THE RELATIONSHIPS OF DISCRIMINATION AND MICROAGGRESSIONS WITH SLEEP QUALITY IN BLACK AMERICANS: THE ROLE OF PERSEVERATIVE COGNITION

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THE RELATIONSHIPS OF DISCRIMINATION AND MICROAGGRESSIONS WITH SLEEP QUALITY IN BLACK AMERICANS: THE ROLE OF PERSEVERATIVE COGNITION

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ABSTRACT

Disparities in health outcomes between Black and White Americans are well-documented, including sleep quality. Black Americans are more likely to report poor sleep quality sleep than their White counterparts. As sleep is a risk factor for many health conditions, it may serve as one mechanism for disparities in health over the life course. A meta-model explaining relationships between race, life events, and health outcomes through biological, psychological, and behavioral pathways suggests that cognitive processes may underly the connection between race and poor sleep quality, and ultimately, health disparities. That is, there are race-specific stressors which disproportionately affect Black Americans, which are associated with poor health through biological, cognitive, and behavioral mechanisms (e.g., sleep). Among these race-specific stressors is discrimination. Studies have found a connection between discrimination and sleep quality, and there is a body of literature connecting perseverative cognition (e.g., rumination and worry or vigilance) to poor sleep. Another kind of race-specific stressor are microaggressions, a more subtle but pervasive form of discrimination. Less research has considered the connection of microaggressions to perseverative cognition, but there are some studies linking

microaggressions to health outcomes. While these reactions to discrimination and microaggressions (i.e., perseverative cognition) are normative and reflect understandable distress at an experience of unfair treatment, perseverative cognition focused on experiences of discrimination may reduce sleep quality. This project, therefore, tested four hypotheses. First, rumination was predicted to mediate the relationship between discrimination and poor sleep quality. Second, it was hypothesized that racism-related vigilance would mediate the association between discrimination and poor sleep quality. Third, rumination was predicted to mediate the association between microaggressions and poor sleep quality. Finally, it was hypothesized that racism-related vigilance would mediate the association between microaggressions and poor sleep quality. Results showed that neither rumination nor racism-related vigilance mediated a relationship between discrimination and poor sleep quality. However, rumination partially mediated a relationship between microaggressions and poor sleep quality, but racism-related vigilance did not. Overall, these findings indicate support for the meta-model, demonstrating a specific pathway from racial microstressors to poor sleep quality. Clinicians should explicitly acknowledge this, and culturally tailored approaches should be developed with this in mind.

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the College of Arts and Sciences have examined a thesis titled "The Relationships of Discrimination and Microaggressions with Sleep Quality in Black Americans: The Role of Perseverative Cognition," presented by Elizabeth J. Wilson, candidate for the Doctor of Philosophy degree, and certify that in their opinion it is worthy of acceptance.

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ABBREVIATIONS

Amazon Mechanical Turk = MTurk

Analysis of Variance = ANOVA

Anticipatory Bodily Alarm Response Scale = ABARS

Anticipatory Race-Related Stress Scale-Psychological sub-scale = ARS

Body Mass Index = BMI

Centers for Disease Control and Prevention = CDC

Epworth Sleepiness Scale = ESS

Experiences of Discrimination Scale = EOD

Health-Related Quality of Life = HRQoL

Non-Rapid Eye Movement = NREM

NREM Stage 1 = N1

NREM Stage 2 = N2

NREM Stage 3 = N3

NREM Stage 4 = N4

Patient Health Questionnaire-9 = PHQ-9

Penn State Worry Questionnaire = PSWQ

Perceived Ethnic Discrimination Questionnaire – Community Version = PEDQ-CV

Perseverative Cognition sub-scale = PCS

Pittsburgh Sleep Quality Index = PSQI

Polysomnography = PSG

Prolonged Activation and Anticipatory Race-Related Stress Scale = PARS

Racial Scale = RMAS

Racism Related Vigilance Scale = RRV

Rapid Eye Movement = REM

Ruminative Responses Scale = RRS

Secondary Appraisal Scale = SAS

Slow Wave Sleep = SWS

Socioeconomic Status = SES

CHAPTER 1

INTRODUCTION

Researchers have long documented health disparities between Black and White people in the United States, ranging from disparities in mortality to higher rates of chronic disease and greater illness severity (Centers for Disease Control and Prevention [CDC], 2013; Hopko et al., 2003; Williams, 2012). Notably, sleep duration and sleep quality are risk factors for many health conditions, among them, diabetes, cardiovascular disease, and coronary heart disease (Gangwisch et al., 2007; Gangwisch et al., 2006; Patyar & Patyar, 2015; Shankar et al., 2010). More broadly, Chen, Gelaye, and Williams (2014) reported associations between poor sleep and global measures of health (e.g., health-related quality of life [HRQoL]). These findings support the role of sleep as a critical behavior connected to a variety of health outcomes, including mortality, cardiovascular disease, and HRQoL, and sub-optimal sleep duration and quality are risk factors for multiple health conditions. Importantly, there are documented disparities in aspects of sleep between Black and White Americans, and Black Americans largely report poorer sleep quality compared to White Americans (Knutson et al., 2010; Lauderdale et al., 2006; Mezick et al., 2008; Ruiter et al., 2011; Thomas et al., 2006). Studies of self-reported sleep in large, nationally representative samples and studies of objective sleep parameters have found disparities in sleep quality and duration between Black and White Americans.

Myers (2009) proposed a meta-model that combines multiple models that conceptualize the complex biological, psychological, and social factors that contribute to health disparities observed between ethnic/racial minorities; this project applies the meta-model to disparities between Black and White Americans. This model accounts for observed

health disparities as the result of complex relationships between race/ethnicity and socioeconomic status (SES), which are mediated through psychological, behavioral, and biological pathways, predicting health status and outcomes across the lifespan through psychosocial adversities (e.g., experiences of discrimination, everyday hassles, etc.), reserve capacity (e.g., inter- and intra-personal reserves which buffer against stressors), and cumulative vulnerabilities (the additive and interactive effects of adversities and reserves). Among the intermediate pathways linking race/ethnicity and health outcomes are cognitive-emotional and behavioral pathways (i.e., thoughts, feelings, and behaviors).

Notably, centuries of oppression and racist policies have limited social, economic, and educational opportunities and privileges for Black Americans, resulting in observed socioeconomic disparities (Williams, 2012). Therefore, observed health disparities in the Black population are the ultimate result of increased exposure to potential psychosocial adversities, among them higher proportions of the population being of low SES. There is also an independent association with increased stressors directly related to race—namely, discrimination. These stressors, then, are associated with cognitive processing and emotion regulation (e.g., rumination, worry, anxiety, depression). Cognitive processes are theorized to relate to health behaviors (e.g., sleep), which contribute to cumulative biopsychosocial vulnerabilities and resistances, ultimately leading to health status (e.g., morbidity and mortality). While Black Americans may face a higher prevalence of adversity due to a disproportionate percentage of the population being of low SES—a result of historical racist policies—factors comprising SES (e.g., income, education, and employment) do not alone account for disparities in sleep between Black and White Americans (Knutson et al., 2010; Lauderdale et al., 2006; Mezick et al., 2008).

Rather, Black Americans face additional race-specific stressors as members of a marginalized population, and research indicates Black people report more experiences of discrimination than White people (Lee et al., 2019). Studies have documented associations between discrimination and poor health in various domains, including symptoms of depression, self-rated health, and a range of mental and physical health outcomes (Pascoe & Smart Richman, 2009; Williams & Mohammed, 2009). Moreover, there is evidence linking poor sleep to inflammation burden—a precursor to a variety of chronic illnesses—through experiences of discrimination (Ong & Williams, 2019).

Furthermore, studies have found a negative relationship between discrimination and sleep (Slopen et al., 2016), indicating that a race-specific stressor is associated with poor sleep. Some research suggests that disparities in sleep faced by Black Americans are mediated by discrimination (Fuller-Rowell et al., 2017), which links race-specific stressors (i.e., discrimination) to injurious health behaviors (i.e., poor sleep), ultimately connecting race to risk factors for poor health outcomes (i.e., inflammation burden). As predicted by Myers (2009), however, there is a psychological process which connects race-specific stressors to health-injurious behavior.

Among the psychological mechanisms which may affect sleep is perseverative cognition, which includes both worry or vigilance and rumination. Importantly, these reactions to discrimination and microaggressions reflect understandable distress at an experience of unfair treatment and serve a psychological function (e.g., problem-solving), but, over time, may contribute to poor sleep quality. Rumination has been found to be related to poor sleep in experimental and observational studies (Guastella & Moulds, 2007; Thomsen et al., 2003; Zoccola et al., 2009). In addition, research has found a relationship between

evening worry and less sleep time (McGowan et al., 2016). Researchers have examined the link between discrimination, perseverative cognition, and poor sleep in samples that include Black participants, finding evidence that worry may link discrimination and subjectively- and objectively-measured sleep in Black populations just as it does in White populations (Beatty et al., 2011). Furthermore, a related construct, racism-related vigilance, links race to poor sleep (Hicken et al., 2013), but future research is needed to examine the possibility that vigilance connects discrimination to poor sleep. In addition, Hoggard and Hill (2018) found that rumination, but not worry, mediated the association of discrimination to poor sleep quality. That is, discrimination was positively related to rumination, and rumination in turn was negatively associated with sleep quality.

Discrimination is one among a variety of race-specific stressors to consider in Myers' (2009) model. Harrell (2000) offered a multidimensional conceptualization of race-specific stressors—in her words, "racism-related stress" (p. 42), which, among at least six types of race-related stressors, includes episodic, discrete experiences (e.g., being harassed by law enforcement) and day-to-day, chronic racial microstressors. Racial and ethnic minority individuals also experience both overt forms of race-specific stress as well as subtle forms of verbal or nonverbal invalidation that are more ambiguous in nature (Meyers et al., 2020). Microaggressions function as a form of race-specific stress of this kind (Torres-Harding et al., 2012). As a race-specific stressor faced by Black people, microaggressions are hypothesized to be associated with cognitive processes and health behaviors (i.e., perseverative cognition and sleep; Myers, 2009), as are episodic, discrete episodes of race-specific stress (i.e., discrimination). However, there is a notable absence of research on microaggressions and health outcomes and behaviors (in particular, sleep) in samples of

Black Americans. That said, there is a body of literature regarding discrimination and sleep, along with reported associations between microaggressions, health behaviors, and mental health outcome in ethnic/racial minority groups (Lilly et al., 2018; Ong et al., 2017; Sittner et al., 2018). These initial findings indicate a need for studies to investigate the plausible connection between microaggressions and sleep quality in Black Americans, as well as the potential mediators of this association.

In sum, research has documented disparities in health outcomes and sleep between Black and White Americans (CDC, 2013; Knutson et al., 2010; Williams, 2012). Furthermore, researchers have reported relationships between discrimination and health outcomes, including sleep (Fuller-Rowell et al., 2017; Pascoe & Smart Richman, 2009; Slopen et al., 2016; Williams & Mohammed, 2009). Theory predicts that cognitive processes such as perseverative cognition connect race-specific stressors to health behaviors (Myers, 2009), and there is evidence of rumination and worry being related to poor sleep (McGowan et al., 2016; Zoccola et al., 2009). Among Black people, findings suggest that discrimination is related to poor sleep, and rumination and racism-related vigilance are related to poor sleep (Beatty et al., 2011; Hicken et al., 2013; Hoggard & Hill, 2018). Little research has considered similar relationships between microaggressions and sleep, although a small body of literature indicates a connection between microaggressions and health outcomes (Lilly et al., 2018; Ong et al., 2017; Sittner et al., 2018).

Therefore, this project investigated the relationship of two forms of perseverative cognition, rumination and racism-related vigilance, to discrimination, microaggressions, and sleep. The hypotheses were tested using mediation analysis, and data were collected via online surveys from a sample of Black adults in the United States. First, it was hypothesized

that rumination would mediate the association between discrimination and poor sleep quality. That is, discrimination was expected to be positively associated with rumination, which in turn was expected to be positively associated with poor sleep quality. Second, it was hypothesized that racism-related vigilance would mediate the association between discrimination and poor sleep quality. That is, discrimination was expected to be positively associated with racism-related vigilance, which in turn was expected to be positively associated with poor sleep quality. Third, it was hypothesized that rumination would mediate the association between microaggressions and poor sleep quality. That is, microaggressions were expected to be positively associated with rumination, which in turn was expected to be positively associated with poor sleep quality. Finally, it was hypothesized that racism-related vigilance would mediate the association between microaggressions and poor sleep quality. That is, microaggressions were expected to be positively associated with racism-related vigilance, which in turn was expected to be positively associated with poor sleep quality.

Hypotheses one and two were not supported; rumination and racism-related vigilance did not mediate the relationship between discrimination and poor sleep quality, although a significant relationship between discrimination and sleep was detected. Hypothesis 3 was supported; rumination partially mediated the relationship between microaggressions and poor sleep quality. Hypothesis 4 was not supported; racism-related vigilance did not mediate the relationship between microaggressions and poor sleep quality. These results indicate that, as previously documented, discrimination is related to poor sleep quality in Black Americans. Furthermore, the novel findings that microaggressions are related to poor sleep quality in Black Americans, and that this relationship is mediated through rumination, supports Myers (2009) meta-model. In particular, this finding provides evidence of a specific pathway

through which race-specific stressors (e.g., microaggressions) encountered by Black Americans are related to poor health outcomes.

In addition to these theoretical implications, clinicians who work with Black Americans should incorporate into their practice the evidence that microaggressions are related to poor sleep quality. Clinicians should take care to validate the toll racial microstressors have on the health of Black Americans; furthermore, clinical research should seek to tailor existing treatments for poor sleep (e.g., CBT-I) to explicitly acknowledge the connection these experiences have on sleep. Beyond clinical interventions, individual and collective coping approaches (e.g., affirming racial identity, protesting at institutional and cultural levels) may offer valuable means to buffer harmful effects of racial microstressors on Black American's sleep quality.

CHAPTER 2

REVIEW OF THE LITERATURE

Health Disparities

Researchers have long documented health disparities between Black and White people in America,[1] ranging from disparities in mortality to higher rates of chronic disease and greater illness severity (Centers for Disease Control and Prevention [CDC], 2013; Hopko et al., 2003; Williams, 2012). For example, mortality data indicate that Black people face death rates from all causes up to 30% higher than that of White people (Williams, 2012). Furthermore, the CDC (2013) reported a multitude of disparities in disease morbidity, health-related quality of life (HRQoL), and mortality. These include Black Americans facing almost six fewer years of life free from activity-limiting conditions as compared to White Americans; more cases of diagnosed diabetes in Black Americans (11.3%) compared to in White Americans (6.8%); 20% higher obesity rates in Black women compared to White women; higher rates of hypertension among Black Americans (41.3%) compared to White Americans (28.6%); and more Black Americans (23.3%) reporting poor or fair health rather than good or excellent health compared to White Americans (13.3%). Furthermore, the CDC (2013) noted higher rates of mortality due to coronary heart disease and stroke.

