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Discrimination and Sleep: Differential Effects by Source
and Coping Strategy among Latinx Adults

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF ARTS

in Social Ecology

by

Angelina Majeno, MPH

Thesis Committee:
Associate Professor Kristine M. Molina, Chair
Professor Ilona Yim
Professor Belinda Campos

2021

DEDICATION

To

my family

Richard and Jessie for their unconditional love and support,

mis padres

como reconocimiento y agradecimiento por todo lo que han hecho para que yo tenga la
oportunidad de perseguir mis sueños,

et ma sœur Damaris

tu me manques.

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ABSTRACT OF THE THESIS

Discrimination and Sleep: Differential Effects by Source
and Coping Strategy among Latinx Adults

by

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Master of Arts in Social Ecology

University of California, Irvine, 2021

Assistant Professor Kristine M. Molina, Chair

Discrimination has been posited as a contributor of sleep disparities for Latinxs. Strategy used to cope with discrimination may reduce or exacerbate its effects on sleep. This study examined whether different types of discrimination (everyday [ED] and lifetime [LD]) were associated with sleep indices (efficiency, quality, disturbances) and whether coping strategy used moderated associations. Data of Latinx adults ($N=602$; 51% female, 65% Dominican, M age =46.72 years) were from the Latino Health and Well-being Project. Multiple linear regressions were estimated separately for each sleep outcome. ED was significantly associated with poorer sleep quality and greater disturbances; LD was significantly associated with worse sleep across the three indices. Coping strategy moderated associations between discrimination and sleep. Compared to Latinxs who used passive coping, those who used passive-active coping strategies had poorer sleep quality the more they experienced ED. Latinxs who used any active coping strategy, compared to passive coping, had greater sleep disturbances the more they reported LD. Findings show that ED and LD impair sleep and suggest that coping with discrimination may require the use of different strategies depending on the type of discrimination experienced.

CHAPTER 1

INTRODUCTION

Sleep disparities have been reported in the literature, with Latinx individuals reporting worse sleep quality and suboptimal sleep durations compared to Whites (Bixler, 2009; Patel et al., 2010). This is particularly concerning given that sleep plays a critical role in health, as it is implicated in important functions including glucose regulation, hormone release, cardiovascular function, immune responses, and cognitive and emotional processes (Bixler, 2009; Irwin, 2015; Orzel-Gryglewska, 2010). Indeed, poor sleep quality and inadequate sleep duration are associated with an increased risk of worse health and chronic conditions, such as obesity and diabetes (Knutson & Van Cauter, 2008)—two areas where Latinxs also evidence health disparities. Thus, as the largest ethnic minority population in the United States (U.S. Census Bureau, 2018), it is imperative to examine potential contributors of poor sleep among this population, as their health is increasingly tied to our nation's health.

Discrimination and Sleep

While several factors contribute to sleep disparities, mounting evidence suggests that disproportionate exposure to discrimination (i.e., actual or perceived differential treatment perpetrated by individuals and social institutions) plays a significant role (Williams & Mohammed, 2009). Nearly 80% of Latinx adults in the United States report experiencing discrimination (Arellano-Morales et al., 2015), and several studies find that discrimination is associated with poor sleep quality and sleep duration disturbances (Grandner et al., 2012; Slopen & Williams, 2014; Tomfohr et al., 2012). For example, findings from the Hispanic Community Health Study/Study of Latinos (Alcántara et al.,

2017) showed that experiencing ethnic discrimination was associated with short (i.e., fewer than 7 hours per day) and long (i.e., more than 9 hours of sleep per day) sleep duration. Moreover, a systematic review of 17 studies reports consistent evidence of a negative association between discrimination and sleep outcomes (objectively and subjectively measured; Slopen, Lewis, & Williams, 2016). Overall, a growing body of research demonstrates that discriminatory experiences constitute psychosocial stressors that can have deleterious effects on biobehavioral processes such as sleep (Williams & Mohammed, 2009), although perceived stress only partially mediates the association between discrimination and sleep outcomes (Majeno et al., 2018).

The Biopsychosocial Model of Racism (Clark et al., 1999) can be used to understand the association between discriminatory experiences and health-related outcomes such as sleep. First, this model posits that perceived discrimination—as a psychosocial stressor—results in a range of psychological and physiological stress responses. For example, exposure to discrimination can disrupt cognitive and emotional regulation, including increased feelings of threat and vigilance (i.e., the mental anticipation and preparation to face discrimination), rumination, feelings of loneliness, and psychological distress. Discrimination may also result in physiological changes (e.g., dysregulated hypothalamic-pituitary-adrenal [HPA] axis activity) that may disrupt sleep quality and sleep patterns (Slopen, Lewis, & Williams, 2016). Together, these stress responses evoked by the experience of discrimination may constitute important mechanisms through which sleep is disrupted (Hicken et al., 2014; Majeno et al., 2018).

Second, the Biopsychosocial Model of Racism (Clark et al., 1999) model emphasizes the importance of distinguishing between chronic and acute forms of discrimination, given

that they differ based on their magnitude (e.g., major life events versus daily hassles) and frequency (Ayalon & Gum, 2011), which may result in them having differential associations with sleep indices. For instance, *everyday discrimination*, which captures the breadth of chronic exposure to day-to-day experiences of discrimination (e.g., being followed around in a store; treated with less respect than others), is persistent and more pervasive. On the other hand, *major lifetime discrimination* captures the cumulative exposure to major events of discrimination across several domains (e.g., receiving differential treatment while getting a bank loan; being unfairly denied a promotion). These experiences may have happened many years ago and generally tend to occur less frequently (Ayalon & Gum, 2011). Previous research finds that both everyday discrimination (Grandner et al., 2012; Slopen & Williams, 2014) and major lifetime discrimination (Ong & Williams, 2019) are associated with poor sleep indices. Yet, to our knowledge, no study to date has examined whether these two forms of discrimination are associated with sleep indices above and beyond the other. Although not focused on sleep, several studies show that, relative to major lifetime discrimination, everyday discrimination appears to have a stronger association with different health-related indicators (Ayalon & Gum, 2011; Kessler et al., 1999; Liu & Kawachi, 2017). As such, examining whether these two forms of discrimination are differentially associated with sleep indices remains an empirical question worthy of scientific inquiry.

Discrimination and Coping

Although research has begun to document the negative consequences that experiencing discrimination has on sleep, limited research exists regarding mechanisms that may ameliorate or reduce the deleterious effects of discrimination. The

Biopsychosocial Model of Racism (Clark et al., 1999) suggests that coping is a particularly salient moderator of the association between discrimination and health outcomes. In particular, it theorizes that maladaptive coping responses, such as the use of passive and inactive strategies (e.g., resigning oneself to experiences of discrimination), may not only independently negatively impact health, but may also exacerbate the adverse effects of discrimination on health. Conversely, engaging in adaptive, active coping strategies such as discussing one's feelings with others, may serve a protective function in the context of discrimination.

