find that the overall pattern of our reciprocal effects is in-line with a larger literature demonstrating the potency of sleep in shaping future emotional and social experiences (Gordon et al., 2021; Konjarski et al., 2018).

³ To explore whether unfair treatment was related to daytime functioning, as shown in prior work, we computed the within-person correlation between unfair treatment and tiredness/fatigue (both assessed in the PM diary). We found that on days when people experienced unfair treatment, they felt more tired and fatigued ($r = .11, p = .01$). Although we cannot determine directionality, this finding is consistent with Yip, Cheon, et al., (2020) and suggests an important link between unfair treatment and daytime dysfunction.

The weak findings for unfair treatment in the current study may be an artifact of the low frequency of reported unfair treatment in our sample, which reduced our ability to capture variance in this social experience, although low frequency of experiences of unfair treatment is common in diary studies (e.g., Wang & Yip, 2020; Zeiders, 2017). Given the low base rates, more than 7 days may be required to estimate the reciprocal effects of unfair treatment and sleep quality. Weak findings may also be a result of our measurement approach. Rather than using multiple items to assess unfair treatment associated with a single identity (e.g., treated with less courtesy due to race/ethnicity), we asked participants to indicate whether they were treated unfairly based on a range of identities (e.g., race/ethnicity, gender). As a result, our measure may not have captured subtle forms of unfair treatment or discrimination. Also, we assessed whether unfair treatment occurred, but did not measure the magnitude or potency of the event. Finally, our sample consisted of mostly first-generation, low-income Latinx college students, whereas prior studies have examined other racial/ethnic minority groups. Consequently, frequency and day-to-day variability in experiences of discrimination (both in form and magnitude) may be impacted by the racial/ethnic groups being studied, which could also explain differences in results across studies.

Limitations and Future Directions

Several limitations of this study should be noted. First, the modest sample size and relatively short diary period may have limited our ability to detect small but potentially important links between daily experiences and sleep and to detect between-person variability in these links. Second, sleep quality was self-reported. Although self-reported sleep quality is correlated with objective measures of sleep (Gordon et al., 2021; Konjarski et al., 2018), self-reports may be influenced by current mood in addition to other factors. Third, because we focused on a single ethnic group at one university, our findings may not generalize across other groups and contexts.

Future research should thus consider a longer diary period, an event-contingent (rather than time-contingent) design, and/or an experience sampling design in which participants respond to brief questions multiple times each day. Understanding how emotions change from wake to bedtime as well as how social processes unfold over the course of the day may be particularly valuable for this line of work. In addition, larger samples are needed to detect small but potentially important effects (especially low base rate events) and to explore possible moderators of these effects (e.g., resilience, family support). Further, future studies should explore new ways to assess the frequency and potency of daily experiences of discrimination, unfair

treatment, and social exclusion, as well as belonging and social connection. Assessing meaningful variability in social experiences related to discrimination and belonging from day-to-day is a significant challenge and will require creativity and innovation. Finally, future work should incorporate objective markers of sleep quality, include other health assessments, and investigate other underrepresented groups.

Conclusion

For underrepresented minority groups, college can prompt concerns about belonging and being treated fairly. College is also a time when students are pressured to live full social and academic lives, often sacrificing sleep for other pursuits. This work highlights the potential social and affective consequences of poor sleep for students and pinpoints the possibility of sleep as a target of intervention. In addition to creating fairer campuses and more opportunities for belonging, universities should consider interventions that promote better health behaviors, such as high-quality sleep. More than these practical conclusions, our findings advance theory on the relative contributions of positive and negative affect on sleep, sleep's more powerful role as an antecedent rather than outcome of affective and social processes, and the relative potency of different forms of social experiences on affect and overall well-being.

Additional Information

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Availability of Data and Material Study materials, data, and data analytic code are stored on Open Science Framework (https://osf.io/bkn79/?view_only=a20109b89881452eacda3ac1b7070731) and can be accessed with author permission (email corresponding author).

Ethics Approval Approval was obtained from the Human Subjects Committee of the University of California, Santa Barbara. All procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s42761-021-00088-0>.

Conflicts of Interest The authors declare no competing interests.

Consent to Participate Informed consent was obtained from all participants included in the study.