Sleep and Health

Notably, short or long sleep duration and poor sleep quality are risk factors for many of the noted disparities in health conditions, including diabetes (Gangwisch et al., 2007),

[1] This document is written in a "person-centered" style, and therefore adjectives describing race (e.g., Black, White) will be in relation to the people they describe (i.e., Black Americans). Descriptions of participants in specific studies, however, reflect the language of the original document. That is, when participants in a study are described as "African American," they are similarly identified in this document. Throughout the body of the document, however, the term "Black" will be used to identify people of historically African descent while the term "White" will be used to identify people of historically European ancestry.

cardiovascular disease, coronary heart disease, obesity (Patyar & Patyar, 2015; Shankar et al., 2010), and hypertension (Gangwisch et al., 2006). For example, Gangwisch et al. (2007) conducted a study using nationally representative data from nearly 9,000 U.S. residents. The authors reported that both chronically short sleep duration (less than five hours per night) and long sleep duration (greater than nine hours of sleep per night) were associated with increased odds of a diabetes diagnosis. Similarly, Shankar et al. (2010) analyzed data collected from the nationally representative Behavioral Risk Factor Surveillance System (N = 372,144), reporting increased odds of cardiovascular disease, coronary heart disease, diabetes, and obesity for those respondents who reported insufficient sleep any night in the past month. Finally, Gangwisch et al. (2006) analyzed data from the National Health and Nutrition Examination Survey (N = 4810), finding that short sleep duration (less than five hours per night) was associated with increased risk of physician-diagnosed hypertension, independent of obesity status or diabetes diagnosis. More broadly, Chen, Gelaye, and Williams (2014) reported associations between poor sleep and global measures of health (e.g., HRQoL). The authors found that young adults (20-39 years old; N = 2,391) who slept less than seven hours per night were more likely to report poor general health and low physical, mental, and overall HRQoL than their counterparts who slept at least seven hours per night. In addition, those who took 30 minutes or more to fall asleep, reported trouble falling asleep, or used sleeping pills were also more likely to have low mental and overall HRQoL than their counterparts. Therefore, sleep is a critical variable connected to a variety of health outcomes, including mortality, cardiovascular disease, and HRQoL, and sub-optimal sleep duration and quality are risk factor for multiple health conditions.

Dimensions of Sleep

Sleep has been defined as a behavior, necessary for rest and restoration of physiological functions, characterized by a relaxed body posture and characteristic brain waves and eye movements (Irwin, 2015; Jackson et al., 2015). There are variety of dimensions of sleep: sleep duration; sleep continuity or efficiency (proportion of time in bed spent asleep), timing (e.g., day-night), alertness or daytime sleepiness, sleep architecture, and self-reported sleep quality or subjective sleep satisfaction (Buysse, 2014). Sleep architecture refers to the proportion of time spent in each sleep stage (Irwin, 2015). Sleep stages fall into two broad types: non-rapid eye movement (NREM) and rapid eye movement (REM) sleep (Irwin, 2015). NREM is further subdivided into three stages: NREM stage 1 (N1), NREM stage 2 (N2), and NREM stage 3 (N3). Older publications sometimes refer to stage NREM stage 4 (N4), which current experts combine with N3; this stage of sleep is also called slow-wave sleep (SWS), which is the stage of sleep during which the brain is least responsive to external stimuli (Irwin, 2015; Jackson et al., 2015). SWS sleep, or N3, is the deepest sleep and correlates to feeling refreshed in the morning (Buysse, 2014). Typically, sleep starts in N1, progressing through N2 and SWS, and then to REM sleep, cycling through this pattern approximately every 90 minutes, although the proportion of sleep spent in SWS tends to decline over the lifespan (Jackson et al., 2015; National Institute of Neurological Disorders and Stroke [NINDS], 2019).

Researchers reported significant relationships between these sleep dimensions and health outcomes (Buysse, 2014). Though findings vary, results generally support the following relationships. Sleep duration is connected to health outcomes, although a U-shaped relationship appears in the literature, such that both overly short and long sleepers are more at

risk for poor health outcomes (Buysse, 2014; Cappuccio et al., 2010; Jackson et al., 2015). Sleep latency is positively associated with health risk, with longer sleep latency being related to worse health (Bowman et al., 2019; Buysse, 2014; Jackson et al., 2015). Sleep efficiency tends to have a positive relationship to health outcomes (Buysse, 2014; Cappuccio et al., 2010). SWS is considered more restful, deep sleep, and restricting this stage of sleep is associated with greater risk of type 2 diabetes (Tasali et al., 2008). Furthermore, both a high and low proportion of REM sleep is associated with greater mortality risk (Dew et al., 2003). Self-reported sleep quality is negatively associated with blood sugar control in patients with diabetic complications (Knutson et al., 2006) and negatively related to health complaints in college students (Pilcher et al., 1997). Overall, literature supports a link between self-reported (including duration, efficiency, quality, and daytime sleepiness) and objectively measured (including duration, proportion of SWS) sleep dimensions and a range of mental and physical health outcomes.

Racial Disparities in Sleep

Researchers have investigated disparities in sleep quality between Black and White Americans, with studies finding that Black Americans largely report poorer sleep quality compared to White Americans (Knutson et al., 2010; Lauderdale et al., 2006; Mezick et al., 2008; Ruiter et al., 2011; Thomas et al., 2006). For example, Knutson et al. (2010) analyzed nationally representative data of time diaries between 1975 and 2006, combining data from eight nationally representative surveys, resulting in a sample of over 50,000 participants surveyed at eight time points over 31 years. Using logistic regression analyses, the authors estimated the odds of being a short sleeper, which they defined as reporting less than six hours of rest, napping, or sleep per 24-hour period. Controlling for other sociodemographic

factors—age, gender, education, employment status, marital status, and income—African American participants were more likely to be short sleepers compared to Asian, Hispanic, and White participants. This study, therefore, documents a disparity in self-reported sleep duration between African Americans and other racial/ethnic groups in the United States, spanning at least three decades.

Other studies have documented this disparity in smaller samples, using objective and self-reported measures of sleep, providing more information about disparities in sleep quality beyond sleep duration. For example, Lauderdale et al. (2006) conducted a study in a sample of 669 middle-aged Black and White adults (44% Black). Participants recorded their sleep time via wrist-worn activity monitors and back-up measures of sleep time via self-report diaries of bed and rise times. Using multiple regression to model average time in bed, objectively measured sleep duration, sleep latency (time to fall asleep), and sleep efficiency (ratio of sleep time to time in bed), the authors reported that each parameter differed between race-gender groups. For each sleep parameter, White women had the most favorable values, followed in descending order by White men, Black women, and finally Black men. This pattern remained significant after controlling for income, education, body mass index (BMI), and alcohol consumption. These findings bolster those of national reports (e.g., Knutson et al., 2010) of disparities in self-reported sleep duration and indicate that a similar disparity exists in objective sleep duration. Furthermore, these findings indicate that disparities in other sleep parameters—sleep latency, time in bed, and sleep efficiency—exist between Blacks and Whites.

Similarly, Mezick et al. (2008) assessed objectively-measured sleep parameters—assessed via actigraph watches and polysomnography (PSG)—and self-reported sleep in a

sample of 187 middle-aged adults (77 Black). Participants provided two nights of PSG data recorded at home, nine nights of actigraphy data, and 10 nightly and daily self-reported measures of sleep quality. Self-report measures of sleep quality included the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), a 19-item questionnaire assessing seven components of sleep quality over the past month—subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Participants also completed the Epworth Sleepiness Scale (ESS; Johns, 1991), an eight-item scale assessing their likelihood of falling asleep during specific daytime activities (e.g., while talking to someone or watching TV). Finally, participants rated the quality of their sleep and how rested they felt with two items, combined to provide a composite rating of sleep quality.

Using multiple regression analyses, Mezick et al. (2008) tested whether race was associated with subjective sleep quality and objective sleep measures: sleep time, sleep latency, waking after falling asleep, sleep efficiency, time spent in each sleep stage (e.g., N1-N4), and rapid eye movement (REM) sleep. The authors reported that Black participants spent less time asleep, had more interrupted sleep, and spent less time in N3 or N4 sleep compared to White and Asian American participants. Importantly, these results remained the same when accounting for SES. Furthermore, the authors tested potential mediators which had significant associations with race—ongoing problems and physical activity—but neither mediated the association between race and sleep outcomes. These results provide additional support of disparities in objectively measured sleep parameters between Black people and those of other racial groups in the United States, which are not explained by SES, ongoing problems, or physical activity.

Thomas et al. (2006) reported results of a smaller study (N = 95; n = 37 African Americans) which examined disparities in sleep architecture and fatigue between African Americans and White Americans. Participants completed a two-night in-hospital sleep study and completed questionnaires of fatigue, ethnic identity, and discrimination. The authors reported that African American participants had a lower percentage of N3 or N4 sleep and lower sleep efficiency than White participants. These results support previous findings of a less favorable sleep profile among African Americans compared to White Americans; furthermore, the authors noted that discrimination mediated the association between race and less stage N4 sleep. That is, African American participants reported more discrimination, and discrimination in turn was associated with less N4 sleep. This study confirms prior findings of poor sleep in African Americans and suggests that variables associated with racial identity may explain this disparity.

Finally, a meta-analysis of 14 studies (n = 1010 Black participants) confirmed that there are subjective and objective disparities in sleep (Ruiter et al., 2011). These include a small mean effect size for self-reported total sleep time—African Americans self-report less sleep than White Americans. Objectively measured total sleep time and sleep efficiency showed small and medium effect sizes respectively, with African American participants obtaining less sleep and less efficient sleep than White participants. Furthermore, there was a small-to medium effect size for sleep onset latency— African American participants reported taking longer to fall asleep than White participants. Finally, findings indicated that African American participants spend more time in N2 sleep (a less restful stage) and less time in SWS (a more restorative stage) than their White counterparts.

The authors also tested for potential moderators of these measures of sleep quality, as there was variability in effect sizes for the outcomes reported (Ruiter et al., 2011). Importantly, neither age, gender, nor BMI moderated findings of objective total sleep time; that is, regardless of age, gender, or BMI, African American participants spent less time asleep than White participants. However, subjective sleep time was moderated by gender, BMI, and age; studies with higher proportions of female participants and those of a higher BMI were associated with larger disparities in self-reported sleep, whereas studies with higher proportions of older age participants reported smaller disparities of self-reported sleep. Notably, there was also an amplified disparity in sleep efficiency for women, but employment and weight restrictions did not affect differences in sleep efficiency. Similarly, a high proportion of women in a study was associated with a larger-than-average disparity in sleep-onset latency between African American and White participants. This meta-analysis confirms the widespread presence of disparities in a range of sleep parameters. Furthermore, the lack of moderation by BMI or employment status (two possible explanatory variables for poor sleep) on disparities in objectively measured sleep quality suggests that other factors should be investigated.

In sum, there is a large body of literature documenting health disparities (CDC, 2013; Williams, 2012) between Black and White Americans, with evidence showing higher rates of diabetes, obesity, hypertension, and stroke as well as worse HRQoL among Black Americans. Furthermore, there is ample evidence of disparities in sleep specifically, indicating that Black Americans tend to get less sleep on average, spend less time in restful sleep stages, have lower sleep efficiency, and have poorer quality of sleep than White Americans (Knutson et al., 2010; Lauderdale et al., 2006; Mezick et al., 2008; Ruiter et al.,

2011; Thomas et al., 2006). Taken with the established link between short sleep duration and poor health outcomes (Gangwisch et al., 2007; Gangwisch et al., 2006; Shankar et al., 2010), there is evidence, therefore, to suggest that Black Americans may face worse health outcomes in part due to having lower quality sleep than White Americans.

Myer's (2009) Meta-Model

Many researchers have sought to conceptualize the complex biological, psychological, and social factors which contribute to health disparities observed between Black and White Americans (e.g., Major et al., 2013; Matthews & Gallo, 2011; Pearlin et al., 2005). Incorporating elements of prior theory, Myers (2009) proposed a meta-model which accounts for observed health disparities as the result of complex relationships between race/ethnicity and SES which are mediated through psychological, behavioral, and biological pathways. This model posits that race/ethnicity and SES predict health status and outcomes across the lifespan through psychosocial adversities (e.g., experiences of discrimination, everyday hassles, etc.), reserve capacity (e.g., inter- and intra-personal reserves which buffer against stressors), and cumulative vulnerabilities (the additive and interactive effects of adversities and reserves). These intermediate pathways affect health status through biological, cognitive-emotional, and behavioral pathways. Importantly, Myers (2009) predicts that long-term exposure to adversities influences health-injurious behaviors in part through cognitive and emotional processing.

In the United States, centuries of oppression and racist policies have limited social, economic, and educational opportunities and privileges for Black Americans; this historical background has resulted in documented disparities in socioeconomic status (Williams, 2012). Therefore, observed health disparities in the Black population are the ultimate result of

increased exposure to psychosocial adversities; these experiences are related to both higher proportions of the population being of low SES as well as an independent association with increased stressors directly related to race—namely, discrimination. These stressors, then, are associated with cognitive processing and emotion regulation (e.g., rumination, worry, anxiety, depression). Cognitive processes are theorized to relate to health behaviors (e.g., sleep), which contribute to cumulative biopsychosocial vulnerabilities and resistances, ultimately leading to health status (e.g., morbidity and mortality). An abbreviated representation of the relevant pathways is presented in Figure 1.

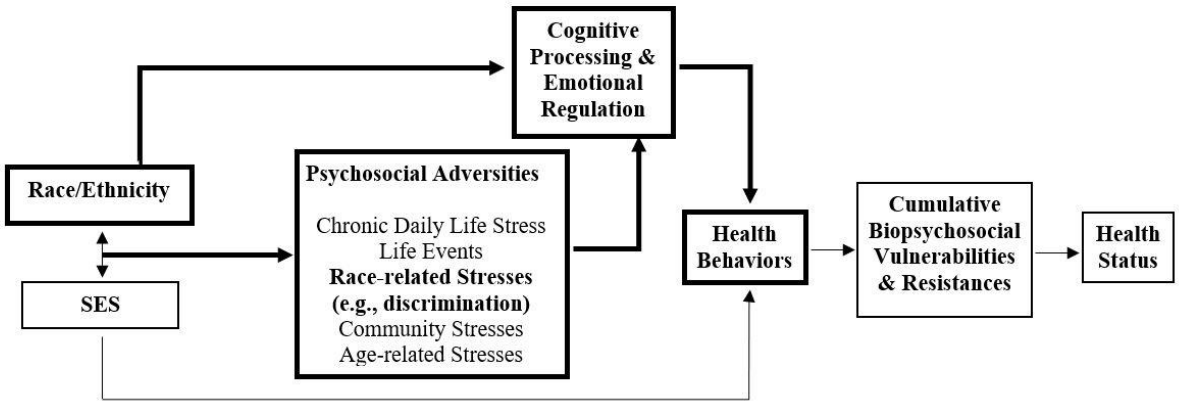


Figure 1. An abbreviated model derived from Myer's (2009) representing pathways from race/ethnicity to health status via psychosocial adversities, cognitive processing and emotional regulation, and health behaviors.

Race, Low SES, and Sleep Disparities

As theorized by Myers (2009) and others (e.g., Matthews & Gallo, 2011), low SES independently contributes to higher prevalence of adverse life events, conceptualized as psychosocial adversities in the meta-model. There is a higher rate of low SES within the Black population compared to the White population (CDC, 2013), due to historical discrimination and racist policies that systematically disenfranchised Black communities. This disparity is predicted to contribute to a higher burden of psychosocial adversities among Black Americans. However, disparities in SES alone do not fully explain disparities in sleep. As noted in Ruiter et al. (2011), employment status (a component of SES) did not moderate disparities in sleep time between African Americans and White Americans, while Knutson et al. (2010) reported that when controlling for education, employment status, and income, African Americans still self-report less sleep than their White counterparts. Likewise, Lauderdale et al. (2006) reported disparities in objectively-measured sleep time even when controlling for income and education; similar results were seen in Mezick et al. (2008). These findings point to another pathway in Myers' (2009) meta-model to explain disparities in sleep: race-specific stressors.

