Affect, emotion dysregulation and sleep quality among low-income women

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Abstract

Objectives—To examine the underlying mechanisms through which steady state emotions, specifically affect and emotion regulation, influence sleep quality among young adult low-income women.

Design—Cross-sectional

Setting—Stress and Health Study (2006–2012) in southeast Texas

Participants—A subgroup (n=392) of racially and ethnically diverse young adult women ages 18–31.

Measurements—Participants provided measures of positive and negative affect, difficulties in emotion regulation, and sleep quality. Structural equation models were designed to identify differential mediating roles of emotion dysregulation in the association between both positive and negative affect and sleep quality.

Results—The relationship between positive affect and improved sleep quality operated completely through domains of emotion regulation (β= –0.054, 95% CI: –0.08 to –0.03), whereas

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the adverse effects of negative affect exhibited both direct (β= 0.142, 95% CI: 0.06 to 0.23) and indirect (β= 0.124, 95% CI: 0.08 to 0.16) effects on poor sleep. Negative affect was associated with poor sleep quality via two pathways—it directly influenced sleep quality and it indirectly influenced sleep quality among women experiencing difficulties in emotion regulation.

Conclusions—Therapies targeting improvement and maintenance of healthy emotion regulation domains, while delineating the positive affect state from the negative affect state, may lessen the burden of poor sleep quality among low-income women.

Keywords

emotion regulation; affect; sleep quality; mediation model; women

INTRODUCTION

Overall health and psychological functioning are often linked to poor sleep-related outcomes (1). Poor sleep quality is a common complaint among individuals with physical conditions as well as affective disorders including depression, anxiety, and bipolar disorder (2,3). While emotion regulation has been implicated A growing body of research supports the hypothesis that regulatory emotional processes contribute to sleep outcomes (2,4). An interplay between affect and emotion regulation has been proposed in predicting sleep quality, but the roles of positive and negative emotions and their subsequent dysregulation to distinguish sleep quality remain largely unknown and have been highlighted as a research priority (2,5).

The effects of sleep, specifically sleep deprivation, on emotions and moods has been well documented in the experimental literature, but despite acknowledgement in the literature of a bidirectional relationship between emotions and sleep, the mechanisms through which emotions impact sleep has received less attention (6). Maladaptive strategies for managing affect are associated with difficulties in emotion regulation, which in turn may increase the risk for poor sleep quality (6–8). In a recent time-lagged analysis using daily diary data, Kouros and El-Sheikh (2015) examined bidirectional associations between sleep and mood in a community sample of 142 elementary school children (9). Findings suggested that within individuals, a day with worse mood than usual predicted poorer sleep quality that night, but between individuals poor sleep increased negative mood (9).

Positive affect and negative affect are two dominant and distinct dimensions of mood, associated with different regional activities in the prefrontal cortex (10). Conceptual models suggest that high negative affect, characterized by adverse mood states, is an independent predictor of chronic pain and cardiovascular disease, whereas high positive affect, characterized by high energy and full concentration, may buffer the influence of stress on health outcomes (11–14). Both high negative affect and low positive affect have been proposed as direct predictors of poor sleep, and high positive affect may additionally act as a buffer of negative affect, as well as other psychosocial risk factors (chronic life stress, social relationships, and psychological distress) on sleep problems (2,15).

The relationship between high negative affect and poor sleep may also be mediated by stress, coping strategies, and emotion regulation (16,17). Gross and John (2003)

hypothesized that positive and negative affect are related to different emotion regulation strategies—increased positive affective experience and expression is associated with reappraisal regulation, whereas increased negative emotion expression is related to suppression regulation (18). Although often considered a symptom of sleep problems, emotion dysregulation is also a contributor to psychopathology and clinical disorders, including those related to sleep (4,6,19,20). Tsypes et al. (2013) identified difficulties with emotion regulation as a mediator of the relationship between generalized anxiety disorder diagnosis, which is correlated with both dimensions of affect, and problems with sleep (21). Thomsen et al. (2005) highlighted the need to investigate emotion regulation for individual differences in negative affect after finding that it accounted for more variation in negative affect than either age or gender (22). Both theoretical and empirical support exists for a model where affective states prompt emotion regulation. Calkins (1994) detailed a theoretical framework in which behavioral traits influence emotion regulation and argued that positive or negative affect act as sources of individual variation in emotion regulation (23). More recently, empirical investigations have investigated emotion regulation as a mediator between negative affect and aggression (24). Kim-Spoon, Cicchetti, and Rogosch (2013) found the effects of emotion negativity on internalizing symptoms were completely mediated through emotion regulation (25).