Consent for Publication Not applicable.

References

- Asarnow, L. D., McGlinchey, E., & Harvey, A. G. (2014). The effects of bedtime and sleep duration on academic and emotional outcomes in a nationally representative sample of adolescents. *The Journal of*

- Adolescent Health: Official Publication of the Society for Adolescent Medicine*, 54, 350–356. <https://doi.org/10.1016/j.jadohealth.2013.09.004>
- Bakdash, J. Z., & Marusich, L. R. (2017). Repeated measures correlation. *Frontiers in Psychology*, 8, 456. <https://doi.org/10.3389/fpsyg.2017.00456>.
- Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, 54, 579–616. <https://doi.org/10.1146/annurev.psych.54.101601.145030>
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529.
- Beattie, L., Kyle, S. D., Espie, C. A., & Biello, S. M. (2015). Social interactions, emotion and sleep: A systematic review and research agenda. *Sleep Medicine Reviews*, 24, 83–100. <https://doi.org/10.1016/j.smrv.2014.12.005>
- Brissette, I., & Cohen, S. (2002). The contribution of individual differences in hostility to the associations between daily interpersonal conflict, affect, and sleep. *Personality and Social Psychology Bulletin*, 28(9), 1265–1274. <https://doi.org/10.1177/01461672022812011>
- Buyse, D. J., Reynolds, C. F., III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28(2), 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Crocker, J., Major, B., & Steele, C. (1998). Social stigma. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 504–553). McGraw Hill.
- Dover, T. L., Major, B., & Glace, A. M. (2020). Discrimination, health, and the costs and benefits of believing in system fairness. *Health Psychology*, 39(3), 230–239. <https://doi.org/10.1037/hea0000841>
- Fredrickson, B. L. (2013). Positive emotions broaden and build. In E. Ashby Plant & P. G. Devine (Eds.), *Advances on experimental social psychology* (Vol. 47, pp. 1–53). Academic Press. <https://doi.org/10.1016/B978-0-12-407236-7.00001-2>
- Fredrickson, B. L., Tugade, M. M., Waugh, C. E., & Larkin, G. R. (2003). What good are positive emotions in crises? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *Journal of Personality and Social Psychology*, 84(2), 365–376. <https://doi.org/10.1037/0022-3514.84.2.365>
- Fuller-Rowell, T. E., Nichols, O. I., Burrow, A. L., Ong, A. D., Chae, D. H., & El-Sheikh, M. (2021). Day-to-day fluctuations in experiences of discrimination: Associations with sleep and the moderating role of internalized racism among African American college students. *Cultural Diversity and Ethnic Minority Psychology*, 27(1), 107–117. <https://doi.org/10.1037/cdp0000342>
- Gable, S. L., & Poore, J. (2008). Which thoughts count? Algorithms for evaluating satisfaction in relationships. *Psychological Science*, 19(10), 1030–1036. <https://doi.org/10.1111/j.1467-9280.2008.02195.x>
- Gillen-O'Neel, C. (2019). Sense of belonging and student engagement: A daily study of first- and continuing-generation college students. *Research in Higher Education*, 62, 45–71. <https://doi.org/10.1007/s11162-019-09570-y>
- Girme, Y. U., Maniacci, M. R., Reis, H. T., McNulty, J. K., Carmichael, C. L., Gable, S. L., Baker, L. R., & Overall, N. C. (2018). Does support need to be seen? Daily invisible support promotes next-day relationship well-being. *Journal of Family Psychology*, 32(7), 882–893. <https://doi.org/10.1037/fam0000453>
- Gordon, A. M., Carrillo, B., & Barnes, C. M. (2021). Sleep and social relationships in healthy populations: A systematic review. *Sleep Medicine Reviews*, 101428. <https://doi.org/10.1016/j.smrv.2021.101428>
- Gordon, A. M., & Chen, S. (2014). The role of sleep in interpersonal conflict: Do sleepless nights mean worse fights? *Social Psychological and Personality Science*, 5, 168–175. <https://doi.org/10.1177/1948550613488952>