Discrimination

As theorized by Myers (2009), Black Americans face race-specific stressors. Among these are higher rates of racial discrimination[2] than White Americans. For example, Lee et al. (2019) conducted analyses of responses to a question about experiences of discrimination

[2] While some studies and measures employ the word *perceived* in reference to self-reported experiences of discrimination, this project will use the term discrimination without qualification. As a range of personal experiences of interest in this project (e.g., sleep quality, microaggressions, rumination, etc.) are measured using self-report, subjective measures are discussed without the qualifier perceived, as there is ample precedent to identify discrimination without this qualification.

collected by the Pew Research Center (N = 3631, 29.66% Black). Participants responded to the question: *Have you ever personally experienced discrimination or been treated unfairly because of your race or ethnicity?* Results indicated that not only do Black Americans both report experiences of discrimination more than White Americans —69.45% of Black Americans endorsed experiences of discrimination *time to time* or *regularly* compared to 29.61% of White Americans but also higher rates than Hispanic or Asian participants. Conceptualized within Myers' (2009) model, discrimination is a race-specific stressor, which disproportionately affects racial/ethnic minority groups and is particularly burdensome to Black Americans.

Discrimination Conceptualized and Measured as a Race-Specific Stressor

As noted above, the higher rates of discrimination reported by Black Americans, in addition to the history of racial discrimination in the United States, justifies discrimination as a race-specific stressor. While studies described below may operationalize discrimination with a variety of measures (e.g., scales of everyday and lifetime discrimination, Perceived Ethnic Discrimination Questionnaire-Community Version [PEDQ-CV; (Brondolo et al., 2005)], unpublished scales or ad-hoc measures, etc.), this literature review groups them into the overarching concept of discrimination and will refer to them as such unless otherwise specified.

Researchers have documented associations between discrimination and poor health in various domains (Pascoe & Smart Richman, 2009; Williams & Mohammed, 2009). For example, Williams and Mohammed (2009) published a review of 115 studies of discrimination and outcomes of health indicators (e.g., symptoms of depression, self-rated health). The authors described positive associations in studies of poor mental health

indicators (i.e., positive association between discrimination and symptoms of depression), and although the sample predominately consisted of cross-sectional studies, prospective studies reported similar findings. While studies focused solely on blood pressure reported inconsistent associations, the authors noted a pattern of positive associations between discrimination and chronic conditions, self-reported health, and other self-reported indicators of poor health (e.g., physical functioning, cardiovascular disease). This overview provides strong support to the theorized pathway from race-specific stressors to health status (Myers, 2009).

Adding detail to the strong body of literature linking discrimination and health, Pascoe and Smart Richman (2009) conducted a meta-analysis of 134 studies. Their sample included studies examining mental and physical health outcomes, and the authors found an average correlation of r = -.30 between discrimination and mental health outcomes (i.e., more discrimination was associated with poorer mental health); similarly, there was a mean association of r = -.13 between discrimination and physical health outcomes. While a meta-analysis including covariates was not possible, it is important to note that examination of those studies that included covariates of age, gender, race, SES, education, income, marital status, and employment reported similar findings. In connection with Williams and Mohammed (2009), this meta-analysis provides strong evidence that discrimination is associated with a broad range of poor health indicators, both mental and physical, and that potential demographic covariates are unlikely to explain the association. Better poised to explain this link are psychological, biological, and behavioral mechanisms as theorized by Myers (2009).

Poor Sleep, Discrimination, and Health Outcomes

While the majority of the literature documenting a connection between discrimination and poor health has employed cross-sectional designs, limiting inferences regarding possible mechanisms underlying the association, sleep has been documented as a predictor of a broad range of health outcomes (e.g., Chen et al., 2014; Gangwisch et al., 2007; Gangwisch et al., 2006; Patyar & Patyar, 2015). Recently, Ong and Williams (2019) investigated the connection between discrimination, sleep, and inflammation burden—a potential precursor to health conditions such as diabetes and cardiovascular disease. In a sample of 300 adults (77.7% African American), the authors collected ratings of global sleep quality via the PSQI. As predictor variables, the authors collected two aspects of discrimination. First, lifetime discrimination, measured via self-report checklist of discrimination in 11 different settings, represents the cumulative burden of discrimination; second, everyday discrimination, measured with a nine-item self-report scale, assesses the frequency of a variety of instances of unfair treatment. Inflammation burden was measured with a composite score of five different inflammatory markers, collected from blood, urine, and saliva samples.

Findings from Ong and Williams (2019) indicated that greater lifetime discrimination was associated with higher inflammation burden, even while accounting for sociodemographic factors (age, gender, education), medical covariates (antihypertensive, cholesterol lowering, steroid, and antidepressant medications), health behaviors (smoking, alcohol problems), and psychosocial factors (depression and anxiety). In addition, global sleep quality mediated this relationship. That is, self-reported discrimination was negatively associated with sleep quality, which in turn was positively associated with inflammation burden, resulting in an overall positive relationship between self-reported discrimination and

inflammation burden. This study provides support to the hypothesized pathway from race-specific stressors (e.g., discrimination) to health status via health behaviors (e.g., sleep) and cumulative biological vulnerabilities and resistances (Myers, 2009).

Furthermore, a growing body of literature has begun to examine the connection between discrimination and sleep quality. For example, Slopen et al. (2016) conducted a systematic review of the literature linking discrimination to sleep, reporting associations between measures of discrimination and subjective and objective measures of sleep quality. The authors note virtual consensus among studies reporting a link between discrimination or instances of unfair treatment and self-reported poor sleep. Notably, four large, prospective studies reported this finding. There were mixed associations between discrimination and sleep duration; subtle ethnic discrimination in high school students and major experiences of discrimination in adults were associated with shorter self-reported sleep duration. Only one of four studies of objectively-measured sleep duration—by actigraphy or PSG—found a significant (negative) association. Other studies examining objectively measured sleep parameters (e.g., sleep latency, wake after sleep onset, light sleep, proportion of REM sleep) reported significant associations between discrimination and worse sleep quality, but there were often inconsistent findings between the studies. For example, multiple studies examined sleep efficiency, but only one reported significant results. This review then, indicates that overall, there is a link between discrimination and sleep quality; the most consistent results appear to be between discrimination and self-reported sleep quality and sleep duration.

While there are few studies examining temporal relationships between poor sleep and discrimination, Fuller-Rowell et al. (2017) conducted a longitudinal investigation of discrimination and sleep over a 1.5-year period. The authors recruited 133 college students

(41% African American) who completed baseline measures of sleep problems (using items of sleep duration, efficiency, latency, and quality from the PSQI) as well as baseline discrimination from a scale which assessed the frequency of a variety of unfair treatments due to race or ethnicity. Control variables assessed at baseline included parent education, parent income, and physical and mental health (BMI, self-rated health, depression symptoms). Time 2 variables were collected via a survey which included the same measure of discrimination and the full PSQI. The outcome measure was a composite score of sleep problems combining overall sleep problems, sleep efficiency, sleep latency, and sleep duration. Using structural equation modelling, the authors analyzed longitudinal changes in sleep problems from baseline to 1.5 years from baseline.

Results indicated that although sleep problems increased among all participants over time, they increased more among African American college students compared to White college students, and this increase was mediated by an increase in discrimination (Fuller-Rowell et al., 2017). That is, for African American students, there was an increase in discrimination over time, and discrimination was positively associated with sleep problems. The authors included covariates of parent education, BMI, self-rated health, and depressive symptoms in the model, finding the same effect; parental income slightly attenuated the effect, but it remained significant. These results indicate that for African Americans, discrimination is associated with an increase in sleep problems over time.

In sum, research documents an association between discrimination and inflammation burden, and further suggests that sleep mediates this association (Ong & Williams, 2019). Furthermore, findings provide support to the hypothesized relationship from discrimination to poor sleep (Slopen et al., 2016), indicating that a race-specific stressor is associated with

poor sleep. Additionally, there is evidence that suggests that disparities in sleep faced by African Americans are mediated by discrimination (Fuller-Rowell et al., 2017). Taken together, these studies link race-specific stressors (i.e., discrimination) to injurious health behaviors (i.e., poor sleep), ultimately connecting race to risk factors for poor health outcomes (i.e., inflammation burden). As predicted by Myers (2009), however, there is a psychological process which connects race-specific stressors to health-injurious behavior.

Perseverative Cognition, Discrimination, and Sleep

Some research has begun to address *how* discrimination affects sleep (Beatty et al., 2011; Hicken et al., 2013; Hoggard & Hill, 2018), but the link is not well understood. As predicted by Myers' meta-model (2009), one pathway linking sleep and discrimination could be cognitive processing. One maladaptive pattern of cognitive processing is perseverative cognition, characterized by repetitive, negative thoughts. These may be future-oriented, and anticipatory, which is here conceptualized as *worry* or *vigilance,* or they may be past-focused, reflecting on past failures, difficulties, or challenges, which is here identified as *rumination.* Rumination has been defined as "a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms" (Nolen-Hoeksema et al., 2008, p. 400). (for more discussion, see Hoggard & Hill, 2018; Thomsen et al., 2003).

Studies have linked rumination to poor sleep in experimental and observational paradigms (Guastella & Moulds, 2007; Thomsen et al., 2003; Zoccola et al., 2009). For example, Thomsen et al. (2003) used a cross-sectional survey to examine the relationship between rumination and sleep quality in Danish college students ($N = 126$). The participants completed measures of rumination, sleep quality (via the PSQI), as well as negative moods.

Results of correlational analyses and partial correlation analyses, controlling for negative moods, indicated that rumination was independently associated with sleep problems. In particular, rumination was negatively associated with sleep quality, but positively associated with time to fall asleep and sleep disturbances. Therefore, this study provides support for a relationship between rumination and sleep quality, independent of negative moods.

Other studies have focused on the effects of rumination on sleep following stressful situations. For example, Zoccola et al. (2009) examined the effect of a stress-inducing task on objectively-measured sleep in college students ($N = 70$). In a laboratory session, participants first completed a measure of trait rumination, performed a stressful task, rested quietly for 10 minutes, and finally completed a measure of state rumination. Trait rumination was assessed by a scale measuring whether participants generally tended to replay or review past events in their day-to-day lives. The stressful task was delivering a 5-minute speech on why they were a good candidate for a hypothetical job in front of a stoic, unresponsive audience. State rumination was measured by a questionnaire asking how frequently participants had negative thoughts about their speech performance. Participants then wore actigraphy monitors to record their sleep the evening following the laboratory session. All participants also completed a sleep diary reporting on the previous night's sleep (completed the morning following the laboratory session), rating the quality, estimated time to fall asleep, bed and wake times, and other sleep-related items (e.g., sleep disturbances).

Results of multiple regression analyses indicated a main effect of trait rumination, such that those students higher in trait rumination experienced longer objectively-measured sleep onset latency (Zoccola et al., 2009). Furthermore, there was an interaction between trait and stressor-specific rumination, whereby high trait ruminations who also scored high on the

measure of state rumination following the stressful task experienced the longest objectively- and subjectively measured sleep onset latency. Interestingly, subjectively-measured sleep onset latency showed a different pattern; the main effect of trait rumination and the interaction with stressor-specific rumination were not significant, but there was a main effect of stressor-specific rumination—those who reported the most stressor-specific rumination reported taking the longest to fall asleep. These findings indicate that trait rumination is associated with longer objectively measured sleep onset latency, and that stressor-specific rumination amplifies this relationship. However, it is notable that this study did not include a well-validated self-report measure of global sleep quality, such as the PSQI, and therefore the relationship of trait rumination to other measures of sleep quality is unclear.

Finally, Guastella and Moulds (2007) examined rumination and sleep difficulties in Australian college students ($N = 114$). Participants completed study procedures the day of and the day following a mid-term exam. Participants completed measures of rumination, depression, anxiety, stress, and intrusive symptoms from the night before the exam, as well as a questionnaire assessing difficulties in getting to sleep. Participants were randomly assigned to a rumination induction or distraction task; approximately half of the students were given instructions to reflect on their performance on an exam taken the same day as they completed questionnaires of rumination, depression, anxiety, and stress, and intrusive symptoms. The next day, participants rated their sleep quality and intrusive symptoms once more. Analysis of variance (ANOVA) results revealed an interaction between trait-rumination and the rumination-induction task: those participants who were classified as high trait ruminators who were in the rumination induction condition reported the worst sleep quality. There was no interaction in the model with intrusive symptoms as an outcome, but

there was a main effect of both trait rumination and condition—high trait ruminators and those in the rumination induction condition reported more intrusive thoughts. These findings bolster literature linking rumination and sleep, and further indicate that the effect of rumination is tied to both trait rumination as well as rumination following discrete distressing events, suggesting that for those who are predisposed to ruminate, stressful events are especially likely to disrupt sleep.

Researchers have also examined the role of worry and sleep; for example, McGowan et al. (2016) investigated the relationship between worry and sleep disturbance in college students ($N = 50$, 10% African American). The authors assessed worry with the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) and sleep problems with a seven-item measure that assesses sleep problems, functional impairment due to lack of sleep, and subjective perceptions of insomnia severity. Participants completed dairies twice daily (morning and evening) over the course of three weeks (one baseline and two intervention weeks). Using multi-level modeling, the authors examined relationships between worry and self-reported sleep problems. Results indicated that higher levels of worry in the evening were associated with less total sleep time, lower sleep efficiency, and greater sleep onset latency in the baseline week. Analyses testing pathways from sleep variables to worry were not significant, indicating that increased worry during the day was not associated with sleep from the prior evening. Similarly, during intervention weeks, worry in the evening was associated with decreased total sleep time, decreased sleep efficiency, increased sleep onset latency, and increased number of awakenings, while there were no significant associations from sleep problems to worry. These findings provide evidence of a unidirectional relationship between worry, a form of perseverative cognition, and sleep problems, whereby

worry predicts sleep problems, but sleep problems do not predict worry. This finding is in line with the pathway predicted by Myers (2009), theorizing that cognitive processes lead to health behaviors, and suggests that for Black people, poor sleep may result from increased levels of worry.

Perseverative Cognition and Sleep in Black Participants

As documented above (Guastella & Moulds, 2007; McGowan et al., 2016; Thomsen et al., 2003; Zoccola et al., 2009), there is a body of literature supporting the hypothesized link from cognitive processing to health-injurious behavior (e.g., sleep problems; Myers, 2009). Several studies have examined the link between discrimination, perseverative cognition, and poor sleep in samples that include Black participants (Beatty et al., 2011; Hicken et al., 2013; Hoggard & Hill, 2018). Beatty et al. (2011) examined the relationship of unfair treatment, a concept similar to discrimination, to sleep in middle-aged adults ($N = 217$; 44.2% African American). Participants completed both subjective and objective measures of sleep over a 10-day period. These measures included sleep diaries (with a single item assessing nightly worry) and two self-report measures of sleep quality—the ESS and PSQI. They also wore actigraph monitors for the 10-day period and completed two-night in-home PSG sleep studies. Unfair treatment was assessed with a questionnaire recording the frequency of a variety of unfair interpersonal treatments without reference to a specific reason (e.g., race).