Past research supports these postulates. For example, in a sample of African American older adults, results showed that engaging in passive coping in response to societal racism (e.g., avoiding it, ignoring it) was associated with worse self-rated health (Moody-Ayers et al., 2005). Further, Dyke and colleagues (2013) found that compared to passive coping (e.g., keeping the experience of discrimination to oneself), using active coping strategies (e.g., trying to do something about discrimination; discussing it with another person) was associated with lower risk of medical comorbidity in diabetes patients. Similarly, a study with Korean immigrants revealed that active coping (e.g., seeking social support, taking formal actions) was more effective in reducing the negative effects of discrimination on mental health, whereas the use of passive coping intensified the deleterious mental health effects of discrimination (Noh & Kasper, 2003). Other studies with African Americans (Krieger & Sidney, 1996; Singleton et al., 2008) found that passive coping in response to perceived racism was associated with higher blood pressure levels, while active coping was associated with lower blood pressure levels. While no study to date has focused on the potential moderating effects of different coping strategies in response to

discrimination on the health of Latinxs, Perez, Gavin, and Diaz (2015) found that Latinx immigrant adults who reported higher levels of stress were those more likely to report having experienced discrimination and having engaged in passive coping (i.e., denial) as their coping strategy in face of these stressors.

Further, individuals employ different coping mechanisms based on the context in which discrimination occurs (Brondolo et al., 2009); therefore, it is important to identify whether and how the association between discrimination is shaped by the type of discrimination individuals encounter (e.g., everyday discrimination versus major life experiences of discrimination) and the specific coping strategies employed. As Clark and colleagues (1999) suggest, some coping responses may be adaptive for acute stressors but maladaptive for chronic stressors. Therefore, it is important to determine whether active and passive coping strategies used in the context of different forms of discrimination buffer or exacerbate the negative effects of discrimination. While no study, to date, has examined whether coping strategies matter for sleep in the context of discrimination, it has been suggested that active coping may buffer the negative effects of discrimination on sleep (Tomfohr et al., 2012). Thus, an examination of coping strategies that Latinx persons may deploy in response to different forms of discrimination and how they may differentially impact sleep outcomes is warranted.

Present Study

The current study addresses gaps in the literature by: (a) examining whether different types of discrimination (everyday discrimination and major lifetime discrimination) are cross-sectionally associated with several sleep indices (i.e., sleep quality, sleep efficiency, and daily disturbances); and (b) identifying if and how coping

strategies (i.e., passive, passive-active, and active coping) moderate the association between each discrimination measure and sleep indices. See Figure 1 for a conceptual model of the proposed associations. It is hypothesized that experiences of everyday discrimination will be associated with all sleep indices (Majeno et al., 2018), whereas lifetime discrimination will be associated with sleep quality and daily disturbances (Hisler & Brenner, 2019; Lui & Kawachi, 2019). Given that lifetime discrimination might be a more distal stressor, it may not be strongly or consistently associated with sleep efficiency (Thomas et al., 2006). Due to the limited research on coping strategies in the context of different forms of discrimination, no concrete hypotheses regarding moderation effects by type of discrimination were formulated. However, based on existing research, it is hypothesized that passive-active and active coping will be protective (i.e., will have buffering effects), whereas passive coping will exacerbate the effects of both types of discrimination on sleep outcomes.

CHAPTER 2

METHOD

Participants and Procedures

This study is based on secondary analysis of cross-sectional data from the Latino Health and Well-being (LHWB) Project cohort. Participants from the LHWB project were recruited from the Lawrence Family Health Center in Lawrence, MA, a community health center serving a large percentage of Latinxs living in the Lawrence area. Proportional sampling within specified age (i.e., 21-34, 35-54, and 55-85 years) and gender strata from electronic patient records was used to randomly identify potential research participants who met inclusion criteria (i.e., self-identifying as Latinx/Hispanic, Spanish or English speakers, aged 21 to 85 years, no plans to move from the area within 1 year, and able to verbally answer administered survey questions). A total of 2,783 potentially eligible individuals were identified, of whom 1,236 (44.4%) could be contacted by study staff. Of these, 602 individuals agreed to participate, representing 21.6% of the 2,783 originally identified eligible individuals. These eligible and interested individuals were invited to participate in the study, and scheduled for a study visit where informed consent was obtained.

Assessments were conducted between September 2011 and May 2013. Questionnaires were verbally administered in English or Spanish by trained bilingual/bicultural research assistants. Study visits lasted between 2.5 and 3.5 hours and occurred at a centralized community location. Participants received \$50 as compensation. The University of Massachusetts Medical School Institutional Review Board approved the

main study (#H-14144). We obtained exempt status for secondary analysis of the main study from UCI's Institutional Review Board.

Measures

Lifetime discrimination. The Experience of Discrimination Scale (EOD; Krieger et al., 2005), a nine-item self-report measure, was utilized to assess experiences of major lifetime discrimination across several domains (e.g., "Have you ever experienced discrimination, or been made to feel inferior, at school because of your race, nationality/ethnicity, or skin color?" and "Have you ever experienced discrimination, or been made to feel inferior, while getting housing because of your race, nationality/ethnicity, or skin color?"). Responses to items followed a yes/no format. The sum of all affirmative responses to lifetime events was used, with higher numbers reflecting greater counts of discrimination. The scale has been utilized in other studies with Latinxs and has been found to be valid and reliable (Busse, Yim, & Campos, 2017; Otiniano Verissimo et al., 2014).

Everyday discrimination. The Everyday Discrimination Scale (Williams, et al., 1997) was used to assess chronic and routine discriminatory events in participants' daily life. A six-point scale (1 = *never*, 6 = *almost every day*) was used to determine the frequency of experiences of discrimination across nine scenarios (e.g., "You have been threatened or harassed" and "You received poorer service than other people at restaurants or stores"). The sum of items was used, with higher scores indicating a greater frequency of everyday discrimination. The construct validity and reliability of this scale have been demonstrated previously with these data (cf. Molina et al., 2018) and national samples of Latinx adults (Molina, Alegria, & Mahalingam, 2013).