- Gordon, A. M., Mendes, W. B., & Prather, A. A. (2019). Sleep and social processes. In *Sleep, Personality, and Social Behavior* (pp. 3–12). Springer. https://doi.org/10.1007/978-3-030-30628-1_1
- Gordon, A. M., Mendes, W. B., & Prather, A. A. (2017). The social side of sleep: Elucidating the links between sleep and social processes. *Current Directions in Psychological Science*, 26, 470–475. <https://doi.org/10.1177/0963721417712269>
- Gordon, A. M., Prather, A. A., Dover, T., Espino-Pérez, K., Small, P., & Major, B. (2020). Anticipated and experienced ethnic/racial discrimination and sleep: A longitudinal study. *Personality and Social Psychology Bulletin*, 46(12), 1724–1735. <https://doi.org/10.1177/0146167220928859>
- Hisler, G. C., & Brenner, R. E. (2019). Does sleep partially mediate the effect of everyday discrimination on future mental and physical health? *Social Science & Medicine*, 221, 115–123. <https://doi.org/10.1016/j.socscimed.2018.12.002>
- Hox, J. J., Moerbeek, M., & Van de Schoot, R. (2017). *Multilevel analysis: Techniques and applications*. Routledge. <https://doi.org/10.4324/9781315650982>
- Huynh, V. W., & Gillen-O'Neel, C. (2016). Discrimination and sleep: The protective role of school belonging. *Youth & Society*, 48(5), 649–672. <https://doi.org/10.1177/0044118X13506720>
- Inagaki, T. K., & Human, L. J. (2019). Physical and social warmth: Warmer daily body temperature is associated with greater feelings of social connection. *Emotion*, 20(6), 1093–1097. <https://doi.org/10.1037/emo0000618>
- Jackson, C. L., Redline, S., & Emmons, K. M. (2015). Sleep as a potential fundamental contributor to disparities in cardiovascular health. *Annual Review of Public Health*, 36(1), 417–440. <https://doi.org/10.1146/annurev-publhealth-031914-122838>
- John-Henderson, N. A., Palmer, C. A., & Thomas, A. (2019). Life stress, sense of belonging and sleep in American Indian college students. *Sleep Health*, 5(4), 352–358. <https://doi.org/10.1016/j.sleh.2019.04.001>
- Kalmbach, D. A., Pillai, V., Roth, T., & Drake, C. L. (2014). The interplay between daily affect and sleep: A 2-week study of young women. *Journal of Sleep Research*, 23(6), 636–645. <https://doi.org/10.1111/jsr.12190>
- King, L., Rangel, E., Simpson, N., Tikotzky, L., & Manber, R. (2020). Mothers' postpartum sleep disturbance is associated with the ability to sustain sensitivity toward infants. *Sleep Medicine*, 65, 74–83. <https://doi.org/10.1016/j.sleep.2019.07.017>
- Konjarski, M., Murray, G., Lee, V. V., & Jackson, M. L. (2018). Reciprocal relationships between daily sleep and mood: A systematic review of naturalistic prospective studies. *Sleep Medicine Reviews*, 42, 47–58. <https://doi.org/10.1016/j.smrv.2018.05.005>
- Lewis, T. T., Troxel, W. M., Kravitz, H. M., Bromberger, J. T., Matthews, K. A., & Hall, M. H. (2013). Chronic exposure to everyday discrimination and sleep in a multiethnic sample of middle-aged women. *Health Psychology*, 32(7), 810–819. <https://doi.org/10.1037/a0029938>
- Major, B., Dovidio, J. F., & Link, B. G. (Eds.). (2018). *The Oxford handbook of stigma, discrimination, and health*. Oxford University Press.
- Monk, T. H., Reynolds, C. F., Kupfer, D. J., Buysse, D. J., Coble, P. A., Hayes, A. J., Machen, M. A., Petrie, S. R., & Ritenour, A. M. (1994). The Pittsburgh sleep diary. *Journal of Sleep Research*, 3(2), 111–120. <https://doi.org/10.1111/j.1365-2869.1994.tb00114.x>
- Murphy, K., & Tyler, T. (2008). Procedural justice and compliance behaviour: The mediating role of emotions. *European Journal of Social Psychology*, 38(4), 652–668. <https://doi.org/10.1002/ejsp.502>
- Ong, A. D., & Williams, D. R. (2019). Lifetime discrimination, global sleep quality, and inflammation burden in a multiethnic sample