Results of multiple regression analyses, which included covariates of age, BMI, gender, hypertensive status, and SES, indicated a negative relationship between unfair treatment and sleep quality (assessed via PSQI), and a positive relationship between unfair treatment and daytime sleepiness (Beatty et al., 2011). Furthermore, there were negative

relationships between unfair treatment, sleep duration, sleep efficiency (measured both via actigraphy and PSG), and proportion of REM sleep (measured by PSG). Moreover, nightly worry—a type of perseverative cognition—partially mediated the association between unfair treatment and sleep quality, daytime sleepiness, sleep efficiency measured by actigraphy, and proportion of REM sleep. That is, unfair treatment was positively associated with nightly worry, which was positively related to both forms self-reported sleep quality and objectively measured sleep efficiency and REM sleep. These findings were not moderated by race, and therefore this study provides evidence that perseverative cognition in the form of worry may link discrimination and subjective and objectively measured sleep in Black Americans, just as it does in White Americans.

Similarly, Hicken et al. (2013) examined the role of racism-related vigilance as a mediator between race and sleep difficulties in a multi-ethnic sample of adults (N = 3,105; 32% Black). The authors measured racism-related vigilance using a modified version of an unpublished scale, comprised of three questions on how often participants prepared for possible insults from others, felt that they have to pay special attention to their appearance to avoid harassment, and tried to avoid certain social situations or places. Sleep quality over the past four weeks was measured by three questions on how often they had trouble falling asleep, waking in the middle of the night, and waking earlier than planned in the morning. The researchers controlled for discrimination, using abbreviated versions of two scales. Everyday discrimination was measured by five questions assessing how frequently (once a week to never) participants encountered discrimination in a variety of day-to-day settings (e.g., receiving poorer service than others at restaurants or stores due to their race/ethnicity). Major experiences of discrimination were assessed via six questions asking how many times

they had received more serious instances of unfair treatment due to their race/ethnicity (e.g., not being hired or unfairly prevented from moving into a neighborhood). The authors also controlled for sociodemographic factors (age, gender, race/ethnicity, and SES), financial strain, and major life stressors (e.g., death of a child).

Mean comparisons indicated that Black participants reported higher levels of sleep problems compared to White participants (Hicken et al., 2013). Furthermore, findings from mediation analyses revealed that race-related vigilance mediated the association of race to sleep problems; that is, race was associated with vigilance—Black participants reported higher levels of vigilance—and vigilance in turn was positively associated with sleep problems. Adjusting for health conditions and behaviors did not alter the results, nor did controlling for measures of discrimination. These findings indicate that perseverative cognition (i.e., racism-related vigilance) may be a mechanism linking race to poor sleep; however, the authors did not explore the potential mediation of vigilance from discrimination to poor sleep. Further research, therefore, is needed to examine the possibility that vigilance connects discrimination to poor sleep.

Ample research links rumination to poor sleep generally (e.g., Guastella & Moulds, 2007; Thomsen et al., 2003; Zoccola et al., 2009), though relatively less research has focused specifically on Black participants or on the hypothesized link from discrimination to perseverative cognition (Myers, 2009). Hoggard and Hill (2018) examined the role of two forms of perseverative cognition, worry and rumination, in linking discrimination and poor sleep in African American college students ($N = 68$). Participants completed measures of discrimination, general worry (PSWQ), rumination, and sleep quality (PSQI). Results of mediation analyses controlling for sociodemographic variables (age, gender, and social class)

indicated that rumination, but not worry, mediated the association of discrimination to poor sleep quality. That is, discrimination was positively related to rumination, and rumination in turn was negatively associated with sleep quality. These results provide support to the hypothesized link from discrimination to poor health behaviors (i.e., sleep) via rumination. Interestingly, unlike Hicken et al. (2013) or Beatty et al. (2011), anticipatory perseverative cognition (i.e., worry) assessed with a generic worry questionnaire was not associated with sleep quality and did not mediate the association between discrimination and poor sleep. This inconsistency suggests that specific worry (i.e., racism-related vigilance or nightly worry) may be related to poor sleep while general worry is not.

In sum, research has documented a link between two forms of perseverative cognition —rumination and worry—to poor sleep. These findings include samples of college students (Guastella & Moulds, 2007; McGowan et al., 2016; Thomsen et al., 2003; Zoccola et al., 2009) as well as multi-ethnic samples of adults (Beatty et al., 2011; Hicken et al., 2013) and samples consisting exclusively of African American participants (Hoggard & Hill, 2018). Beyond the evidence of a connection from perseverative cognition to sleep, findings indicated that perseverative cognition mediates the relationship of race to poor sleep (Hicken et al., 2013). Furthermore, there is some evidence that perseverative cognition mediates the link from discrimination to poor sleep (Hoggard & Hill, 2018).

Race-related Stress, Discrimination, and Sleep Quality

Discrimination is one among a variety of race-specific stressors to consider in Myers' (2009) model. Harrell (2000) offered a multidimensional conceptualization of race-specific stressors—in her words, "racism-related stress" (p. 42), which, among at least six types of race-specific stressors, includes episodic, discrete experiences (e.g., being harassed by law

enforcement) and day-to-day, chronic racial microstressors. The literature examining race-specific stress and health outcomes and behaviors (e.g., Hicken et al., 2013; Hoggard & Hill, 2018) has often considered race-specific stressors using measures of discrimination such as the PEDQ-CV (Brondolo et al., 2005), the Everyday Discrimination Scale (Williams et al., 1997), or the Major Experiences of Discrimination Scale (Williams et al., 2008). These measures generally assess experiences of overt, intentional mistreatment based on an individual's racial or ethnic background. For example, the PEDQ-CV (Brondolo et al., 2005) assesses the frequency of incidents such as "[someone] *hinted you must be lazy*," and the Everyday Discrimination Scale asks about "*people act[ing] as if they are afraid of you*" (Williams et al., 1997). These measures capture the episodic, discrete aspect of racial stress, "racism-related life events" as well the some of the chronic, day-to-day events, "daily racism microstressors," described by (Harrell, 2000, p. 45).

Racial microstressors that are measured as everyday forms of discrimination (e.g., Hicken et al., 2013) address overt, albeit day-to-day, instances; however, racial and ethnic minority individuals also experience more subtle forms of verbal or nonverbal invalidation that are more ambiguous in nature (Meyers et al., 2020). Microaggressions are a related construct (Torres-Harding et al., 2012), which function as a form of race-related stress. The "micro" aspect of microaggressions refers to their magnitude (i.e., brief and commonplace)—they are a racial microstressor. A microaggression may not be an intentional expression of prejudice or attempt to harm the recipient, and the perpetrator may view themself a well-meaning individual who professes to hold egalitarian values (Sue et al., 2007). Regardless of the intent of the perpetrator, microaggressions are often subtle, ambiguous, commonplace experiences which communicate invalidating and demeaning messages to the recipient.

Therefore, while a single microaggression may be small, over time and in accumulation, they serve as a low-level stressor wearing on the cognitive and emotional reserves of members of minority and marginalized groups. Microaggressions are likely occur with more frequency than discrete, episodic racial stressors, functioning alongside episodes of overt discrimination as a more chronic form of racial stress (Harrell, 2000).

Microaggressions have been organized into a taxonomy of three overarching forms: micro-assaults, microinsults, and microinvalidations (Sue et al., 2007). A micro-assault, for example, is typically a display of hostility (e.g., use of a racial epithet) while an microinvalidation may be a White person dismissing a Black person's experience of discrimination. Microaggressions pertaining to racial/ethnic identity have been organized into nine themes: "alien in one's own land, ascription of intelligence, color blindness, criminality/assumption of criminal status, denial of individual racism, myth of meritocracy, pathologizing cultural values/communication styles, second-class status, and environmental invalidation" (Sue et al., 2007, p. 5). As microaggressions are race-specific stressors faced by Black Americans, they are hypothesized to be associated with cognitive processes and health behaviors (i.e., perseverative cognition and sleep; Myers, 2009).

A small body of literature has begun to investigate these links (Lilly et al., 2018; Sittner et al., 2018), finding associations between microaggressions and health behaviors as well as with depression risk in diverse groups. For example, Lilly et al. (2018) used a sample of racial and ethnic minority graduate and professional students (African American, Hispanic, Asian, and mixed-race; $N = 325$) to investigate the association between microaggressions and risk of depression. The frequency of and distress experienced due to microaggressions was assessed by the Racial Microaggressions Scale (RMAS; Torres-

Harding et al., 2012) and depression risk was assessed with a well-validated screener asking about the frequency of two depression symptoms in the past two weeks. The researchers statistically controlled for subjective social status, age, gender, race, and childhood socioeconomic status (i.e., parental income and education). Results of logistic regression analyses indicated that overall, more frequent microaggressions were associated with a positive depression risk screen (i.e., meeting the cut-off score for probable depression); moreover, distress associated with microaggressions was likewise positively associated with odds of positive depression risk screening. These findings indicate that across racial/ethnic minority groups, microaggressions are positively associated with mental health risks.

There is also evidence that microaggressions may impact health behaviors (Sittner et al., 2018). In a sample of American Indian adults with diabetes ($N = 192$), researchers modelled associations between microaggressions, diabetes distress, and health-promoting behaviors (i.e., diet and exercise). The authors used an 11-item scale assessing presence or absence of, and the distress associated with, experiences of microaggressions specifically relating to themes relevant to American Indians. Diabetes distress was measured with two questions assessing whether patients felt overwhelmed and as if they were failing in managing their diabetes. Health behaviors were measured by two items each asking about healthy eating behaviors and exercise behaviors. The authors also included depressive symptoms in their model, assessed with the Patient Health Questionnaire-9, a well-validated measure assessing nine symptoms of depression over the past two weeks (PHQ-9; Kroenke et al., 2001).

Results of path analyses indicated that microaggressions were indirectly, negatively related to exercise behaviors through a positive association with diabetes distress (Sittner et

al., 2018). That is, microaggressions were positively associated with diabetes distress, which was negatively related to exercise behaviors. Microaggressions were also positively associated with depressive symptoms, but depressive symptoms were not associated with health behaviors. These findings indicate that for American Indians, and likely other groups, microaggressions are related to disease-related distress and this distress, in turn, is related to health behaviors. These associations raise the possibility of not only microaggressions having associations with health outcomes via these intermediate pathways (i.e., distress and exercise), but also indicate a need for future research into their associations with other health behaviors (e.g., sleep).

Of note, one study (Ong et al., 2017) examined Asian American college students' (*N* = 152) reports of racial microaggressions and sleep. Over the course of 14 days, participants completed a daily checklist measure of 20 different kinds of microaggressions, recorded their bed and wake times, and answered five questions assessing sleep quality. Multilevel modeling analysis revealed that participants who reported more microaggressions on average had worse sleep quality; furthermore, on days with more microaggressions, participants reported lower quality sleep and shorter sleep duration compared to days without microaggressions. There is a notable absence of research on microaggressions and health outcomes and behaviors (in particular, sleep) in samples with Black participants. That said, the body of literature regarding discrimination and sleep, along with reported associations between microaggressions and health behaviors and mental health outcome in ethnic/racial minority groups (Lilly et al., 2018; Ong et al., 2017; Sittner et al., 2018), indicates a need for studies to investigate the plausible connection between microaggressions and sleep quality in Black Americans, as well as the potential mediators of this association.

COVID-19 Pandemic

The development and data collection of this project occurred during the COVID-19 pandemic. While this project focused on racial stressors, the pandemic presented a range of psychosocial stressors on a global scale. Kujawa et al. (2020) reported that stressful events related to the pandemic were particularly high among Black emerging adults. Furthermore, pandemic stress was associated with depression and anxiety. Therefore, while the pandemic is not a race-related stressor, its effects disproportionately affected Black Americans; furthermore, the connection between this stressor and sleep quality is important to assess.

Gaps in the Literature

A large body of literature documents health disparities between Black and White Americans (CDC, 2013; Williams, 2012), including lower sleep quality in Black Americans (Knutson et al., 2010; Mezick et al., 2008; Thomas et al., 2006). Furthermore, disparities in sleep quality may be a contributing factor to broader health disparities (Gangwisch et al., 2007; Gangwisch et al., 2006; Patyar & Patyar, 2015). Importantly, experiences of discrimination are associated with a variety of poor health outcomes in Black samples (Pascoe & Smart Richman, 2009; Williams & Mohammed, 2009), including poor sleep quality (Fuller-Rowell et al., 2017; Slopen et al., 2016). Some studies have examined mediators of the relationship between discrimination and poor sleep, and perseverative cognition is a plausible pathway linking them (Beatty et al., 2011; Hicken et al., 2013; Hoggard & Hill, 2018). Findings are inconsistent regarding worry (one form of perseverative cognition), with generic measures of worry not being associated (Hoggard & Hill, 2018), while racism-specific vigilance has been associated with poor sleep (Hicken et al., 2013). Rumination (another form of perseverative cognition) has strong support as a mediator,

though previous research examining rumination's link to discrimination and poor sleep in Black samples has not used a well-validated measure of sleep quality (Hoggard & Hill, 2018). Furthermore, while many studies examine discrimination, few, if any, examine the relationship of microaggressions to sleep among Black Americans. Finally, much as perseverative cognition may mediate a negative relationship between discrimination and sleep quality, perseverative cognition may also mediate a negative relationship between microaggressions and sleep quality.

Hypotheses

This project, therefore, tested the hypotheses that racism-related vigilance and rumination mediate the relationship between discrimination and poor sleep, as well as between microaggressions and poor sleep, among Black Americans. These four hypotheses are further detailed below:

1. Rumination was hypothesized to mediate the association between discrimination and poor sleep quality. That is, discrimination was hypothesized to be positively associated with rumination, which in turn would be positively associated with poor sleep quality (see Figure 2).

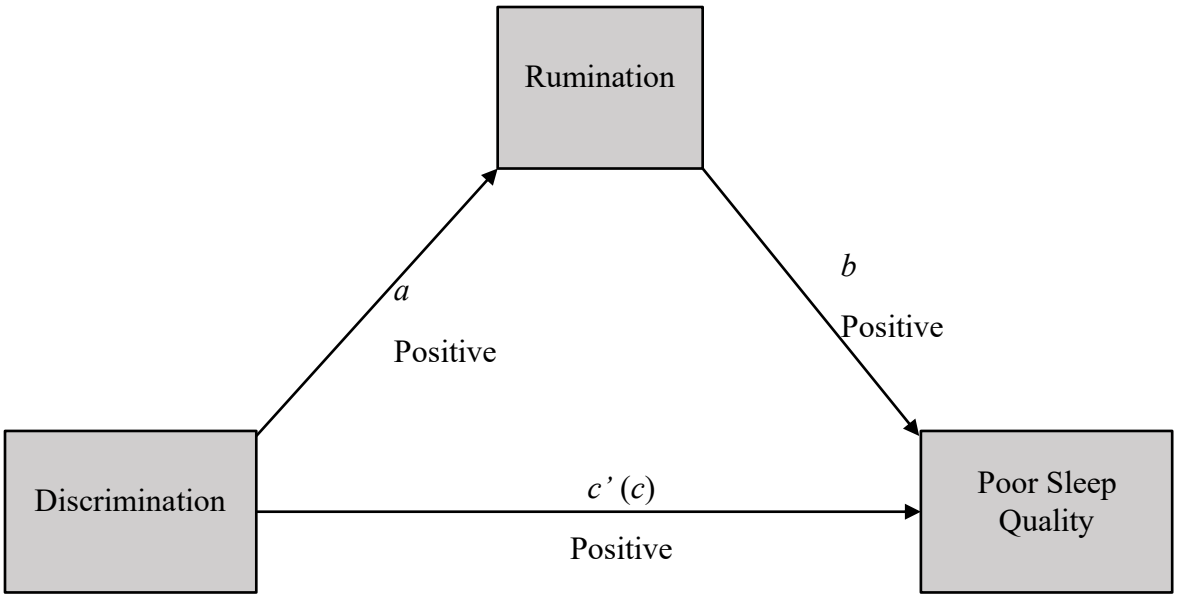


Figure 2. Graphical representation of hypothesis 1.