We have focused the present study on the role of emotion dysregulation as a mediator of the relationship between positive and negative affect and sleep quality on a racially diverse group of low-income women. Problems with sleep quality and sleep duration are more common among individuals with low income and education levels (26–28). In a sample of over 150,000 participants from the 2006 Behavioral Risk Factor Surveillance System, lower income was associated with a higher likelihood of sleep complaints, and this association was stronger among women (29). Poor sleep is often considered in the causal pathway between low income and socioeconomic status and increased disease risk, likely due to a combination of both mediating and moderating effects of psychosocial and physical health factors, as well as the built environment.(30) There has been a paucity of research, however, focusing specifically on mechanisms through which sleep is impacted among low-income groups. We hypothesized that negative affect is positively associated with worse sleep quality, and that this relationship is mediated by distinct domains of emotion dysregulation. In contrast, we hypothesized that positive affect is negatively associated with worse sleep quality, also mediated by emotion dysregulation. Based on previous studies looking only at direct associations, we expected negative affect to have a greater overall influence than positive affect on emotion dysregulation, as well as on sleep (31).

METHODS

Participants

A subgroup of low-income women attending one of six University of Texas Medical Branch (UTMB) family planning clinics and participating in the Stress and Health Study (2006–2012) provided data for this analysis (32). Inclusion criteria were: female, not pregnant, age ≥ 18 years; non-Hispanic white, non-Hispanic black, or Hispanic; able to speak English or Spanish; and able to consent. Participants completed questionnaires related to demographics,

positive affect, negative affect, and emotion dysregulation. All survey instruments and consent forms were translated into Spanish by bilingual research assistants (all RAs were bilingual), and all instruments have been previously validated in Spanish (33–35). All participants had follow-up bi-monthly telephone interviews as a part of the larger longitudinal study (n = 886). A subgroup of 409 women were sequentially consented from telephone interviews to provide information on sleep quality, with the number of subgroup participants limited by research assistant availability. Participants with complete data (n = 392) on positive affect, negative affect, and emotion dysregulation were retained for analysis and did not differ from the larger sample (n =409) in age, race, education, employment status, and income. The study was approved by UTMB's IRB and all participants provided written informed consent.

Measures

The Positive and Negative Affect Schedule (PANAS) is a valid and reliable self-report measure of positive affect and negative affect, consisting of two 10-item scales to capture the respective dimensions of affect (36). For each item, participants were asked to indicate on a five-point scale the extent to which they had experienced each item in the past 8 weeks. Responses were labeled "very slightly or not at all," "a little," "moderately," quite a bit," or "extremely". The internal consistency estimate from the present study (Cronbach's $\alpha = 0.85$ for positive affect and $\alpha = 0.87$ for negative affect), as well as correlation between the two scales ($r = -0.09$, $p > 0.05$) matches previous estimates of the orthogonal relationship between positive affect and negative affect as measured by the PANAS (36), and scores did not vary based on timing of entry to the study (p > 0.05, data not shown but available upon request).

The Difficulties in Emotion Regulation Scale (DERS) is a 36-item self-administered Likert-type scale used to assess emotion dysregulation trait, comprising six related dimensions including nonacceptance of emotional responses, difficulty concentrating on and accomplishing goals, impulsive behavior, lack of awareness of emotion responses, limited access to effective strategies to regulate emotions, and a lack of clarity about the emotions being experienced (37). Participants were instructed to indicate how often the items applied to themselves, with responses ranging from 1 ("almost never") to 5 ("almost always"). In order to assess dysregulation specifically, many DERS items prompted participants to respond to situations in which they felt distress. DERS items were recoded so high scores on each item reflected greater dysregulation. The internal consistency estimate of reliability for the DERS items was excellent (Cronbach's $\alpha = 0.92$), and mean emotion dysregulation scores did not significantly vary based on timing of entry to the study.