- of middle-aged adults. *Cultural Diversity and Ethnic Minority Psychology*, 25(1), 82–90. <https://doi.org/10.1037/cdp0000233>
- Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin*, 135(4), 531–554. <https://doi.org/10.1037/a0016059>
- Sechrist, G. B., Swim, J. K., & Mark, M. M. (2003). Mood as information in making attributions to discrimination. *Personality and Social Psychology Bulletin*, 29(4), 524–531. <https://doi.org/10.1177/0146167202250922>
- Sin, N. L., Almeida, D. M., Crain, T. L., Kossek, E. E., Berkman, L. F., & Buxton, O. M. (2017). Bidirectional, temporal associations of sleep with positive events, affect, and stressors in daily life across a week. *Annals of Behavioral Medicine*, 51, 402–415. <https://doi.org/10.1007/s12160-016-9864-y>
- Slopen, N., Lewis, T. T., & Williams, D. R. (2016). Discrimination and sleep: A systematic review. *Sleep Medicine*, 18, 88–95. <https://doi.org/10.1016/j.sleep.2015.01.012>
- Sommet, N., & Morselli, D. (2017). Keep calm and learn multilevel logistic modeling: A simplified three-step procedure using Stata, R, Mplus, and SPSS. *International Review of Social Psychology*, 30(1), 203–218. <https://doi.org/10.5334/irsp.90>
- Sternthal, M., Slopen, N., & Williams, D. R. (2011). Racial disparities in health: How much does stress really matter? *Du Bois Review*, 8(1), 95–113. <https://doi.org/10.1017/S1742058X11000087>
- Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior*, 52(2), 145–161. <https://doi.org/10.1177/0022146510395592>
- van den Bos, K. (2003). On the subjective quality of social justice: The role of affect as information in the psychology of justice judgments. *Journal of Personality and Social Psychology*, 85(3), 482–498. <https://doi.org/10.1037/0022-3514.85.3.482>
- Yip, T., Cham, H., Wang, Y., & El-Sheikh, M. (2020). Discrimination and sleep mediate ethnic/racial identity and adolescent adjustment: Uncovering change processes with slope-as-mediator mediation. *Child Development*, 91(3), 1021–1043. <https://doi.org/10.1111/cdev.13276>
- Yip, T., Cheon, Y. M., Wang, Y., Cham, H., Tryon, W., & El-Sheikh, M. (2020). Racial disparities in sleep: Associations with discrimination among ethnic/racial minority adolescents. *Child Development*, 91(3), 914–931. <https://doi.org/10.1111/cdev.13234>
- Walton, G. M., & Cohen, G. L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology*, 92(1), 82–96. <https://doi.org/10.1037/0022-3514.92.1.82>
- Walton, G. M., & Cohen, G. L. (2011). A brief social-belonging intervention improves academic and health outcomes of minority students. *Science*, 331(6023), 1447–1451. <https://doi.org/10.1126/science.1198364>
- Walton, G. M., Cohen, G. L., Cwir, D., & Spencer, S. J. (2012). Mere belonging: The power of social connections. *Journal of Personality and Social Psychology*, 102(3), 513–532. <https://doi.org/10.1037/a0025731>
- Wang, Y., & Yip, T. (2020). Sleep facilitates coping: Moderated mediation of daily sleep, ethnic/racial discrimination, stress responses, and adolescent well-being. *Child Development*, 91(4), e833–e852. <https://doi.org/10.1111/cdev.13324>
- Williams, D. R., & Mohammed, S. A. (2009). Discrimination and racial disparities in health: Evidence and needed research. *Journal of Behavioral Medicine*, 32(1), 20–47. <https://doi.org/10.1007/s10865-008-9185-0>
- Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial differences in physical and mental health: Socioeconomic status, stress, and discrimination. *Journal of Health Psychology*, 2(3), 335–351. <https://doi.org/10.1177/135910539700200305>
- Zeiders, K. H. (2017). Discrimination, daily stress, sleep, and Mexican-Origin adolescents' internalizing symptoms. *Cultural Diversity and Ethnic Minority Psychology*, 23, 570–575. <https://doi.org/10.1037/cdp0000159>