2. Racism-related vigilance was hypothesized to mediate the association between discrimination and poor sleep quality. That is, discrimination was hypothesized to be positively associated with racism-related vigilance, which in turn would be positively associated with poor sleep quality (see Figure 3).

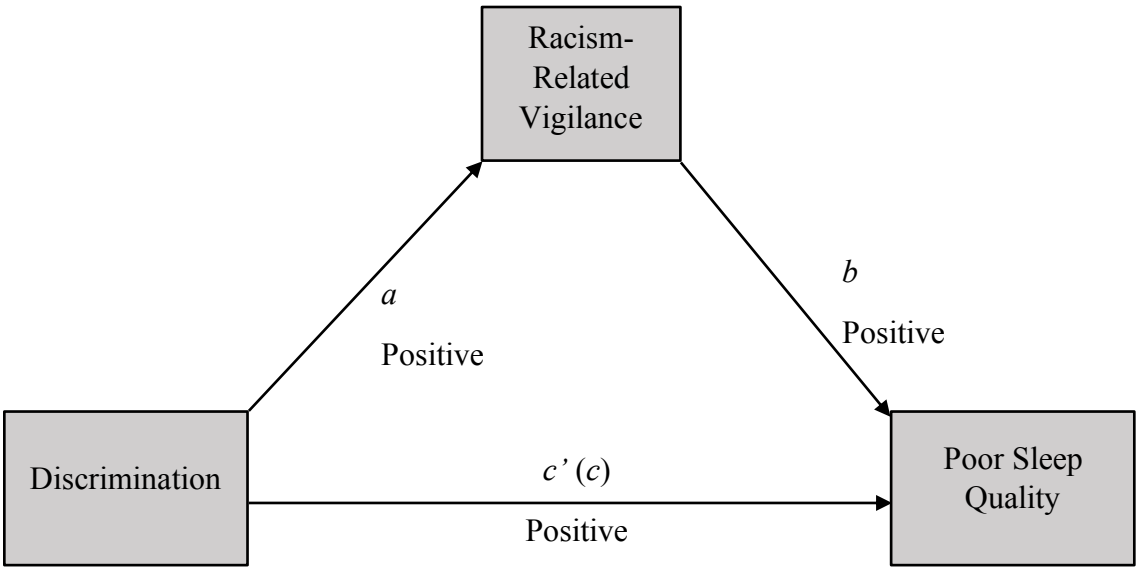


Figure 3. Graphical representation of hypothesis 2.

3. Rumination was hypothesized to mediate the association between microaggressions and poor sleep quality. That is, microaggressions were hypothesized to be positively associated with rumination, which in turn would be positively associated with poor sleep quality (see Figure 4).

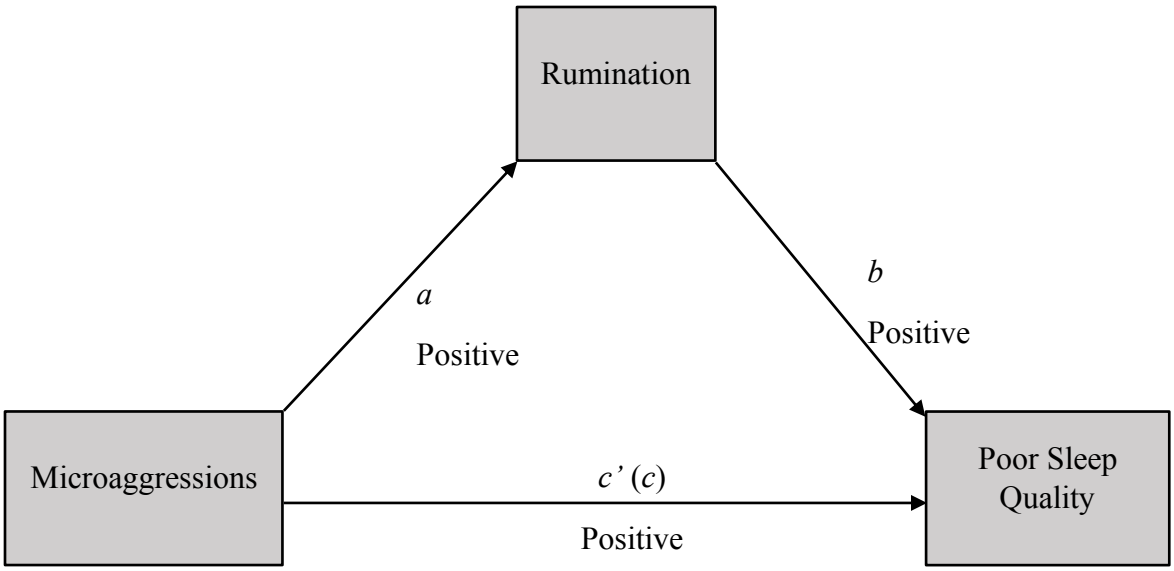


Figure 4. Graphical representation of hypothesis 3.

4. Racism-related vigilance was hypothesized to mediate the association between microaggressions and poor sleep quality. That is, microaggressions were hypothesized to be positively associated with racism-related vigilance, which in turn would be positively associated with poor sleep quality (see Figure 5).

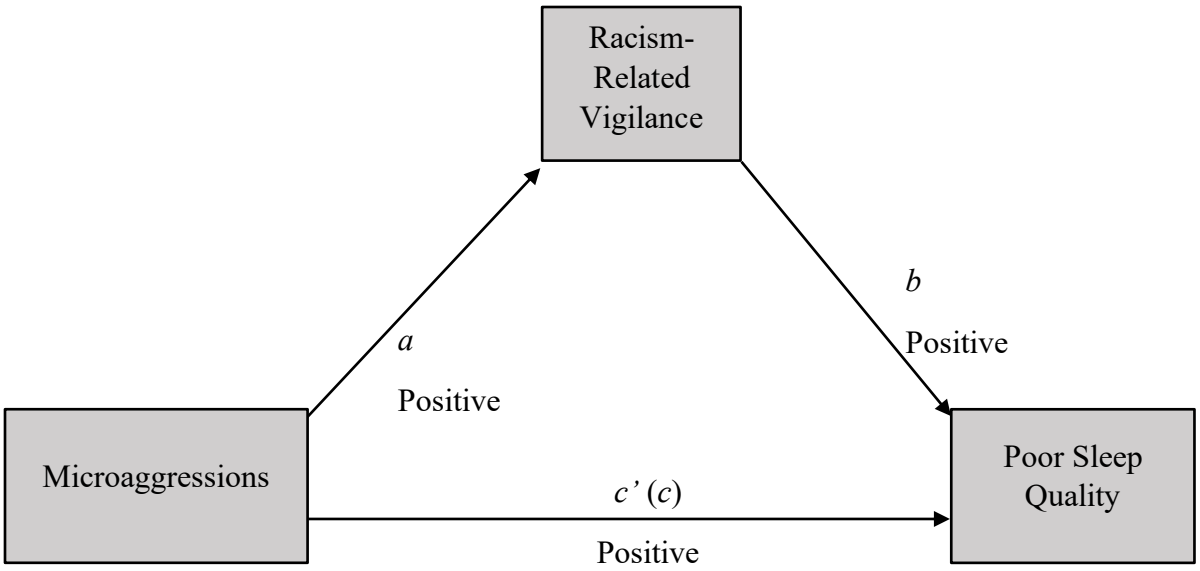


Figure 5. Graphical representation of hypothesis 4.

CHAPTER 3

METHODOLOGY

Participants

This project collected data from participants recruited via the Amazon Mechanical Turk (MTurk) program, an online platform that allows researchers to post "human intelligence tasks" that workers sign up for and complete (n.d.). The study was advertised to Black adults residing in the United States through this online platform. Inclusion criteria included: 1) Current U.S. residency, 2) age 18 years to 65 years, 3) Black racial/ethnic identity (including participants who identified as biracial or multiracial), 4) having been born in the United States, and 5) having at least one parent born in the United States, as research suggests that experiences of discrimination may differ across immigration status (Krieger et al., 2005).

Participant Characteristics

Table 1 presents descriptive information on the study sample ($N = 223$); participants ranged in age from 20 to 65 years, with a mean age of 35.7 ($SD = 9.75$). In the sample, 53.4% indicated they were assigned male sex at birth; 53.8% of the sample identified as men, while 44.8% identified as women and 1.3% identified as non-binary. Three participants indicated that they identified as a gender discordant with the sex they were assigned at birth (e.g., assigned female at birth and identify as male or non-binary). Most participants identified as Black/African American (78.2%), and most were partnered (61.4%). The largest percentage of participants had completed a four-year college degree (37.2%), and most were working full-time (72.6%); annual income in the sample ranged widely, but most participants reported

annual incomes between $20,001 and $70,000 (63.4%). In terms of region of residence, a the largest percentage of participants indicated residence in the southern region of the United States (48.2%).

Table 1.

Descriptive statistics of participant characteristics (N=223).

Participant characteristics	*M (SD)* or %
Age (years) [a]	35.77 (*9.75*)
Sex Assigned at Birth	
Male	53.4%
Female	46.6%
Gender Identity	
Identify as man	53.8%
Identify as woman	44.8%
Identify as non-binary	1.3%
Racial/Ethnic Identity	
Black/African American	78.2%
Multiracial [b]	10.6%
Did not provide race/ethnicity	11.2%
Relationship Status	
Married	46.6%
Single	33.6%
Serious relationship and living together	8.5%
Serious relationship and living apart	6.3%
Divorced	4.0%
Separated	0.4%
Widowed	0.4%
Education	
High school diploma/GED	8.5%
Technical school	0.4%
Some college	24.2%
4-year college degree	37.2%
Graduate degree	29.6%
Employment	
Working full-time	72.6%
Working one part-time job	8.5%
Unemployed, but looking	5.4%

Participant characteristics	*M (SD)* or %
Working multiple part-time jobs	4.9%
Student	4.0%
Other (includes self-employed and working at home)	3.1%
Retired	0.9%
Unemployed, not looking	0.4%
Annual Income	
$0 - $9,999	9.4%
$10,000 - $20,000	5.8%
$20,001 - $30,000	14.8%
$30,001 - $40,000	9.9%
$40,001 - $50,000	16.6%
$50,001 - $60,000	13.9%
$60,001 - $70,000	7.6%
$70,001 - $80,000	11.2%
$80,001 - $90,000	2.2%
$90,001 - $100,000	3.1%
More than $100,000	2.7%
Decline to answer	2.7%
Region [c]	
South	48.2%
Northeast	17.8%
Midwest	16.9%
West	16.4%

Note:
[a] Age calculated from 2021 - year born.
[b] Participants categorized as multi-racial self-identified as Black/African American and one or more other racial/ethnicities including Native American/Alaska Native (0.4%), Asian (1.3%), Latino/Hispanic (2.2.%), and White (6.3%).
[c] States within regions include: Midwest = Illinois, Ohio, Wisconsin, Minnesota, Missouri, Michigan, Indiana, South Dakota, North Dakota, Kansas; Northeast = New York, New Jersey, Massachusetts, Pennsylvania, Connecticut, Rhode Island. South = Florida, Texas, Georgia, Alabama, Louisiana, Virginia, North Carolina, Maryland, South Carolina, Tennessee, Mississippi, Oklahoma, Kentucky, Washington, D.C., Arkansas; West = California, New Mexico, Arizona, Washington, Wyoming, Oregon, Montana, Hawaii. *Only states in which participants reported living are listed here. States are listed in descending order of frequency within regions.*

Procedures

Screening

Participants completed a brief screening survey with questions regarding inclusion criteria, as recommended by McDuffie (2019). Potential participants completed a screening

survey to determine whether they met inclusion/exclusion criteria. The screener is presented in Appendix A-1. All participants who completed the screener questions were compensated $0.05 for their time. Participants who did not meet inclusion criteria were excluded (*n* = 4520). Therefore, a total of 4,832 participants were screened, with 311 (6.93%) meeting inclusion criteria.

Compensation, Consent, and Ethics Approval

As an online participant recruitment and management platform, MTurk poses unique ethical concerns. In particular, Gleibs (2017) noted that the ethical principle of respect for autonomy is challenged by typically low wages for tasks on this platform, while the power imbalance between the researcher likewise undermines respect for autonomy. For instance, researchers are able to reject a task completed by a participant and refuse to pay for the work completed, unlike typical laboratory studies.

To address these ethical concerns, participants who met inclusion criteria were provided with information describing the procedures in the study, the potential for emotional distress due to survey questions, and their rights to stop participating at any time. Participants were informed of how to contact study personnel should they have questions as well as national crisis line numbers in case they had urgent distress. Participants who completed study materials were paid for their participation; payment was equivalent to federal minimum wage (U.S. Department of Labor, n.d.), based on estimated time of task completion of six questions per minute (Cloud Research, 2020). The complete survey included 113 multiple choice questions (including two measures administered as part of a larger project); the time estimate to complete this portion of the survey was approximately 22 minutes. In order to account for two free text response items, the total time it was estimated to take was 25

minutes. Therefore, the compensation was 25/60 x $7.25 = $3.02. While this amount is lower than most in person survey compensation, it is in line with best practice recommendations (Cloud Research, 2020). Study procedures were approved by the Institutional Review Board of the University of Missouri-Kansas City.

Survey Completion

Those participants who met inclusion criteria were assigned credentials in MTurk that allowed them to access the full survey. Of the 311 participants who were qualified for the study based on the screener, 264 completed the full survey. To ensure participants were appropriately attending to the survey, participants' time to complete the survey was recorded. Responses from participants who completed the survey too quickly would not have been included in final analyses, though none fit this criterion. Likewise, as the survey included several open-text questions, responses from participants who provided nonsensical answers to these items were not be included in analyses (n = 22). Furthermore, several surveys displayed suspicious response patters (e.g., two surveys completed within an hour of each other, with near-identical responses), and these were not included in the final analyses (n = 7). Finally, several surveys indicated that they did not meet inclusion criteria (i.e., not identifying as Black/African American; n = 12). The final sample consisted of the total who completed the survey (264) minus 22 who were eliminated for nonsensical answers, seven duplicate entries, and 12 who indicated in the main survey that they did not meet criteria, bringing the total N to 223. Participants completed online questionnaires measuring study variables, described below, as well as a demographic questionnaire (Appendix A-2).

Measures

This study employed the measures described below, as well as a general demographic information form. All measures are available to the public free of charge online or through contacting the respective authors (e.g., The Ruminative Responses Scale; Nolen-Hoeksema & Morrow, 1991).