The Pittsburgh Sleep Quality Index (PSQI) is a 19-item questionnaire which measures seven components of self-rated sleep quality and habits on a 0 to 3 scale, with higher scores indicating poorer sleep (38). The PSQI was self-administered—participants were asked to answer items based on their sleep during the previous month. A global index of sleep quality was created by summing component scores, and was treated as a continuous variable and the primary outcome of the study. The PSQI showed good internal consistency (Cronbach's $\alpha =$

0.84) and scores did not significantly vary based on timing of entry to the study (p > 0.05, data not shown).

Information on age, race and ethnicity, education, employment status, marital status, and income were collected and coded as dummy variables.

Data analysis

Initial bivariate associations were tested to examine relationships among sociodemographic characteristics, positive affect, negative affect, emotion dysregulation, and sleep quality. Group differences in sociodemographic characteristics were compared using one-way analysis of variance (ANOVA) with Bonferroni correction. Pair-wise Pearson correlation (*r*) was used to evaluate the association between continuous variables.

Mediation analysis was conducted using the default maximum likelihood estimator in the structural equation modeling (SEM) software program Mplus (39). The entire sample (n=392) was included in the model and considered relationships between positive affect and negative affect with emotion dysregulation and sleep quality. In addition to the primary model, which included emotion dysregulation as a mediator between positive and negative affect and sleep quality, several alternative models were also tested. The first considered positive affect and negative affect as mediators between emotion dysregulation and sleep quality, and the second considered sleep quality as a mediator between affect and emotion dysregulation. Positive affect was also included in a model as a moderator of the relationship between negative affect and emotion dysregulation.

Each model was adjusted for sociodemographic characteristics when they were marginally predictive ($p< 0.10$) of any of the main variables in the model. Model fit was evaluated through examination of test statistics: chi-square, comparative fit index (CFI, where values greater than 0.90 indicated good fit), and the root-mean-square error of approximation (RMSEA, where values less than 0.10 indicated good fit) with 90% confidence intervals (40,41). Indirect effects of positive affect and negative affect on sleep quality were also evaluated. To test for bias-corrected significance and to construct 95% confidence intervals, mediated effects were estimated using a bootstrapped sample of 1000 (42).

RESULTS

Descriptive statistics were examined for all study variables, as well as Pearson correlations for the main variables included in the mediation model. The study sample represented a racially and ethnically diverse group of participants—the majority of women identified as Black (n = 224, 57.1%), but White (n = 101, 25.6%) and Hispanic (n = 67, 17.1%) women were also well represented. The majority of the sample was categorized as extremely low-income, with an annual household income reported less than or equal to $5,000. Table 1 provides sociodemographic characteristics for the study sample.

No significant differences in sleep quality by any sociodemographic characteristics were observed in bivariate analyses. Some small yet statistically significant differences were observed, however, for positive affect—Black and White participants had significantly

higher positive affect than Hispanic participants and women who worked full time reported higher positive affect than women who classified themselves as homemakers. Positive affect was moderately negatively correlated with emotion dysregulation, but was not correlated with negative affect or sleep quality. In contrast, negative affect exhibited moderate positive correlation with both emotion dysregulation and sleep quality (Table 2). Moderate positive correlation was also observed between emotion dysregulation and sleep quality.

Primary mediation model

The final mediation model is presented in Figure 1. The model includes direct effects of positive affect and negative affect, respectively, on emotion dysregulation and sleep quality, as well as indirect effects of positive affect and negative affect on sleep quality, through emotion dysregulation. Model fit statistics indicated good overall model fit, $\chi^2 (9) = 8.52$, $p > 0.05$ (CFI = 1.00, RMSEA = <0.001, 90% CI: <0.001 to 0.055). The direct path from emotion dysregulation to sleep quality was highly significant (Figure 1). Positive affect was negatively associated with emotion dysregulation, whereas negative affect was positively associated with emotion dysregulation. Preliminary models testing the associations between affect and the six dimensions of emotion dysregulation suggested similar patterns as the overall emotion dysregulation score with few exceptions. Negative affect was directly associated with all six emotion dysregulation dimensions, and positive affect was directly associated with all six domains with the exception of "difficulty concentrating on and accomplishing goals."