Sleep. The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) includes 18 items, which encompass seven distinct dimensions of sleep: duration, disturbance, latency, daytime dysfunction, efficiency, quality, and sleeping medication use. These dimensions of sleep were measured retrospectively within the past month. The PSQI included open-ended items such as “During the past month, what time have you usually gone to bed at night?” and items with Likert-scale response options such as “How would you rate your sleep quality, overall, during the past month?” (1 = *very good*, 4 = *very bad*). To obtain scores for the dimensions of interest (i.e., perceived sleep quality, sleep efficiency, and daily disturbances), we followed procedures from Cole and colleagues' (2006) three-factor scoring method, which yielded three separate sleep factors from the seven components of the PSQI scale: sleep quality, sleep efficiency, and daily disturbances. The *sleep quality* factor included the sleep quality, latency, and use of sleeping medications components. The *sleep efficiency* factor was composed of the sleep duration and sleep efficiency components. The *daily disturbances* factor encompasses the sleep disturbances and daytime dysfunction components. Each of these three factors was calculated by averaging across the appropriate components; therefore, each factor has a maximum score of three points, with higher numbers reflecting worse sleep quality, less efficient sleep, and more sleep disturbances.

Coping Strategy. Two items from the Experience of Discrimination Scale (EOD; Krieger et al., 2005) were used to measure coping strategies used in response to discrimination. Participants indicated how they generally respond to experiences of unfair treatment and chose between “accept it as a fact of life” or “try to do something about it” for the first item, and “talk to other people about it” or “keep it to yourself” for the second item.

A three-level categorical variable was created. Participants who indicated they respond to unfair treatment by “accept[ing] it as a fact of life” or “keep[ing] it to themselves” were categorized as utilizing *passive coping only*. Those who reported responding to unfair treatment by “try[ing] to do something about it” or “talk[ing] to other people about it” were categorized as using *active coping*. And those who reported one passive and one active coping response were categorized as utilizing *passive-active coping*.

Sociodemographic Characteristics. The following sociodemographic characteristics were considered as potential covariates (see Data Analysis section) in statistical models: age (in years), sex (female, male), education level (1= *Less than high school* to 6= *college graduate or post-graduate*), Latinx ethnicity (i.e., Puerto Rican, Dominican, Other Latinx), nativity status (U.S.-born vs. immigrant), participants’ perceived income (i.e., whether they have enough money to meet their needs), and employment status (unemployed vs. employed). Additionally, given prior research finds that optimism is linked to sleep quality and duration (Hernandez et al., 2019), we controlled for it using the 10-item Life Orientation Test-Revised scale (Scheier, Carver, & Bridges; 1994), a standard psychological measure used for assessing optimism.

Data Analysis Plan

All analyses were conducted using Stata 15 software. Tests of significance were two-tailed and level of significance was taken at the $p < .05$ level.

Preliminary Analyses. Following procedures by Heeringa et al. (2010), we first conducted bivariate analysis between all proposed covariates and dependent variables (i.e., sleep measures). Associations with p-values of .25 and lower were considered in a fully adjusted model of covariates to arrive at a more parsimonious model of potential

confounders. Covariates that were found to be significant at this stage were included in the estimated models.

Descriptive Statistics. Descriptive statistics, including means and standard deviations, were computed for continuous variables; frequencies, proportions, and standard errors were derived for categorical variables (Table 1). Pearson's correlations (between continuous measures) and Point biserial correlations (between dichotomous measures) were used to examine bivariate correlations between key study variables (Table 2).

Main Analyses. Main analyses consisted of estimating multiple linear regression models for continuous outcomes. Sleep outcomes were modeled by building three models for each sleep measure (see Tables 3-5). In Model 1 (main effects model), both discrimination variables (i.e., everyday discrimination and major lifetime discrimination) along with covariates were included. In Model 2 (main effects model), the coping strategy categorical variable was further added. To examine effect modification; that is, the extent to which coping strategy shaped the direction and/or strength of the associations between discrimination variables and sleep outcomes, a model that included interaction terms between each discrimination variable and coping strategy (discrimination \times coping strategy), with coping strategy coded as 0= Only passive coping, 1=Passive-Active coping, and 2 = Only active coping was estimated. Continuous variables included in interaction terms (e.g., discrimination measures) were mean-centered to reduce multicollinearity (Aiken & West, 1991). Model 3 included the 2-way interaction terms for everyday discrimination \times coping strategy and for major lifetime discrimination \times coping strategy, main effects (everyday and major lifetime discrimination), and covariates. To aid in

interpreting and illustrating any significant interactions, coefficients from the respective final models (Model 3) were used to calculate predicted marginal means of sleep outcomes.

CHAPTER 3

RESULTS

Descriptive Statistics and Preliminary Analyses

Table 1 presents the distribution of selected sociodemographic characteristics of the sample. Table 2 reports descriptive statistics for main study variables and bivariate correlations among these variables. Briefly, everyday and lifetime discrimination measures were significantly and positively associated with the three sleep indices. Participants reported relatively low levels of everyday discrimination, with the average person reporting about one discriminatory event per year. The average participant also reported about one occurrence of major lifetime discrimination. The most commonly reported coping strategy was passive-active, with over two-thirds of participants endorsing this approach.

Multivariable Linear Regression Models

Sleep Quality

In the first regression model (see Table 3), results showed that everyday discrimination ($\beta = .13, p = .004$) and major lifetime discrimination ($\beta = .10, p = .029$) were significantly associated with worse sleep quality, controlling for covariates. In Model 2, where the coping strategy variable was added, results indicated that it was not associated with sleep quality. Both discrimination measures remained significantly associated with worse sleep quality in the second model. In the final model (Model 3), where the two interaction terms for discrimination \times coping strategy were added, results revealed that coping strategy moderated the effects of everyday discrimination on sleep quality, but not for major lifetime discrimination. More specifically, the slopes of the regression lines

between everyday discrimination and sleep quality are significantly different ($\beta = .28, p = .033$) for those employing only passive coping strategies compared to those employing passive-active strategies.

Follow-up contrasts of estimated means were conducted to examine the interaction term at different levels of everyday discrimination. Findings showed that at low levels of everyday discrimination, Latinxs who employed only passive coping strategies were predicted to have marginally worse sleep quality compared to those who used passive-active coping strategies ($M_{diff} = -.44, SE = .24, p = .065$). There were no significant differences on sleep quality at moderate or high levels of everyday discrimination by any coping strategy. Further, post-hoc simple slopes analyses revealed that among Latinxs who used either only passive coping ($\beta = -.018, SE = .018, p = .33$) or only active coping ($\beta = .004, SE = .012, p = .75$), increasing levels of everyday discrimination did not affect sleep quality. However, among Latinxs who used passive-active coping, increasing levels of everyday discrimination worsened sleep quality ($\beta = .023, SE = .006, p < .001$). Figure 1 shows the plotted predicted marginal means of sleep quality as a function of everyday discrimination and coping strategy.