Discrimination

The Experiences of Discrimination Scale (EOD; Krieger et al., 2005) was used to assess experiences of discrimination. The full scale is presented in Appendix A-3. The EOD is a nine-item self-report questionnaire which assesses experiences of discrimination in nine different settings. Questions on the scale ask whether participants have "ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your race, ethnicity, or color?" in settings such as school, work, or housing (Krieger et al., p. 1590). Participants can respond "*yes*" or "*no*" to each situation. If participants respond affirmatively, they are asked to rate how many times this occurred, from 1 = *once* to 3 = *four or more times*. The situation version is scored by summing positive responses to situations, with a possible range of 0-9; scores on the frequency version measure the total number of occurrences of discrimination across situations. Items are assigned a value of 0 if respondents selected "*no*," 1 if they endorsed ''*once*,'' 2.5 if they selected ''*2–3 times*,'' and 5 if they selected ''*4 or more times*.'' These values are summed and can range from 0 to 45, with higher scores indicating more lifetime discrimination. Using a sample of African American and Latino adults ($N = 208$; 90 African American), scale developers reported evidence of internal consistency, convergent validity, test-retest reliability, and inter-rater reliability. The situation and frequency scales both had a

Cronbach's alpha of .82 in the African American sample. Evidence of convergent validity was found through strong correlations with measures of major and everyday experiences of discrimination. Test-retest reliability for the situation scale was r =.69 and r=.70 for the frequency scale. Furthermore, concordance was found between responses from sub-set of participants with reports from key informants (κ = .35).

The Racial Microaggressions Scale (RMAS; Torres-Harding et al., 2012) was used to measure experiences of microaggressions. The full scale is presented in Appendix A-4. This 32-item tool was developed in a sample of people of color (N = 377; 39.5% Black), and it comprises six sub-scales: Foreigner/Not Belonging, Criminality, Sexualization, Low-Achieving/Undesirable, Invisibility, and Environmental Invalidations. Participants indicate how frequently they experience examples of microaggressions (e.g., "Other people often ask me where I am from, suggesting that I don't belong") on a Likert type scale (0 = *never*, 1 = *a little/rarely*, 2 = *sometimes/a moderate amount*, 3 = *often/frequently*).

Torres-Harding et al. (2012) first conducted an exploratory factor analysis in a random half of the original study sample (n = 189) on a set of 45 test items, which revealed a six-factor solution consistent with theory. Items which loaded poorly on an individual factor, or which loaded heavily on multiple factors were then deleted, resulting in a final scale of 35 items which explained 53.99% of scale variance. The authors then conducted a confirmatory factor analysis (CFA) with the remaining half of the sample (n = 188) to test the six-factor structure of the 35-item scale. Results of the analyses indicated good fit for the 35-item model, $\chi^2(545) = 1139.83$, $p < .000$; root mean squared error of approximation (RMSEA) = .076. However, several items loaded on factors inconsistent with theory and were subsequently deleted. A second CFA with the remaining 32 items also had good fit, $\chi^2(488) =$

912.15, $p < .00$; RMSEA = .069, 90% CI [.063, .076]. Fit indices suggested good fit; goodness of fit index (GFI) = .96, adjusted GFI = .96, parsimony GFI = 1.0, and comparative fit index = 1.0; root mean squared residual (RMSR) = .07 and standardized RMSR = .06. The authors also tested model fit across gender, finding very good fit for men, and good fit for women. A CFA of a bifactor model was conducted to compare fit to a multidimensional model of microaggressions. Although this model had good fit, most variance was accounted for by loadings on specific factors; factor intercorrelations in the multidimensional model ranged from .07 to .68, suggesting related, but distinct factors.

Internal consistency with the scale was found to be good or acceptable in all six sub-scales: Environmental Invalidations (α = .81); Foreigner/Not Belonging (α = .78); Sexualization (α = .83); Low-Achieving/Undesirable Culture (α = .87); Criminality (α = .85), and Invisibility (α = .89). As most variance was accounted for by high internal consistency within sub-scales, it is best practice to consider them individually. The authors reported evidence of convergent validity supported by correlations between all RMAS sub-scales and subscales on a scale of experiences of racism and race-related stressors. Concurrent validity was supported by mean differences on sub-scales between participants of ethnic/racial minority backgrounds and White participants.

Rumination

The Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991) was used to assess participants' tendency to ruminate. The full scale is presented in Appendix A-5. The RRS is a 22-item scale which asks participants how frequently they engage in ruminative cognitions (e.g., "How often do you think: Why do I always react this way?") on a scale of 1 = *never* to 4 = *almost always*. Items are summed and a higher score indicates a

higher tendency to ruminate. Treynor et al. (2003) conducted psychometric analyses of the scale in a sample of 1328 participants and reported very good internal consistency estimates for the entire scale (α = .90) and a test-retest correlation of .67. A factor analyses of the full scale revealed a three factor solution accounting for 55.7% of the total variance (Roberts et al., 1998). The first factor, comprised of seven items, was characterized as Symptom-Based Rumination (α = .81); the second was comprised of five items and labelled Introspection/Self-Isolation (α = .84). Finally, the third factor (α = .71) contained three items and was described as Self-Blame.

Vigilance

The Racism Related Vigilance Scale (RRV), an unpublished measure employed by Clark et al. (2006), was used to assess participants' tendency to anticipate and prepare for instances of racism. The full scale is presented in Appendix A-6. This scale was originally developed through ethnographic research conducted by D. R. Williams, PhD (Clarke et al., 2006), and reflects themes which Black participants expressed when asked about how they prepare for day-to-day experiences of racism. The scale has been employed in its full form, and as a shortened measure in studies of cardiovascular health in youth and adults (Clark et al., 2006; Hicken et al., 2013; Hicken et al., 2014). This measure contains six items, scored from 1 (*Almost Every day*) to 6 (*Never*) assessing the frequency of participants' anticipatory or preparatory cognitions related to experiences of discrimination. That is, participants are asked, *"In dealing with these day-to-day experiences..."* questions such as, "*How often do you feel that you always have to be very careful about your appearance to get good service or avoid being harassed?"* and "*think in advance about the kinds of problems you are likely to experience?* Item responses are reverse scored so that a higher score indicates more

racism-related vigilance. Psychometric analyses in a group of Black adolescents revealed a single factor structure with good internal consistency (α = .85; Clark et al., 2006).

Sleep Quality

Sleep quality over the past month was assessed with the 19-item Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). The full scale is presented in Appendix A-7. The PSQI comprises seven components of sleep quality—duration, sleep efficiency, sleep latency, disturbance, restfulness, daytime dysfunction, and use of sleeping medication. Component scores are summed to create a global sleep quality score, with possible scores ranging from 0-21. Higher scores indicate more poor global sleep quality; scores greater than 5 are considered indicative of clinically significant poor sleep. Initial psychometric analyses of the scale indicated good internal consistency (α = .83) and a test-retest correlation of r = .82.

Pandemic Stress

The Pandemic Stress Questionnaire (PSQ; Kujawa et al., 2020) was used to assess the impact of the COVID-19 pandemic on participant wellbeing. The full scale is presented in Appendix A-8. The PSQ is a 25-item measure that assesses exposure to stressful events related to the pandemic in six domains: general life disruption, interpersonal, financial, education/professional goals, health-self, and health-others. For example, an item on the general disruption sub-scale is "I had to move unexpectedly because of the coronavirus pandemic." Items are rated as "yes" or "no"; those items that are endorsed are then rated in terms of how severely (i.e., negative impact, frequency, and duration) they have impacted the respondent, from 1 = *not at all bad* to 5 = *extremely bad.* A total events score is derived by summing across measures within subscales, ranging from 0 to 25. To calculate the severity

score, those items that were denied or that were endorsed with a severity of 1 (*not at all bad*) are scored as 0. Items scored 2 are re-coded 1, those scored 3 are recoded 2, a score of 4 is recoded as 3 and a score of is recoded as 4. These recoded values are then summed to calculate a severity score, ranging from 0 to 100. Using a sample of young adults (aged 18-25; $N = 450$; 13:3% Black/African American), scale developers reported evidence of internal consistency, convergent validity, and test-retest reliability. The total events and severity scales both had acceptable Cronbach's alphas (.72 and .79, respectively). The total events ($r = .78$) and severity ($r = .82$) scales had high test-retest reliability, and convergent validity was supported by correlations with a measure of perceived stress.

Reactions to Police/State Violence

An open-ended item assessed participants' perspectives on public reports of police and state violence against Black people: "How has exposure to state/police violence against Black people (through social media, news, conversations with others, etc.) affected you? This may include whether police are charged or indicted following a shooting."

Reactions to Activism and Social Justice Demonstrations

An open-ended item was used to assess participants' reactions to demonstrations of social justice activism: "How have recent social justice activism and protests affected you?"

Data Analysis Plan

Descriptive statistics were run using SPSS 26.0 (IBM Corp, 2019). Using several steps, I screened data for completeness and assumptions prior to hypothesis testing. First, I ran descriptive statistics to identify incomplete cases, and reviewed response patterns for suspicious cases and study inclusion criteria. Second, I screened the data for assumptions (e.g., linearity, multivariate normality, no or little multicollinearity, no autocorrelation, and

homoscedasticity). To this end, I created histograms and reviewed skew and kurtosis values to evaluate univariate normality and outliers. I then created Mahalanobis distance values and plots of multivariate residuals to evaluate multivariate normality. Third, I conducted correlation analyses and independent samples *t*-tests to identify covariates, screening multiple demographic variables: age, education, income, pandemic stress, sex assigned at birth, employment, and relationship status.

Analyses

Hypotheses 1 through 4 were tested using the PROCESS macro (Hayes, 2018). Specifically, one model used parallel mediation to test hypotheses 1 and 2. That is, rumination was expected to mediate an association between discrimination and sleep quality, while racism-related vigilance was also expected to mediate that association. A second parallel mediation model was used to test hypotheses 3 and 4: rumination was expected to mediate an association between microaggressions and sleep quality, while racism-related vigilance was also expected to mediate that association. The PROCESS macro provides point estimates and confidence interval estimates of direct and indirect effects; evidence of mediation would be found if the 95% CI of the indirect paths estimates in the above models do not cross zero.

As multiple models were estimated, Hochberg's False Discovery Rate (FDR) correction was applied to reduce the risk of Type I error. I conducted this correction following procedures described by Cribbie (2000) to control for FDR. First, all *k* parameters were ranked from largest to smallest *p*. Then, descending from the largest *p*, I calculated an adjusted *p* for the *k* parameter at that rank *I*, using the following formula: $\alpha(I/k)$. If $pI \leq \alpha(I/k)$, then the parameter was declared significant, but if the largest *p* failed to reach the

adjusted significance level, this procedure was repeated until for any I = *k*, k-1, . . . , 1, if pI ≤ α(I/k), whereupon I rejected all parameters associated with pÍ(Í ≤ I).

The FDR correction was conducted separately on overall model parameters, direct and total effect parameters, and indirect effect parameters. The results of the FDR correction for overall model parameters are presented in Appendix B-1. Direct effect parameters are presented in Appendix B-2. To obtain exact significance values for indirect effect parameters, for which the software output only provides confidence intervals, I calculated a critical ratio, then obtained a significance value based on the normal distribution. The FDR correction was then conducted with these significance values (See Appendix B-3).

Positionality Statement

As no social science research is without bias, I seek to explicitly state my positionality and the lens with which I undertook this project. I am a White cis-gendered female of a lower middle-class background. My worldview is informed by personal experiences of growing up in a low-income family and noticing the toll that low social status takes on a person's mental and physical health. As a White person conducting a project that examines experiences of Black Americans, I am an outsider to the population I seek to study, and my perspective is limited by not having lived experiences of racial discrimination and microaggressions. In addition, I am part of the social group situated at the top of a social hierarchy based in racist theories that underlie discrimination and microaggressions experienced by Black Americans and which affords me unearned power and privileges. This facet of my identity not only both prevents me from seeing all relevant aspects of the topic but affects how participants may perceive me.

My theoretical conceptualization of the research question relies on a model that connects experiences as a result of a social status (i.e., discrimination) to health processes (i.e., sleep) through psychological processes (i.e., perseverative cognition), but this model intuitively aligns with my worldview shaped by personal experience. Furthermore, as a clinical psychologist in training, my research lens is heavily focused on individual level factors (e.g., cognition) that affect health, rather that broader societal influences. This approach is apparent in the research question I have explored, and it limits my findings to more clinical applications rather than interventions at broader societal levels.

CHAPTER 4

RESULTS

Descriptive Statistics and Assumptions

Prior to conducting study analyses, data were inspected for accuracy, completeness, and fit with assumptions of multivariate regression analyses, using SPSS 26.0 (IBM Corp, 2019). Two hundred twenty-three participants met inclusion criteria and had complete data (see Appendix B-4 for details). Inspection of histograms and skew and kurtosis values revealed that study variables were roughly normally distributed with no univariate outliers. Mahalanobis distance values and plots of residuals revealed no multivariate outliers. Descriptive statistics for study variable and scale correlation coefficients are summarized in Table 2.

Table 2

Descriptive statistics and correlations for all study variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Poor Sleep Quality	--											
2. Foreigner/Not Belonging	.37**	--										
3. Criminality	.36**	.47**	--									
4. Sexualization	.30**	.49**	.54**	--								
5. Low-Achieving/Undesirable	.29**	.39**	.64**	.55**	--							
6. Invisibility	.38**	.59**	.66**	.57**	.66**	--						
7. Environmental Invalidation	.18**	.36**	.40**	.43**	.50**	.54**	--					
8. Discrimination	.29**	.39**	.57**	.45**	.50**	.58**	.41**	--				
9. Rumination	.45**	.44**	.34**	.31**	.30**	.47**	.24**	.23**	--			
10. Vigilance	.14*	.15*	.28**	.16*	.34**	.33**	.08	.28**	.20**	--		
11. Pandemic Stress	.28**	.32**	.29**	.26**	.20**	.31**	.17*	.25**	.25**	.25**	--	
12. Income	-.15*	.06	.13	-.05	.08	-.03	.06	.01	.02	.00	-.02	--
M	7.53	3.03	5.04	3.01	12.94	8.55	7.35	10.66	50.54	23.16	19.70	5.28
SD	3.83	2.71	3.58	2.83	6.84	6.36	4.06	7.86	14.45	5.97	16.85	2.75
Range	0 – 21	0 – 9	0 – 12	0 – 9	0 – 27	0 – 24	0 – 15	0 – 36	22 – 88	8 – 36	0-95	1-12
Skew	0.50	0.57	0.12	0.54	-0.08	0.32	-0.02	0.05	0.15	-0.40	0.44	2.05
Kurtosis	0.18	-0.79	-1.11	-0.91	-0.79	-0.98	-0.87	0.59	-0.53	-0.44	-0.16	1.34
Coefficient alpha	.87	.81	.86	.85	.87	.90	.78	.78	.93	.82	.88	-

Note ** $p < 0.01$; * $p < .05$; the mean income represented by 5.28 would fall between $40,000 to $60,000 per year; the range includes values from $0 to over $100,000 per year.

Power and Sample Size

Initial power analyses indicated that the sample sizes necessary to detect small and medium effects in R^2 deviation from 0 and R^2 change with .80 and .70 power at four different alpha levels ranged from 44 to 1037. Due to time and financial constraints, this study sought to collect data from 200 participants. G* Power (Faul, 2008) was used to estimate the achieved power. For overall models, post-hoc power was calculated based on an alpha of .05, final sample size of 223, and observed effect sizes of f^2 = .37 to .43, the range observed in overall regression models, with five predictors (X, M1, M2, and two covariates). Overall, results showed that the regression models were fully powered (i.e., >.99). For individual direct effect parameters, power was calculated with three to five predictors, n = 223, alpha = .05, and effect sizes of f^2= 0 to .19, the observed range of effect sizes for direct effects among the seven models. Power for these direct effects ranged from .05 for effects sizes of 0 with three predictors to .99 for effect sizes of .19 with five predictors. For indirect effects, power was calculated with five predictors, n = 223, alpha = .05, and effect sizes f^2= 0 to .023, the observed range of effect sizes for indirect effects among the seven models. Power for these indirect effects ranged from .05 for effects sizes of 0 with five predictors to .36 for effect sizes of .023 with five predictors. In sum, this project achieved a sample size larger than initially planned, which resulted in an achieved power that was sufficient to detect large effects in the overall models, but not adequate to detect small direct or indirect effects.