Both indirect effects of positive affect and negative affect, respectively, on sleep quality via emotion dysregulation were significant. The bias-corrected indirect standardized coefficient for negative affect was significant ($\beta= 0.124$, 95% bootstrap CI: 0.08 to 0.16, $p< 0.001$). The bias-corrected indirect standardized coefficient for positive affect was also significant ($\beta = -0.054$, 95% bootstrap CI: −0.08 to −0.03, $p= 0.001$), but more than two times smaller in magnitude than the indirect effect from negative affect. Only the direct effect to sleep quality from negative affect was significant ($\beta = 0.142$, 95% CI: 0.06 to 0.23, $p= 0.005$), indicating emotion dysregulation as a partial mediator for negative affect, and as a total mediator for positive affect. Moderated mediation analysis was also conducted to test whether the mediator, emotion dysregulation, also moderated the effect of positive affect and negative affect on sleep quality. This test for moderated mediation specifically assessed whether the mediational effects of emotion dysregulation varied across the levels of positive and negative affect, respectively,(43,44) and revealed no support for affect-by-emotion dysregulation interactions in separate models for positive affect and negative affect. Indirect and direct effects showed the same pattern as the classical approach from the final model reported, so we are confident in their estimates (44,45). Regarding the mediating effects of the six dimensions of emotion dysregulation, all dimensions except "lack of awareness of emotion responses" were indirectly associated with poorer sleep quality through negative affect; all dimensions except "difficulty concentrating on and accomplishing goals" were indirectly associated with poorer sleep quality through positive affect. In summary, negative affect was associated with poor sleep quality via two pathways—it directly reduced sleep quality and it indirectly reduced sleep quality among women experiencing difficulties in emotion regulation.

Alternative models

Several alternative models were also tested to determine other possible associations among variables. First, positive affect was included in a model as a moderator of the relationship between negative affect and emotion dysregulation. The fit of this model worsened dramatically in comparison to the final model, with no evidence of an interaction effect between positive affect and negative affect on emotion dysregulation or on sleep quality. A mediational model in which emotion dysregulation affects sleep quality through positive affect and negative affect was also considered, but model fit statistics (χ^2 (14) = 21.53, p = 0.09) favored the model in Figure 1. Due to the cross-sectional nature of our study design, an equivalent model with sleep quality as a mediator of the relationship between affect and emotion dysregulation was also considered. Despite adequate fit statistics (χ^2 (9) = 13.77, p = 0.13, the original mediation model (Figure 1) still had the best overall fit. We detail the alternative mediational models in Appendix A, and provide coefficients for all relationships between primary variables in the saturated model.

DISCUSSION

Overall, we have identified a mechanism through which emotional processes, specifically emotion dysregulation and affect, are related to poor sleep quality. Emotion dysregulation was found to be a larger contributor to poor sleep quality than the two dimensions of affect, which were more indirectly linked to sleep quality through emotion dysregulation. There has been some recent evidence in the literature proposing a similar conceptual framework, but our study adds further empirical support for an underlying mechanism linking emotional processes and sleep (4,6,46). In two recent studies, Brand et al. (2015) found that poor emotion regulation, stress, and coping completely mediated the relationship between perfectionism and poorer sleep.(47) In a similar analysis assuming a bidirectional link between sleep and emotional competence, Brand et al. (2015) found that whereas insomnia symptoms were associated with poorer emotion regulation and perception, insomnia was not associated with emotional expression, which are direct indicators of affect.(47) These results lend support to the theoretical framework that emotion regulation acts as a mediator in the association between personality traits or affect and sleep.

The strength of association between positive affect and negative affect, respectively, and emotion dysregulation is consistent with the literature, which suggests that negative affect and emotion dysregulation exhibit a greater association with poor sleep quality than positive affect does (4). We expected negative affect to have a greater overall influence than positive affect on emotion dysregulation, as well as on sleep, based on the body of evidence in the psychological literature suggesting that it is evolutionarily adaptive for negative stimuli and events to elicit stronger reactions and effects on health, well-being, and behavior than positive ones (31).

Our findings also suggest that the relationship between positive affect and poor sleep quality operates completely through emotion dysregulation—increasing positive affect has no direct effect on sleep quality, suggesting that any increase in positive affect may not attenuate poor sleep in an individual with high emotion dysregulation. When the positive affective state is identified, therapies aimed at improving sleep quality can target emotion regulation. In

contrast, the adverse effects of increasing negative affect on poor sleep quality, which are more common in low-income populations, could be mitigated via more effective dimensions of emotion regulation (48). Our result suggests that in order to improve sleep quality among women with negative affect, more complex (multiple, or tiered) intervention strategies may be needed to focus simultaneously on negative affect and emotional dysregulation.