Two sets of supplementary analyses were conducted. First, because our final model included two sets of continuous \times categorical (3-level) interactions, which may have resulted in reduced statistical power to detect interactions (Durand, 2013), we ran separate regression models for each interaction term (i.e., either only everyday discrimination \times coping strategy or major lifetime discrimination \times coping strategy). Results from these regression models yielded similar results to those in our final model, suggesting that estimation of fewer parameters did not make a difference. Second,

supplementary analyses were conducted using the final model of sleep quality to examine whether the difference found between those employing only passive coping strategies versus those employing passive-active strategies was driven by a specific type of passive-active strategy. These analyses showed that the slopes of the regression lines between everyday discrimination and sleep quality were marginally significantly different for the combinations of passive-active coping (i.e., Talking to someone about the experience of discrimination and accepting it as a fact of life ($\beta = .23, p = .055$) and keeping it to themselves and doing something about it ($\beta = .12, p = .074$)) compared to those employing a passive only coping strategy. While marginally significant on their own, these supplemental results lend support to those of the main analyses, which when categorized together, showed that those who were engaged in any form of passive-active coping were significantly different from those who only use passive coping. The pattern of the slopes are the same as those seen in Figure 1.

Sleep Efficiency

Table 4 reports on multivariable regression models of sleep efficiency. In Models 1 and 2, results showed that only lifetime discrimination ($\beta = .12, p = .011$) was significantly associated with poor sleep efficiency, controlling for covariates. There was no main effect of coping strategy when added in Model 2. In the final model (Model 3), associations between each discrimination measure and sleep efficiency were not moderated by coping strategy. Further, the main effect of major lifetime discrimination on sleep efficiency was no longer significant in this final model. Similar to models for sleep quality, supplementary analyses of separate regression models for each interaction term were run for the sleep

efficiency models. Results from these regression models yielded similar results to those in our final model, suggesting that estimation of fewer parameters did not alter our results.

Sleep Disturbances

In the first regression model (see Table 5), results showed that everyday discrimination ($\beta = .17, p < .001$) and lifetime discrimination ($\beta = .21, p < .001$) were significantly associated with more sleep disturbances, controlling for covariates. In Model 2, where the coping strategy variable was added, results indicated that passive-active coping ($\beta = -.15, p = .087$), compared to only passive coping, was marginally associated with fewer sleep disturbances. Both discrimination measures remained significantly associated with more sleep disturbances. In the final model (Model 3), where the two interaction terms for discrimination \times coping strategy were added, results revealed that coping strategy moderated the effects of major lifetime discrimination on sleep disturbances, but not for everyday discrimination. More specifically, the slopes of the regression lines between major lifetime discrimination and sleep disturbances are significantly different between those employing only passive strategies compared to those employing only active coping strategies ($\beta = .27, p = .011$).

Follow-up contrasts of estimated means were conducted to examine the interaction term at different levels of major lifetime discrimination. Findings showed that at low levels of major lifetime discrimination, Latinxs who employed only passive coping strategies were predicted to have significantly more sleep disturbances compared to those who employed passive-active coping ($M_{\text{diff}} = -.49, SE = .21, p = .017$) or active only coping ($M_{\text{diff}} = -.46, SE = .22, p = .033$). At moderate levels, those who employed only passive coping strategies were predicted to have marginally more sleep disturbances compared to those employing

passive-active coping strategies ($M_{diff} = -.21, SE = .13, p = .094$). Those who used only active coping strategies did not differ from those who employed only passive coping strategies ($M_{diff} = -.06, SE = .13, p = .64$). At high levels, those who employed only passive coping strategies were predicted to have marginally less sleep disturbances compared to those employing only active coping strategies ($M_{diff} = .34, SE = .20, p = .083$). Those who used passive-active coping strategies did not differ from those who employed only passive coping strategies ($M_{diff} = .06, SE = .18, p = .71$). Further, post-hoc simple slopes analyses revealed that among Latinxs who employed passive only coping strategies ($\beta = -.103, SE = .093, p = .27$), increasing levels of major lifetime discrimination did not affect sleep disturbances. However, among Latinxs who employed passive-active ($\beta = .079, SE = .021, p < .001$) or active only coping strategies ($\beta = .158, SE = .043, p < .001$), increasing levels of major lifetime discrimination worsened sleep disturbances. Figure 2 shows the plotted predicted marginal means of sleep disturbances as a function of major lifetime discrimination and coping strategy.

Similar to the supplemental analyses conducted for sleep quality, two sets were conducted for sleep disturbances. First, supplemental analyses of regression models including one interaction term at a time, which yielded similar results to those in the sleep disturbances final model, suggesting that estimation of fewer parameters did not change the findings. Second, supplementary analyses were conducted using the final model of sleep disturbances to examine whether the difference found between those employing only passive coping strategies versus those employing passive-active strategies was driven by a specific type of passive-active strategy. Results showed that the slopes of the regression lines between major lifetime discrimination and sleep disturbances were significantly

different between those employing only passive coping strategies compared to those employing only active coping strategies ($\beta = .23, p = .03$), but not compared to any of the specific passive-active coping strategy combinations ($P_s > .05$). Supplemental findings are aligned with those from the main analyses using the combined passive-active coping strategy, suggesting that the type of combination of passive-active strategy used does not appear to make a difference.

CHAPTER 4

DISCUSSION

The current study examined: 1) whether and how everyday and major lifetime discrimination were associated with different sleep indices; and 2) whether and how coping strategies moderated associations among a community sample comprised mostly of immigrant Latinxs living in Lawrence, Massachusetts.

For the first research question, both everyday and major lifetime discrimination were found to be associated with worse sleep quality and greater sleep disturbances, consistent with hypothesized main effects. These findings are consistent with prior research that shows experiencing more frequent instances of everyday discrimination (Hoggard & Hill, 2016; Sims et al., 2016; Vaghela & Sutin, 2016) and major lifetime discrimination (Ong & Williams, 2019; Sims et al., 2016) are associated with worse sleep quality, and others that find that experiences of everyday (Majeno et al., 2018) and lifetime (Steffen & Bowden, 2006) discrimination are both associated with more daily sleep disturbances. Contrary to our hypothesis, major lifetime discrimination, but not everyday discrimination, was associated with poorer sleep efficiency. Limited research has examined how experiences of major lifetime discrimination relate to sleep efficiency among Latinx adults. However, the null finding for everyday discrimination corroborates that of previous studies using the everyday discrimination (Alcántara et al., 2019) or a racial/ethnic discrimination measure (Pichardo et al., 2020) with Latinx adult samples.

Overall, these findings are in line with the Biopsychosocial Model of Racism (Clark et al., 1999), which conceptualizes chronic and acute sources of discrimination as forms of psychosocial stress that can impact health outcomes, including sleep health, in both similar

and different ways. However, results from the moderation analyses provide additional insight as to how the discrimination-sleep relationship varies by type of discrimination, coping strategy, and sleep indicator. As Joseph and Kuo (2009) point out, certain coping strategies may be more beneficial in some contexts compared to others.