Comparison to Other Samples

Sleep Quality. The mean score in this sample was 7.53 (*SD*=3.83). In comparison, Hoggard and Hill (2018) reported a mean of 6.98 (*SD*=3.41), Beatty et al. (2011) reported a mean of 7.00 (*SD*=3.50) in the African American sub-set of participants (n = 96), and Mezick

et al. (2008) reported a mean of 7.00 (*SD*=3.60) in the Black participants in their study (*n* = 77). Therefore, the participants in this study had comparable sleep quality reported in similar samples.

Microaggressions. The mean score in this sample on the Foreigner/Not Belonging microaggressions subscale was 3.03 (*SD*=2.71), which is higher than the mean score of 0.48 (0.59) for African American participants (*n* = 149) reported in Torres-Harding et al. (2012) and mean of 1.93 (*SD*=2.52) reported in a multi-racial sample of African Americans (*n* = 135), Hispanic/Latinx Americans, and Asian Americans (O'Keefe et al., 2015). On the Criminality microaggressions subscale the mean score in this sample was 5.05 (*SD*=3.58), while Torres-Harding et al. (2012) reported the mean score of 1.19 (*SD*=0.83) for African American participants (*n* = 149) and O'Keefe et al. (2015) reported a mean of 2.57 (*SD*=3.45) in their sample. On the Sexualization microaggressions subscale, the current sample's mean was 3.01 (*SD*=2.83); in contrast, the mean score was 0.95 (*SD*=0.89) for African American participants (*n* = 149) reported in Torres-Harding et al. (2012) and 1.98 (*SD*=2.48) noted in O'Keefe et al. (2015). On the Low-Achieving/Undesirable microaggressions subscale, the mean for this sample was 12.94 (*SD*=6.84); similarly O'Keefe et al. (2015) reported a mean of 10.57 (*SD*=7.18), but Torres-Harding et al. (2012) reported a mean of 1.68 (*SD*=0.72) for African American participants (*n* = 149). On the Invisibility microaggressions subscale, the mean in this sample was 8.55 (*SD*=6.36), while the mean score was 0.86 (*SD*=0.72) for African American participants (*n* = 149) in Torres-Harding et al. (2012) and 4.07 (*SD*=5.00) in O'Keefe et al. (2015). Finally, on the Environmental Invalidation microaggressions subscale the mean for the current sample was 7.35 (*SD*=4.06), compared to the mean score of 1.27 (*SD*=0.70) for African American participants (*n* = 149) reported in Torres-Harding et

al. (2012) but 7.07 (*SD*=2.52) in (O'Keefe et al., 2015). Overall, participants in this sample tended to report higher microaggressions across all sub-scales than those reported in previous studies.

Discrimination. The mean score in this sample for the frequency scale was 10.66 (*SD*=7.86); in comparison, Krieger et al. (2005) reported a mean of 6.46 (*SD*=8.92) in the sub-sample of African American adults (*n* = 159), suggesting the current sample experienced a comparatively high frequency of discriminatory events.

Rumination. The mean score in this sample was 50.54 (*SD*=14.45); in comparison Guastella and Moulds (2007) reported means of 57.65 (*SD*=7.69) in a high trait ruminator sub-sample (*n* = 59) and 36.75 (*SD*=5.77) in a low trait-ruminator sub-sample (*n* = 55). This suggests the current sample was comparatively high in rumination.

Vigilance. The mean score in this sample was 23.16 (*SD*=5.97)[3], while Clark et al. (2006) reported a mean of 20.0 (*SD*=9.3) in a sample of 153 Black adolescents.

Responses to Open-Ended Question One: Reactions to Police Violence

In total, 157 participants provided responses to the first open-ended question, eliciting reactions to exposure to police/state violence against Black people. I reviewed these responses for terms such as "worry" "sleep" "vigilance" or other related terms relevant to model constructs. In addition to constructs of interest for my quantitative models, I reviewed the responses for three general themes: positive, neutral, and negative. Results are presented in Table 3.

[3] Due to a clerical error, the response options on the Racism-Related Vigilance scale were different than the original scale. In this survey, responses offered were 1 = *almost every day,* 2 = *at least once a day* (while the original scale listed "*at least once a week*"), 3 = *at few times a month*, 4 = a *few times a year*, 5 = *less than once a year*, 6 = *never*. Response options one and two were recoded to reflect the higher frequency of vigilance in the second option, and all items were reverse coded as described in the methodology chapter. Therefore, while higher scores on the RRV still reflect higher levels of vigilance, the total score is not directly comparable to standard administration of the scale.

Table 3
Open-Ended Item 1: Reactions to Police Violence (Total responses = 157)

Response category	*N*	%	Example
Positive	14	8.80%	"It has…a positive effect because they cannot just do anything without thinking that people are watching them. This will put them in check."
Neutral	41	25.80%	"It hasn't affected me."
Negative	103	64.8%	"It has made me very sad and angry because this violence could happen to me or my loved ones."
Mixed	1	0.64%	"… It was difficult to watch all of the videos where people in power abused it, but I was hopeful that these actions being brought to light would be a positive thing over time."
Declined	65	43.04%	N/A
Related to worry, vigilance	27	17.20%	"I have been careful of my surroundings as well as for others of my race. I feel that I have to let someone know my whereabouts at all times in case I come up missing or have an issue with the law."
Related to sleep	1	0.64%	"…it has been one of the major causes of me feeling hopeless, losing sleep, etc [*sic*] in the past year."

Note. Since some participants' responses included both positive and negative themes, the total number of coded themes is not the same as the number of participants who responded.

Responses to Open-Ended Question Two: Reactions to Social Justice Protests

There were 137 participants who provided responses to the second open-ended question, eliciting reactions to recent social justice protests. I reviewed these responses for terms such as "worry" "sleep" "vigilance" or other related terms relevant to model

constructs. Additionally, I categorized the responses into three general themes: positive, neutral, and negative. Results are presented in Table 4.

Table 4
Open-Ended Item 2: Reactions to Social Justice Protests (Total responses = 137)

Response category	*N*	%	Example
Positive	56	40.88%	"This makes me happy that people have come together to fight on the behalf of African Americans who are wrongly prejudiced against. It inspires me and provides me with hope for the future."
Neutral	55	40.15%	"I do not think recent social justice activism and protests have affected me all that much."
Negative	32	23.36%	"I feel like protesting gets no positive results or reinforcements. After we protest, I feel as if things gets [*sic*] worse."
Mixed	6	4.40%	"They give me hope but they also drain me of hope at the same time. We shouldn't still be protesting the same thing our grandparents and parents protested decades ago."
Declined	87	63.50%	N/A
Related to worry, vigilance	5	3.65%	"It's scary to look at the state of the world and my country, makes my anxiety worse."
Related to sleep	0	0.00%	N/A

Note. Since some participants' responses included both positive and negative themes, the total number of coded themes is not the same as the number of participants who responded.

Covariates

I examined potential covariates coded as continuous variables—age, education, income, pandemic stress—with correlation analyses (Table 5). Results showed that pandemic stress and income were significantly related to poor sleep quality. Therefore, these two variables were entered as covariates in the models estimated.

Table 5.
Correlations for control variables.

	1	2	3	4	5
1. Poor Sleep Quality	--				
2. Age	-.08	--			
3. Education	-.02	.21**	--		
4. Income	-.15*	.22*	.34**	--	
5. Pandemic Stress	.28**	-.01	.21**	-.02	--

Note ** $p < .01$; * $p < .05$.

I also conducted *t*-tests to examine potential covariates with dichotomous variables: sex assigned at birth[4], employment, and relationship status (Table 6). However, none of these significantly differed by sleep quality. Therefore, none was used as a covariate in the models estimated.

[4] Although participants provided both sex assigned and birth and current gender identity, most participants reported a gender identity concordant with their sex assigned at birth. Due to the low prevalence of discordant gender identity (3 participants), it was not possible to evaluate differences between these participants and those with concordant gender identities. Likewise, due to the low number of participants identifying as non-binary, groupwise comparisons were not possible.

Table 6.
Results of t-tests for sleep quality by sex, employment, and relationship status

	Sex									
	Female			Male			95% CI for Mean Difference	*t*	*p*	*df*
	M	*SD*	*n*	*M*	*SD*	*n*				
Poor Sleep Quality	7.67	4.05	104	7.41	2.65	118	-0.75, 1.28	0.51	.61	221
	Employment									
	Employed			Not Employed			95% CI for Mean Difference	*t*	*p*	*df*
	M	*SD*	*n*	*M*	*SD*	*n*				
Poor Sleep Quality	7.58	3.81	208	6.93	4.20	15	-1.38, 2.67	0.63	.53	221
	Relationship Status									
	Partnered			Not Partnered			95% CI for Mean Difference	*t*	*p*	*df*
	M	*SD*	*n*	*M*	*SD*	*n*				
Poor Sleep Quality	7.56	3.73	137	7.48	4.02	86	-0.97, -0.99	0.14	.45	221

Hypothesized Models

Hypotheses One and Two

One model tested hypotheses one and two—that rumination and racism-related vigilance would mediate the association between discrimination and poor sleep quality. That is, I predicted that discrimination would be positively associated with rumination and racism-related vigilance, both of which in turn would be positively associated with poor sleep quality. Parameters for pathways through both mediators were estimated in Model 1 (Tables 7 and 8; Figure 6). Significant parameters after the FDR correction are bolded.

Table 7. *Model 1: Coefficients of Discrimination on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* *(df = 219)*	*p*
X (discrimination) →*M₁* (rumination)	**a_1**	**0.29**	**0.14**	**0.02, 0.55**	**2.12**	**.04**
$F(3, 216) = 6.26$, $p = .0004$, $R^2 = .08$						
X (discrimination) →*M₂* (racism-related vigilance)	**a_2**	**0.19**	**0.05**	**0.08, 0.30**	**3.44**	**.0007**
$F(3, 216) = 8.42$ $p < .0001$, $R^2 = .10$						
X (discrimination) → *Y* (poor sleep quality)	**c'**	**0.08**	**0.03**	**0.01, 0.14**	**2.32**	**.02**
M₁ (rumination) → *Y* (poor sleep quality)	**b_1**	**0.10**	**0.03**	**0.07, 0.14**	**6.51**	**<.0001**
M₂ (racism-related vigilance) → *Y* (poor sleep quality)	b_2	0.00	0.04	-0.08, 0.08	0.03	.98
$F(5, 214) = 16.80$ $p < .0001$, $R^2 = .28$						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 8. *Model 1: Total and Indirect Effects of Discrimination on Poor Sleep Quality*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t* *(df = 219)*	*p*
Total effect	**0.11**	**0.03**	**0.04, 0.17**	**.22**	**3.07**	**.002**
	Unstandardized Coeff	*SE*	95% CI	Standardized *ß*	*SE*	95% CI
Total indirect effect	0.03	0.02	0.00, 0.07	.06	0.03	0.00, 0.13
Through rumination	0.03	0.02	0.00, 0.07	.06	0.03	0.00, 0.13
Through racism-related vigilance	0.00	0.00	-0.02, 0.02	.00	0.02	-0.03, 0.04

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

The overall model was significant. Path a_1, estimating the relationship between discrimination and rumination was significant, as well as Path a_2, estimating the relationship between discrimination and racism-related vigilance. In addition, Path b_1, estimating the path from rumination to poor sleep quality was significant. Path b_2, however, was not significant. Furthermore, path *c'*, the relationship of discrimination to poor sleep quality after controlling for paths through rumination and racism-related vigilance, remained significant. The total effect of the model was significant, but no indirect effects were significant. Therefore, hypotheses one and two were not supported.

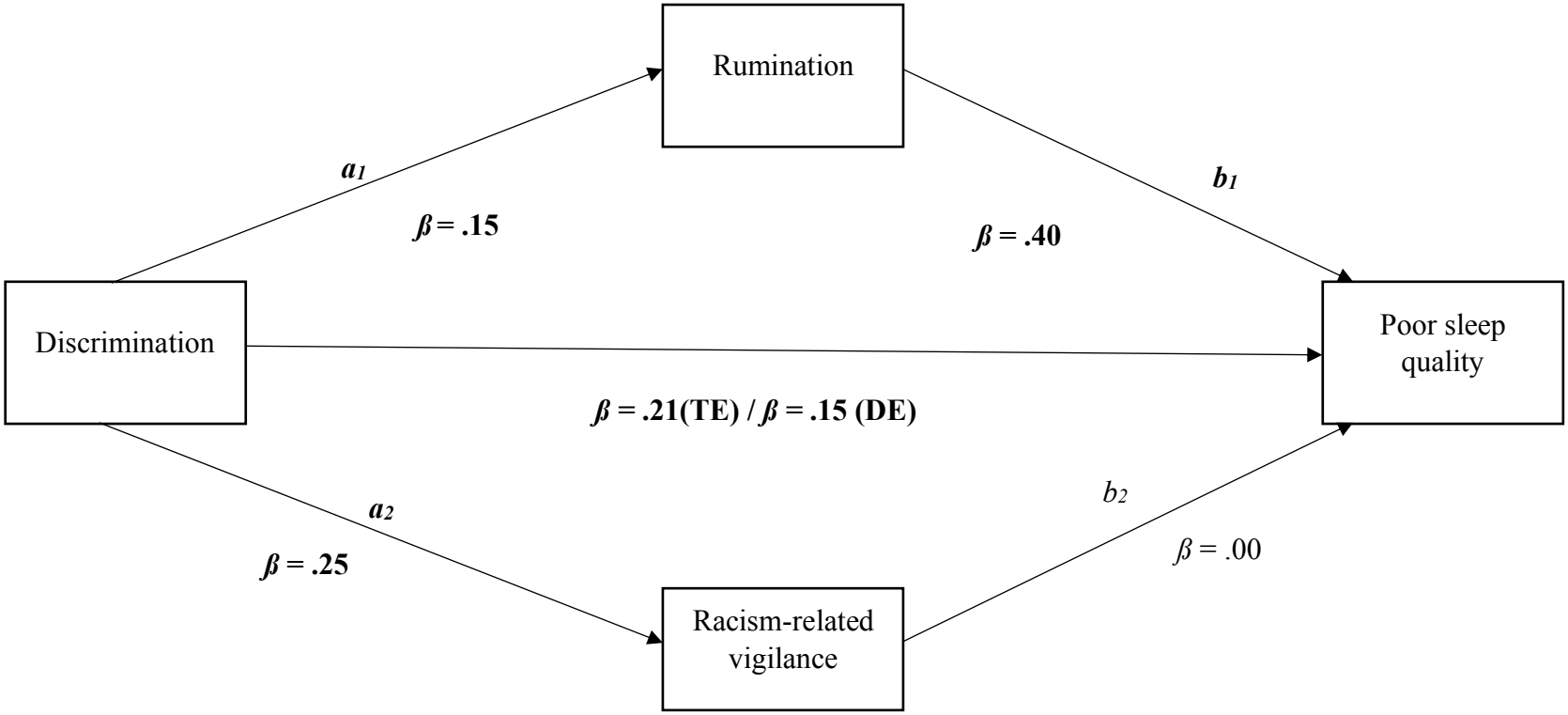


Figure 6. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of discrimination onpoor sleep quality; standardized beta-coefficients for the effects of each path are included (β = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

Hypotheses 3 and 4

Hypotheses three and four predicted that both rumination and racism-related vigilance would mediate the association between microaggressions and poor sleep quality. That is, I predicted that microaggressions would be positively associated with rumination and racism-related vigilance, both of which in turn would be positively associated with poor sleep quality. As microaggressions are not a unitary construct, six separate models were run to estimate relationships between six subscales of the RMAS (Torres-Harding et al., 2012) and poor sleep quality. As above, significant parameters after the FDR correction are bolded.