Limitations

The present study has several limitations. Participants were low-income women ages 18–31, which limits external generalizability. Second, since study design was cross-sectional, we made an assumption of temporal order in the model process with affect as an upstream predictor of emotion dysregulation. To justify the use of affect as a predictor of trait emotion dysregulation, we tested alternate mediational models where positive affect and negative affect mediated the relationship from emotion dysregulation to sleep quality, and where sleep quality was treated as the mediator. These alternative models did not perform as well as the model in Figure 1. Despite this finding, there is evidence to suggest that poor sleep quality or sleep loss inhibits neurocognitive processes, including emotional information processing and control over negative emotions (49). This is a complex problem—emotional distress can degrade sleep quality, and poor sleepers experience emotional consequences via cognitive change or altered behavior, which reinforces negative emotions such as reduced social engagement and activity (5). Future research should explore this alternate model prospectively.

It would be of interest for future investigations to determine if the significant pathways identified in Figure 1 can be generalized to other populations. Health providers' ability to anticipate the risk of sleep problems if they are aware of patients' affective states and emotion regulation strategies could help tailor cognitive-behavioral therapy (CBT) to function as a complement to interventions that specifically target sleep. In randomized controlled trials, CBT including sleep education, stimulus control, and time-in-bed restrictions have been compared to pharmacological treatment and placebo among patients with chronic insomnia—results suggest both acute and more long-term (6 months) benefits are associated with CBT (50). In the context of emotion regulation, CBT can be directed to operationalize concepts of cognitive reappraisal to change expectations and response to some negative exposure or outcome. Davies et al. (2015) also recommend acceptance and commitment therapy (ACT), which guides patients to increase their mindfulness, acceptance, and ability to "live in the moment" (51). A recent study examining the ability of CBT for anxiety to improve sleep related problems in an adolescent sample found parent-reported improvements in "bedtime resistance" and "sleep anxiety," but adolescents did not report significant changes (52). For participants in our study—younger low income women, maybe the best approach is to try to address both the causes of distress in these women's lives (improve clarity about the emotions being experienced), come to an acceptance of the emotions being experienced, and control impulsive behavior. Providers may additionally offer advice on how to achieve a "healthy" sleep environment (dim evenings, dark bedroom, do not turn on lights if awakens up in the middle of the night).