Everyday Discrimination, Coping, and Sleep

Results showed that employing a passive-active versus passive only coping strategy was associated with worse sleep quality. When the interaction was probed, results showed that among those employing passive-active coping, increasing levels of everyday discrimination were associated with worse sleep quality. Though contrary to what was hypothesized, follow-up contrasts revealed that at *low levels of everyday discrimination*, those who employed passive-active coping strategies reported marginally better sleep quality than those who employed only passive strategies. Although this difference was only marginally significant, the pattern is in line with the prediction that passive-active coping would buffer the effects of everyday discrimination. However, the marginal protective effect appears to be dependent on the amount of everyday discrimination reported.

Consistent with socio-cognitive models of racism (Brondolo et al., 2018), employing any combination of passive-active coping strategies in the face of frequent exposure to everyday discrimination may mean having to repeatedly negotiate when and how to respond to chronic and ambiguous discriminatory occurrences, which may deplete an individual's cognitive resources (Ozier, Taylor, & Murphy, 2019) and negatively impact sleep quality. Ambiguity is one of the effects that may result from the experience of discrimination. For example, when individuals are treated with less respect or courtesy than others, it may be difficult to determine if and why they were treated unfairly (Major,

Quinton, & McCoy, 2002; Sue et al., 2007). As a result of this ambiguity, individuals may feel less inclined to do something about these kinds of encounters or may question whether such experiences are worthy of discussing with others. Additionally, questioning whether what one experienced constitutes discrimination and then having to decide if to do something about it or whether and how to communicate it to others, can be stressful above and beyond the event (Harrell, 2000). In addition to taxing an individual's cognitive resources, this ambiguity can also prolong the duration of the stress response to such an experience, which could result in decreased sleep quality (Smyth, Zawadzki, & Gerin, 2013). Lastly, responding to discrimination may have social costs (e.g., being thought of as difficult or a troublemaker; Joseph & Kuo, 2009), whereas not responding may have intrapersonal costs (e.g., feeling powerless and vulnerable; Harrell, 2000), both of which may contribute to rumination (Hoggard & Hill, 2016) and heightened vigilance (Pichardo et al., 2020)— mechanisms through which chronic forms of discrimination relate to worse sleep quality.

On the other hand, there are different reasons why everyday discrimination may not have had a significant effect on sleep quality for those who engaged in only passive or active coping. Among individuals who engaged in only passive coping, it is plausible that they have purposefully accepted the pervasive nature of unfair treatment as an uncontrollable part of the lived reality of Latinxs. Therefore, they may have developed ways to persist meaningfully through these experiences, which may have contributed to better sleep quality. These speculations are consistent with the "shift-and-persist" perspective (Chen & Miller, 2012), which postulates that low status individuals may experience positive health outcomes despite stressful environmental situations (e.g.,

discrimination) because they develop coping strategies that prioritize shifting oneself (e.g., accepting adversity and adapting the self to it) in tandem with persisting through life with strength and meaning. Among Latinxs who employ only active coping strategies, it could be that individuals who confront discrimination (e.g., express one's satisfaction) or seek support (e.g., talk to others), regardless of the threshold of discrimination, are buffered by accrued psychosocial benefits, including an increased sense of autonomy (Sanchez et al., 2015) and control (Jang, Chiriboga, & Small, 2008), and increased emotional support and validation (Garcini et al., 2020)—all of which are health-promoting.

Interactive effects between everyday discrimination and coping strategy were not present for sleep efficiency or daily sleep disturbances. This could be due to the fact that other factors, such as negative mood, pain-related disorders, and mental and chronic health conditions (Desjardins et al., 2019; Yip & Cheon, 2020), may be more predictive of sleep efficiency and sleep disturbances than our measured experiences of everyday discrimination and coping strategies. Indeed, the model for sleep efficiency indicates that the variables in that model explained only up to 5% of the total variance in that outcome across estimated regression models. Further, while not significant, findings for coping and sleep disturbances point to a marginally protective effect of passive-active coping, which suggests that how a person copes with chronic unfair treatment may be a potential predictor of daily sleep disturbances than the perception of unfair treatment.

Major Lifetime Discrimination, Coping, and Sleep

Results showed that employing an active only (compared to a passive only coping strategy) was associated with more sleep disturbances. Whereas follow-up contrasts indicated that Latinxs who employed passive-active and active coping strategies reported

less sleep disturbances than those who employed only passive coping—consistent with the hypothesized buffering effect—this was only observed at low levels of major lifetime discrimination. In fact, when the interaction was probed, results showed that sleep disturbances got worse with increasing levels of major lifetime discrimination among those who used passive-active or active only coping strategies.

An explanation for these findings could be due to the consequential effects of major lifetime discrimination, which closely relates to systematic discriminatory experiences generally perpetrated by individuals within institutions with power (Williams & Mohammed, 2013). That is, while experiences of major lifetime discrimination tend to occur less often, when experienced they can result in significant economic and life consequences that limit access to health-promoting resources (Harrell, 2000) that can help individuals maintain healthy sleep routines. For instance, being denied a bank loan may indirectly result in daily sleep disturbances, such that not getting a loan to buy a home may result in a Latinx person having to reside in noisy or unsafe neighborhoods, which may contribute to daily sleep disturbances (Simonelli et al., 2017). Likewise, being unfairly denied a promotion, for instance, might relegate an individual to work extended hours and compromise sleep, which could result in irregular sleep schedules, daytime sleepiness, and disturbances in daily activities (Virtanen et al., 2009).

Given that major lifetime experiences of discrimination (e.g., being denied a promotion) are less ambiguous and may be seen as having greater resource-based costs (e.g., wage stagnation), individuals may be more inclined to use active coping strategies in response to them (e.g., speaking with or filing a formal complaint with human resources). However, the initial protective effect observed for proactive coping (at low levels of

lifetime discrimination) may result in unforeseen psychosocial costs such as increased worry/rumination, ostracization, and self-regulatory fatigue the more these strategies are employed with increasing occurrences of discrimination. Consequently, daily sleep disturbances may result from the increase of these health-damaging psychosocial mechanisms. Moreover, given that Latinxs in our study relied heavily on talking to others as a coping strategy in response to unfair treatment, perhaps this form of active coping was detrimental to daily sleep health if it had been overused. That is, while disclosing negative experiences to others may result in receipt of emotional support, repeatedly disclosing one's discriminatory experiences to others may result in seeing oneself as a victim, which may have adverse psychological effects in the long term (Harell, 2000) and can progress into negative schemas about oneself, others, and the world (Brondolo et al., 2018).