CONCLUSIONS

Overall, our findings suggest that emotion dysregulation mediates the relationship between affect and poor sleep quality in low-income women. This study has identified emotion dysregulation as a target for healthcare providers to potentially intervene in the cycle that operates when emotional processes compromise sleep quality, which in turn may lead to disrupted emotions. Further, it is also important for individuals to identify their own affective state, positive or negative, and attempt to target the different dimensions of emotion regulation that together can ultimately improve their sleep quality.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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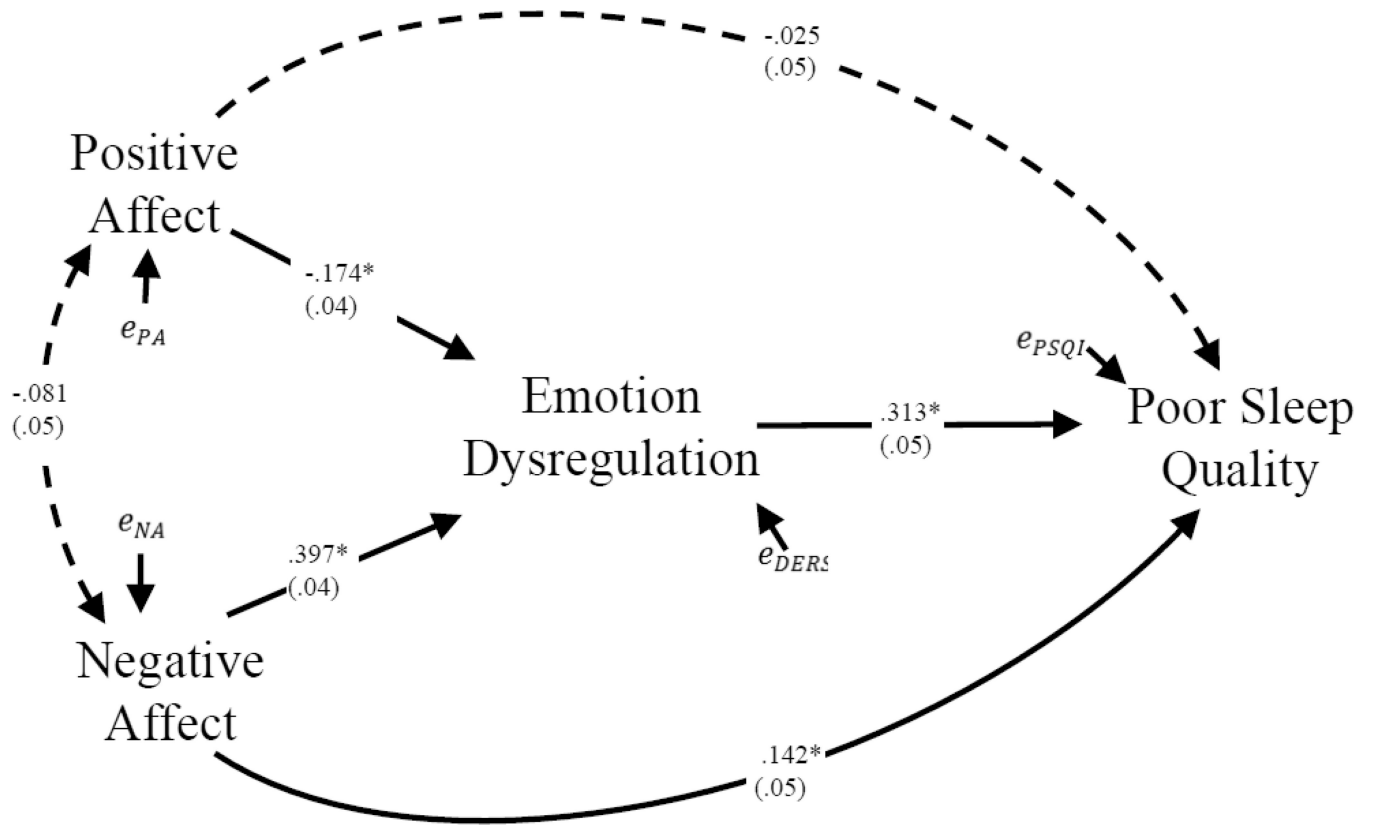
Figure 1.
Mediation effects of emotional dysregulation on the relationships from affect to sleep quality
(n= 392)

Note: Coefficients (SE) are standardized; *p <.05; interrupted lines show non-significant coefficients. Models are adjusted for race, age, education, employment, marital status, and income. *Fit*: χ^2 (9) = 8.52; p = 0.483, CFI= 1.00, RMSEA= <0.0001, 90% CI [<0.0001 to 0.055]; R^2_{DERS}=0.272; R^2_{PSQI}=0.181. Indirect effects through DERS: from NA: +0.124* (95% CI: 0.08 to 0.16); from PA: −0.054* (95% CI: −.08 to −.03), bootstrap CIs.

Table 1

Participant characteristics (n = 392)

	n	(%)
Race		
Black	224	(57.1)
Hispanic	67	(17.1)
White	101	(25.6)
Age (years)		
18 – 21	119	(30.1)
22 – 25	142	(36.2)
26 – 31	131	(33.4)
Education		
< 12th grade	128	(32.7)
High school graduate	166	(42.4)
Some college	98	(25.0)
Marital status		
Married	75	(19.1)
Co-habitated	76	(19.4)
Boyfriend, not married	146	(37.2)
No boyfriend, not married	95	(24.2)
Employment		
Full time	107	(27.3)
Part time	57	(14.5)
Homemaker	70	(17.9)
Unemployed	158	(40.3)
Annual household income		
$5,000	267	(68.1)
$5,000–$15,000	71	(18.1)
> $15,000	54	(13.8)

Table 2

Pearson correlation coefficients and descriptive statistics for study variables in the mediation model

	1	2	3	4
1. Positive affect	1.00			
2. Negative affect	−0.09[†]	1.00		
3. Emotion dysregulation	−0.25	0.43	1.00	
4. Sleep quality	−0.09[†]	0.26	0.37	1.00
Mean	31.1	21.6	79.7	4.9
Standard deviation	8.7	8.7	23.6	3.7
Range	0 – 50	0 – 48	36 – 161	0 – 17

Note: All correlations statistically significant ($p < 0.001$) except †.