Taken together, findings from the current study indicate that experiences of discrimination, whether in everyday interpersonal interactions or as major events across life domains, can be detrimental to the sleep health of Latinx adults. Findings also suggest that coping strategies—whether passive, active, or a combination of passive and active—can either be protective against or exacerbate the deleterious sleep health effects of discrimination depending on the type of discrimination experienced and the frequency with which these experiences occur.

Strengths, Limitations, and Future Directions

Our study has several methodological strengths. First, most previous studies focused on Black/African American or White populations, and only a few included Latinxs (Ong & Williams, 2019; Slopen & Williams, 2014; Steffen & Bowden, 2006). Our study focused on a segment of the Latinx population underrepresented in this area of research

(i.e., Caribbean Latinxs) and who may be at increased risk of poor sleep outcomes (Dudley et al., 2017) because of increased exposure to discrimination due to constitutional factors (e.g., darker skin color; Araujo-Dawson, 2015; Oropesa & Jensen, 2014). Second, we included measures assessing chronic and acute forms of discrimination as well as multiple sleep indicators, which had not been previously done within a single study. Third, the use of proportional sampling to identify potential research participants, the implementation of standardized procedures (e.g., having research assistants ask the questions to account for literacy problems), and the use of measures that have been validated for use with Latinx groups in English and Spanish were also strengths of the study.

Several key limitations are acknowledged. First, all measures utilized in this study were self-reported, which are subject to participant recall and social desirability. Future studies should aim to include self-report and objective measures of sleep, including dimensions of sleep not evaluated in this study (e.g., sleep architecture, nocturnal physiology). Moreover, although the study's cross-sectional design does not allow for claims about bidirectionality or temporal associations to be made, prospective studies show that exposure to discrimination disrupts sleep in the short and long term (Gordon et al., 2020; Yip, 2015). Nevertheless, future work would be strengthened by using methods such as ecological momentary assessments (e.g., daily diaries, smartphone applications), which may better capture exposure to unfair treatment and concurrent coping responses in real-time and that can allow for employing analytic strategies used to examine to same-day, lagged, and reciprocal effects. Further, we included coping measures widely used in the literature, but we did not assess coping strategies that may be more culturally salient among Latinxs, including spiritual/religious (Sanchez et al., 2012) and collective coping

(Joseph & Kuo, 2009). Lastly, our findings may not be generalizable to other Latinx groups and those living in different contexts. Participants in this study resided primarily in an ethnic enclave where they may have encountered fewer instances of everyday discrimination (e.g., being threatened or harassed; Viruell-Fuentes, 2007). Future studies should aim to capture the ways in which Latinxs residing in neighborhoods with different ethnoracial compositions (e.g., those comprised of different Latinx groups, those where Latinxs are in the minority; those comprised primarily of one Latinx group) may experience discrimination.

Implications

Overall, our findings provide new insight as to how chronic and acute discrimination, when included in the same model, relate to different sleep indicators among Latinx adults. Notably, our findings also point to the importance of considering the type of discrimination to which Latinxs are exposed and the coping approach employed when confronted with discrimination, given their synergistic and distinct effects across different sleep indices. Indeed, Latinxs do not all respond to discrimination in the same way, partly due to the fact that each person is shaped by an amalgamation of their unique personalities and personal experiences and conditions (Guarnaccia et al., 2007). Thus, there is no “right” or universal way of responding to every type of discriminatory occurrence they may face.

At the individual level, a potential solution for reducing the risk of poor sleep outcomes among Latinxs may include implementing workshops at community centers (or contexts where the reach/participation may be the greatest) that incorporate strategies (e.g., bolstering self-efficacy for responding to discrimination, cost-benefit trade-off

considerations of different responses, role-playing different strategies across scenarios) that may empower individuals to carefully consider different outcomes and more confidently decide on which coping strategy(ies) to employ under certain circumstances. Rather than “teaching” Latinx adults about “maladaptive” or “adaptive” coping responses, incorporating agentic, goal-oriented, and culturally resonant strategies may hold promise for reducing the health-damaging effects of discrimination. Likewise, increasing awareness of the support systems and resources available in their communities, including settings where they can discuss with others how they have thrived in the face of discrimination, may increase collective coping and help to lessen the burden on the individual (Harrell, 2000).

At the institutional level, organizations (e.g., schools, health care facilities, businesses), could make visible to others (e.g., students, employees, patients, customers) their rights in that setting, the organization’s anti-discrimination policies and potential consequences of those who violate them (including those previously employed). Perhaps this approach has the potential to reduce discriminatory behavior across contexts and for signaling to stigmatized individuals that organizations are sincere about fairness and will hold perpetrators accountable, similar to the effectiveness of priming “identity-safe” environmental cues to reduce identity threat and promote sense of belonging among stigmatized groups (Emerson & Murphy, 2014). Last, organizations could implement programs that offer access to legal resources and support, similar to financial and wellness benefits programs offered; this might encourage targets of discrimination within their organizations to seek counsel and make well-informed decisions about how to respond.

Conclusion

In sum, Latinxs face health disparities across several health indicators (Bierman & Lee, 2018), of which sleep disruption has been posited as a driving mechanism (Slopen, Lewis, & Williams, 2016). Latinxs are at an increased risk of experiencing discrimination across different levels and forms (Arellano-Morales et al., 2015; Perez, Fortuna, & Alegria, 2008), and also face sleep disparities (Chen et al., 2015), two issues that can increase their risk of poor health across the life-course. As the largest ethnic minority group in the U.S. (Noe-Bustamante, Lopez, & Krogstad, 2020), the health of this segment of the population is intricately tied to the health and economic viability of our nation. As such, efforts aimed at reducing sleep disparities among Latinxs would benefit not only this community, but our society as a whole.

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APPENDIX
TABLES AND FIGURES

Table 1*Sociodemographic Characteristics for the Total Sample*

	Total (N = 602)	
	n (%)	SE
Gender		
Male	294 (49%)	0.02
Female	308 (51%)	0.02
Ethnicity		
Dominican	391 (65%)	0.02
Puerto Rican	95 (16%)	0.01
Other Latinx	116 (19%)	0.02
Nativity		
U.S. Born	47 (8%)	0.01
Foreign born	555 (92%)	0.01
Education		
< High School	308 (51%)	0.02
High School graduate	120 (20%)	0.02
Some college or higher education	174 (29%)	0.02
Employment Status		
Employed	304 (51%)	0.02
Unemployed/Other	296 (49%)	0.02
Perceived Income		
Not enough	290 (48%)	0.02
Just enough/more than needed	308 (52%)	0.02
	M(SD)	Range of Scores
Age in years	46.72 (15.43)	21- 83
Optimism	19.66 (2.92)	7 - 25

Note. Data were missing on employment status for two participants (n=600) and on perceived income for four participants (n=598).

Table 2*Descriptive Statistics and Correlations among Main Study Variables*

	1	2	3	4	5	6	7	8
1. Everyday Discrimination (ED)	--							
2. Major Lifetime Discrimination (MLD)	.43***	--						
3. PSQI Perceived Quality Factor	.19***	.13**	--					
4. PSQI Sleep Efficiency Factor	.10*	.13**	.55***	--				
5. PSQI Daily Disturbances Factor	.24***	.26***	.51***	.33***	--			
<i>Coping Strategies</i>								
6. Passive Only	.06	.05	.03	.01	.09*	--		
7. Active and Passive	-.01	-.01	-.10*	-.02	-.12*	-.33***	--	
8. Active Only	-.02	-.02	.09*	.02	.08*	-.13**	-.89***	--
M (SD)	14.96 (7.21)	0.94 (1.54)	1.03 (0.87)	1.01 (1.04)	0.69 (0.66)	--	--	--
% (SE)	--	--	--	--	--	5% (.01)	69% (.02)	26% (.02)

Note. Higher scores in PSQI measures indicate worse sleep quality, efficiency, and disturbances, respectively. Data were missing on ED for one participant (n=601) and on coping for five participants (n=597). Range of scores on continuous measures were: ED = 9-46, MLD = 0-8, PSQI measures = 0-3. M= Mean; SD= Standard Deviation; SE= Standard Error.

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

Table 3*Multiple Linear Regression Models Predicting PSQI Perceived Quality*

Models	Model 1			Model 2			Model 3		
	B (SE)	95% C.I.	β	B (SE)	95% C.I.	β	B (SE)	95% C.I.	β
Main Effects									
<i>Discrimination Type</i>									
ED	.02(.01)**	.005, .027	.13	.02(.01)**	.005, .027	.13	-.02(.02)	-.054, .018	-.15
MLD	.06(.03)*	.006, .106	.10	.05(.03)*	.005, .105	.10	.10(.13)	-.148, .345	.18
Main Effects									
<i>Coping Strategy</i>									
Passive only	-			REF			REF		
Passive-Active	-			-.07(.17)	-.397, .253	-.04	-.14(.17)	-.477, .196	-.07
Active only	-			.12(.17)	-.224, .458	.06	.05(.18)	-.304, .399	.02
Interactions									
<i>Discrimination × Coping Strategy</i>									
ED × Passive Only	-			-			REF		
ED × Passive-Active	-			-			.04(.02)*	.003, .079	.28
ED × Active Only	-			-			.02(.02)	-.020, .064	.08
MLD × Passive Only	-			-			REF		
MLD × Passive-Active	-			-			-.05(.13)	-.305, .197	-.08
MLD × Active Only	-			-			-.02(.14)	-.288, .253	-.01
<i>F-test statistic</i>	<i>F(10, 579)= 8.62***</i>			<i>F(12, 577)= 7.71***</i>			<i>F(16, 573)= 6.19***</i>		
<i>Adj. R²</i>	11%			12%			12%		

Note. C.I.= Confidence interval. ED= Everyday discrimination; MLD= Major lifetime discrimination. REF= reference group. All models adjusted for covariates.

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

Table 4*Multiple Linear Regression Models Predicting PSQI Sleep Efficiency*

Models	Model 1			Model 2			Model 3		
	B (SE)	95% C.I.	β	B (SE)	95% C.I.	β	B (SE)	95% C.I.	β
Main Effects									
<i>Discrimination Type</i>									
ED	.01(.01)	-.004, .023	.07	.01(.01)	-.004, .023	.07	-.01(.02)	-.054, .038	-.05
MLD	.08(.03)*	.018, .141	.12	.08(.03)*	.018, .141	.12	.01(.15)	-.295, .312	.01
Main Effects									
<i>Coping Strategy</i>									
Passive only	-			REF			REF		
Passive-Active	-			-.02(.20)	-.422, .378	-.01	-.08(.21)	-.499, .331	-.04
Active only	-			.01(.21)	-.414, .428	.00	-.05(.22)	-.487, .381	-.02
Interactions									
<i>Discrimination x Coping Strategy</i>									
ED x Passive Only	-			-			REF		
ED x Passive-Active	-			-			.02(.02)	-.022, .071	.14
ED x Active Only	-			-			-.01(.03)	-.058, .047	-.02
MLD x Passive Only	-			-			REF		
MLD x Passive-Active	-			-			.04(.16)	-.255, .365	.07
MLD x Active Only	-			-			.13(.17)	-.189, .479	.09
<i>F-test statistic</i>	<i>F(10, 574) = 4.24***</i>			<i>F(12, 572) = 3.53***</i>			<i>F(16, 568) = 2.95***</i>		
<i>Adj. R²</i>	5%			4%			5%		

Note. C.I.= Confidence interval. ED= Everyday discrimination; MLD= Major lifetime discrimination. REF= reference group. All models adjusted for covariates.

* $p < .05$, *** $p < .001$

Table 5

Multiple Linear Regression Models Predicting PSQI Daily Disturbances

Models	Model 1			Model 2			Model 3		
	B (SE)	95% C.I.	β	B (SE)	95% C.I.	β	B (SE)	95% C.I.	β
Main Effects									
<i>Discrimination Type</i>									
ED	.02(.00)***	.007, .023	.17	.02(.00)**	.007, .023	.17	.04(.01)**	.013, .066	.43
MLD	.09(.02)***	.050, .125	.21	.09(.02)***	.049, .123	.20	-.10(.09)	-.286, .081	-.24
Main Effects									
<i>Coping Strategy</i>									
Passive only	-			REF			REF		
Passive-Active	-			-.21(.12)†	-.454, .031	-.15	-.21(.13)†	-.464, .037	-.15
Active only	-			-.06(.13)	-.319, .190	-.04	-.06(.13)	-.324, .200	-.04
Interactions									
<i>Discrimination x Coping Strategy</i>									
ED x Passive Only	-			-			REF		
ED x Passive-Active	-			-			-.03(.01)†	-.054, .002	-.23
ED x Active Only	-			-			-.03(.02)†	-.059, .003	-.14
MLD x Passive Only	-			-			REF		
MLD x Passive-Active	-			-			.18(.10)†	-.006, .368	.37
MLD x Active Only	-			-			.26(.10)*	.059, .462	.27
<i>F-test statistic</i>	$F(10, 579) = 9.25^{***}$			$F(12, 577) = 8.48^{***}$			$F(16, 573) = 6.94^{***}$		
<i>Adj. R²</i>	12%			13%			14%		

Note. C.I.= Confidence interval. ED= Everyday discrimination; MLD= Major lifetime discrimination. REF= reference group. All models adjusted for covariates.

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

Figure 1

Conceptual Model of Proposed Moderating Effect of Coping Strategy on Associations among Perceived Discrimination (Everyday and Major Lifetime) and Sleep Indices

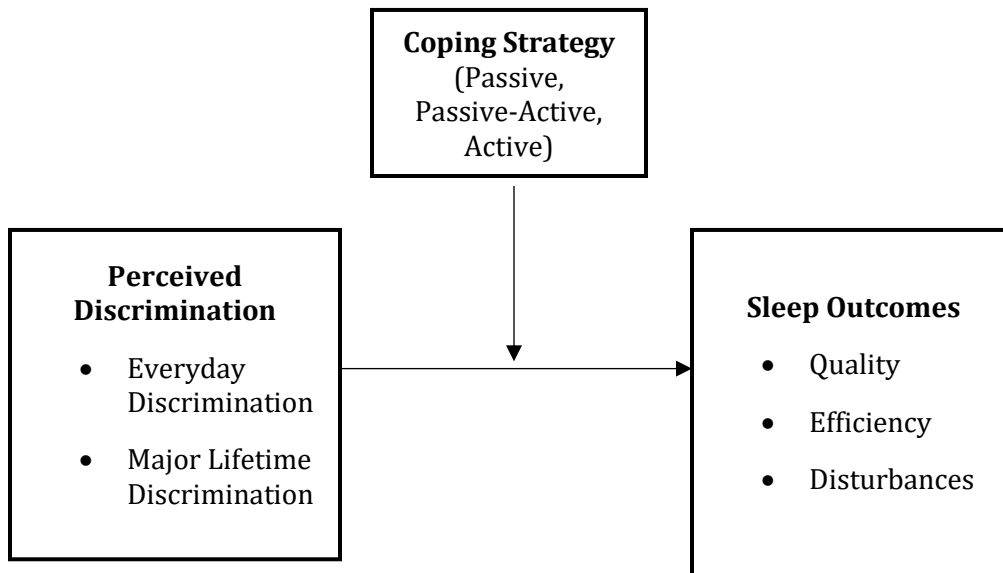
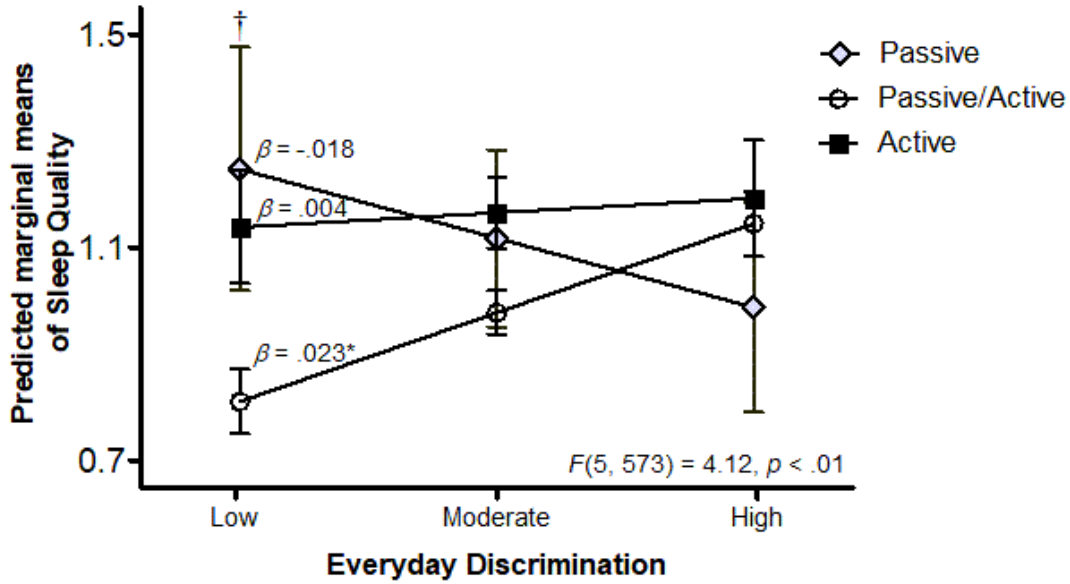


Figure 2

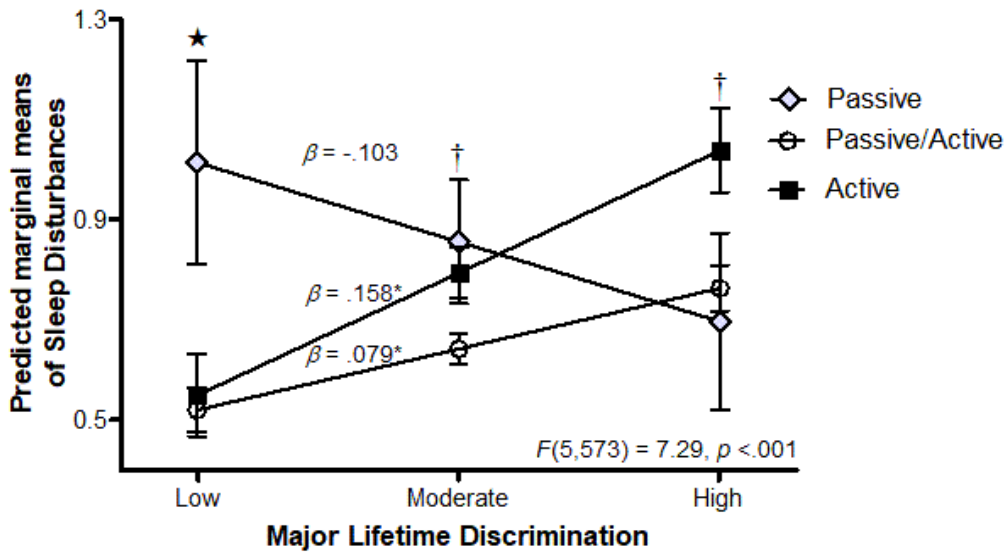
Sleep Quality as a Function of Everyday Discrimination and Coping Strategy



Note. Higher values on sleep quality represent worse sleep quality. Error bars represent standard errors. *Simple slope significantly different from 0 at a $p < .001$ level. †Indicates marginally significant differences between estimated marginal means at low levels of everyday discrimination (passive only vs. passive-active).

Figure 3

Sleep Disturbances as a Function of Major Lifetime Discrimination and Coping Strategy



Note. Higher values on sleep quality represent worse sleep quality. Error bars represent standard errors. *Simple slopes significantly different from 0 at a $p < .001$ level. ★Indicates differences between estimated marginal means at low levels of everyday discrimination (passive only vs. passive-active & passive only vs. active only). †Indicates marginally significant differences between estimated marginal means at moderate (passive only vs. passive-active) and high (passive only vs. active only) levels of everyday discrimination.