Model 2: Foreigner/Not Belonging Microaggressions Subscale on Poor Sleep Quality.

Model 2 tested a parallel mediation of the Foreigner/Not Belonging subscale through rumination and racism-related vigilance to poor sleep quality (Tables 9 & 10; Figure 7). The overall model was significant. Path a_1, from Foreigner/Not Belonging to rumination, was significant and there was a significant relationship between rumination and poor sleep quality (path b_1). On the other hand, paths a_2 and b_2, from Foreigner/Not Belonging to rumination and from rumination to poor sleep quality were not significant. Path *c'*, the relationship of Foreigner/Not Belonging to poor sleep quality after controlling for paths through rumination and racism-related vigilance, remained significant. The total effect was significant as well as the total indirect effect; the indirect effect through rumination was significant, but not the indirect effect through racism-related vigilance.

Table 9. *Model 2: Coefficients of Foreigner/Not Belonging Microaggressions Subscale on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* (*df* = 219)	*p*
X (Foreigner/Not Belonging) →*M*$_1$ (rumination)	**a_1**	**2.16**	**0.34**	**1.49,2.84**	**6.30**	**<.0001**
***F*(3, 216) = 18.76, *p* < .0001, R^2 = .21**						
X (Foreigner/Not Belonging) →*M*$_2$ (racism-related vigilance)	a_2	0.18	0.15	-0.12, 0.48	1.17	.24
***F*(3, 216) = 4.73, *p* = .003, R^2 = .06**						
X (Foreigner/Not Belonging) → *Y* (poor sleep quality)	**c'**	**0.30**	**0.09**	**0.12, 0.48**	**3.22**	**.002**
M$_1$ (rumination) → *Y* (poor sleep quality)	**b_1**	**0.09**	**0.02**	**0.05, 0.12**	**5.10**	**<.0001**
M$_2$ (racism-related vigilance) → *Y* (poor sleep quality)	b_2	0.02	0.01	-0.06, 0.09	0.47	.65
***F*(5, 214) = 18.16, *p* < .0001, R^2 = .30**						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 10. *Model 2: Total and Indirect Effects of Foreigner/Not Belonging Microaggressions Subscale on Poor Sleep Quality*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t* (*df* = 219)	*p*
Total effect	**0.49**	**0.09**	**0.31, 0.76**	**.35**	**5.44**	**<.0001**
	Unstandardized Coeff	*SE*	95% CI	Standardized *ß*	*SE*	95% CI
Total indirect effect	**0.19**	**0.05**	**0.12, 0.29**	**.14**	**0.03**	**0.08, 0.20**
Through rumination	**0.19**	**0.05**	**0.11, 0.29**	**.13**	**0.03**	**0.08, 0.20**
Through racism-related vigilance	0.00	0.01	-0.01, 0.03	.01	0.01	-0.01, 0.02

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

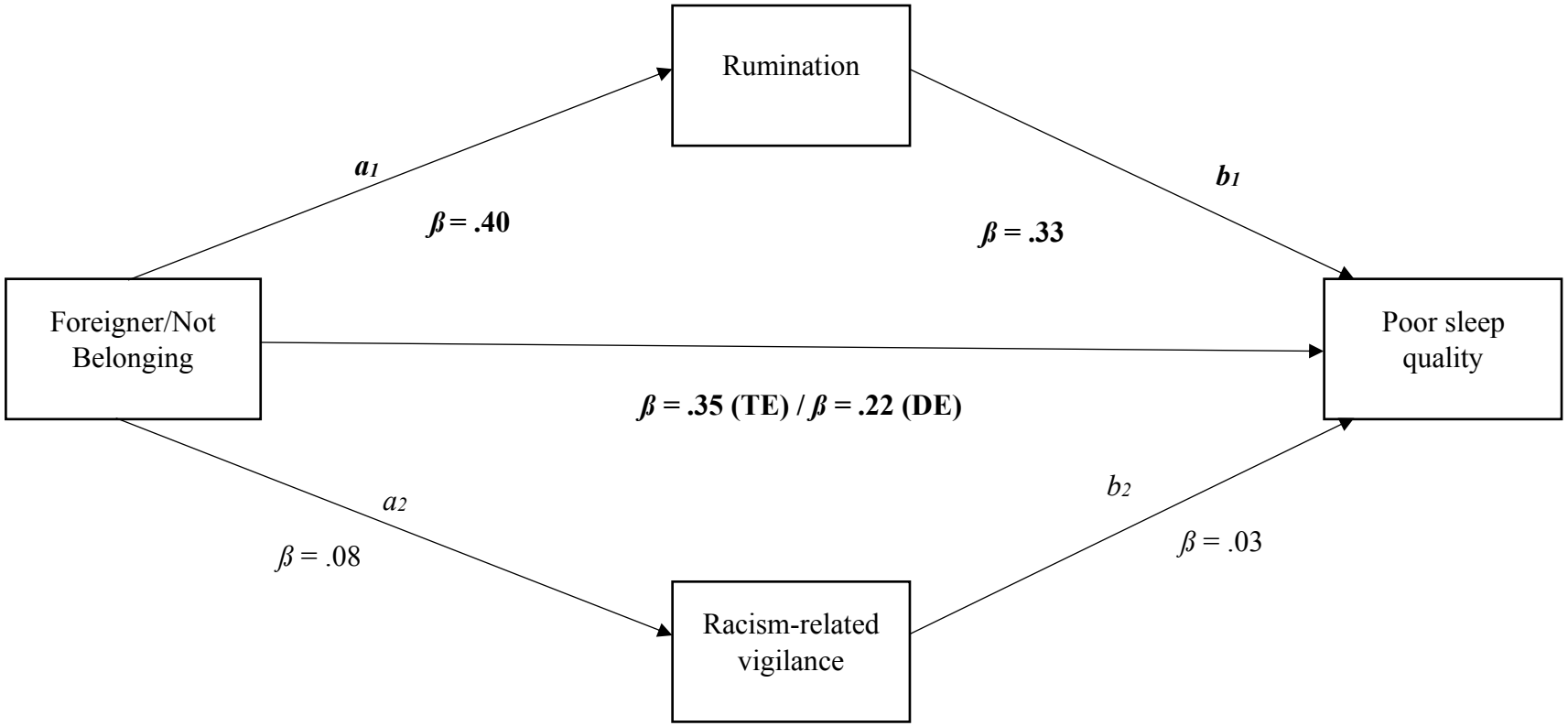


Figure 7. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of Foreigner/Not Belonging microaggressions subscale on poor sleep quality; beta-coefficients for the effects of each path are included (β = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

Model 3: Criminality Microaggressions Subscale on Poor Sleep Quality.

Model 3 tested a parallel mediation of the Criminality subscale through rumination and racism-related vigilance to poor sleep quality (Tables 11 & 12; Figure 8). The overall model was significant. Additionally, path a_1, from Criminality to rumination and path a_2, from Criminality to racism-related vigilance were significant. Furthermore, path b_1, from rumination to poor sleep quality was significant. However, path b_2, from racism-related vigilance to poor sleep quality was not significant. Path *c'*, the relationship of Criminality to poor sleep quality after controlling for paths through rumination and racism-related vigilance, remained significant. The total effect was significant as well as the total indirect effect; the indirect effect through rumination was significant, but not the indirect effect through racism-related vigilance.

Table 11. *Model 3: Coefficients of Criminality Microaggressions Subscale on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* (*df = 219)*	*p*
X (Criminality) →M_1 (rumination)	a_1	**1.18**	**0.27**	**0.65, 1.70**	**4.42**	**<.0001**
$F(3, 216) = 11.60$, $p < .0001$, $R^2 = .1$4						
X (Criminality) →M_2 (racism-related vigilance)	a_2	**0.39**	**0.11**	**0.17, 0.61**	**3.46**	**.0006**
$F(3, 216) = 8.48$, $p < .0001$, $R^2 = .10$						
X (Criminality) → *Y* (poor sleep quality)	c'	**0.22**	**0.07**	**0.08, 0.35**	**3.17**	**.0018**
M_1 (rumination) → *Y* (poor sleep quality)	b_1	**0.09**	**0.02**	**0.06, 0.13**	**5.80**	**<.0001**
sM_2 (racism-related vigilance) → *Y* (poor sleep quality)	b_2	-0.00	0.04	-0.08, 0.07	-0.10	.92
$F(5, 214) = 18.07$, $p < .0001$, $R^2 = .30$						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 12. *Model 3: Total and Indirect Effects of Criminality Microaggressions Subscale on Poor Sleep Quality*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t* *(df = 219)*	*p*
Total effect	**0.33**	**0.07**	**0.19, 0.46**	**.31**	**4.76**	**<.0001**
	Unstandardized Coeff	*SE*	95% CI	Standardized *ß*	*SE*	95% CI
Total indirect effect	**0.11**	**0.03**	**0.05, 0.18**	**.10**	**0.03**	**0.05, 0.17**
Through rumination	**0.11**	**0.03**	**0.05, 0.19**	**.11**	**0.03**	**0.05, 0.17**
Through racism-related vigilance	-0.00	0.02	-0.03, 0.03	-.00	0.02	-0.03 0.03

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

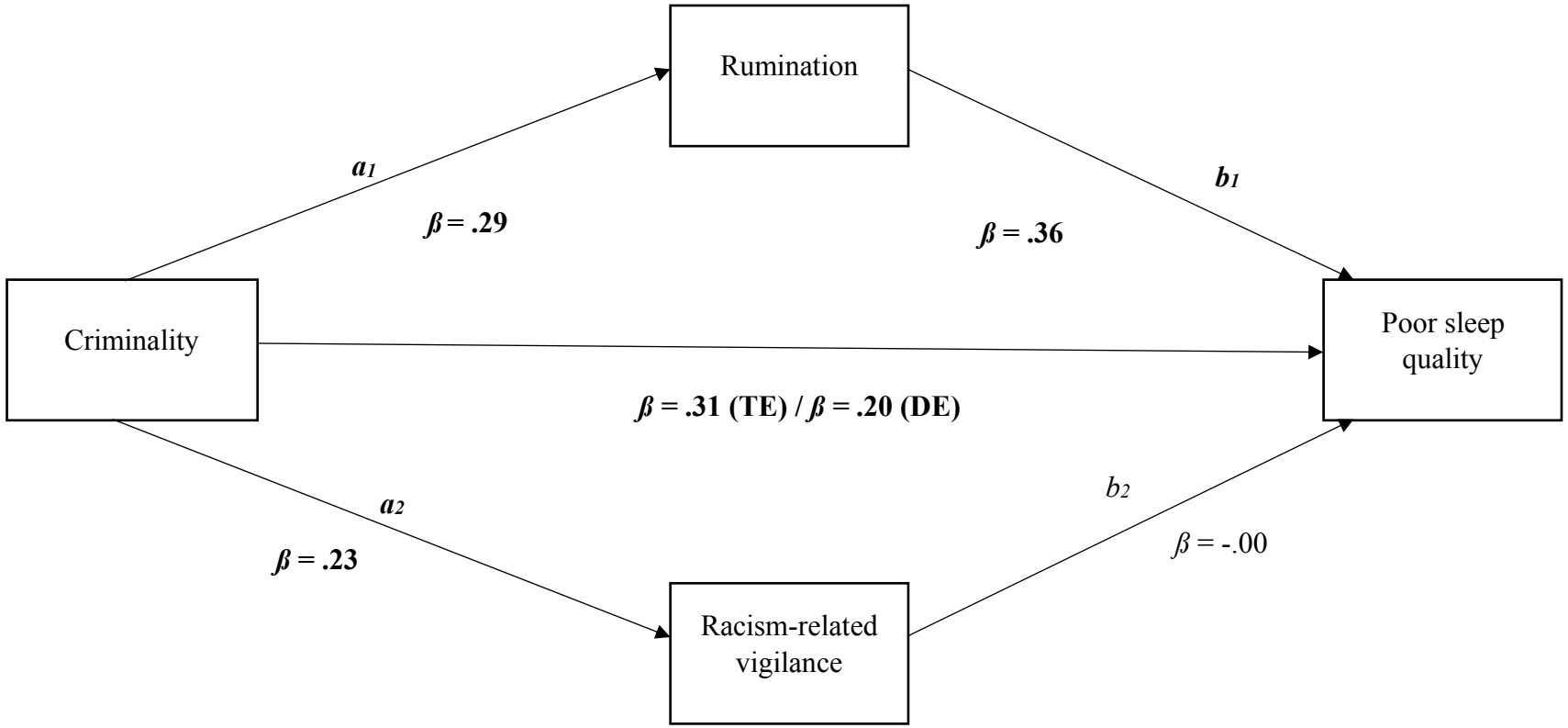


Figure 8. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of Criminality microaggressions subscale on poor sleep quality; beta-coefficients for the effects of each path are included (*ß* = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

Model 4: Sexualization Microaggressions Subscale on Poor Sleep Quality.

Model 4 tested a parallel mediation of the Sexualization subscale through rumination and racism-related vigilance to poor sleep quality (Tables 13 & 14; Figure 9). The overall model was significant. In addition, path a_1, from Sexualization to rumination, was significant and there was a significant relationship between rumination and poor sleep quality (path b_1). However, paths a_2 and b_2, from Sexualization to racism-related vigilance and from racism-related vigilance to poor sleep quality were not significant. Finally, path *c'*, the relationship of Sexualization to poor sleep quality after controlling for paths through rumination and racism-related vigilance, remained significant. The total effect was significant as well as the total indirect effect; the indirect effect through rumination was significant, but not the indirect effect through racism-related vigilance.

Table 13. *Model 4: Coefficients of Sexualization Microaggressions Subscale on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* *(df = 219)*	*p*
X (Sexualization) →M_1 (rumination)	**a_1**	**1.38**	**0.33**	**0.72, 2.04**	**4.12**	**.0001**
$F(3, 216) = 10.70$ $p < .0001$, $R^2 = .13$						
X (Sexualization) →M_2 (racism-related vigilance)	a_2	0.25	0.14	-0.03,0.53	1.76	.08
$F(3, 216) = 5.34$, $p = .0014$, $R^2 = .07$						
X (Sexualization) → *Y* (poor sleep quality)	**c'**	**0.21**	**0.08**	**0.04, 0.37**	**2.48**	**.014**
M_1 (rumination) → *Y* (poor sleep quality)	**b_1**	**0.10**	**0.02**	**0.07, 0.13**	**5.96**	**<.0001**
M_2 (racism-related vigilance) → *Y* (poor sleep quality)	b_2	0.01	0.04	-0.06, 0.09	0.32	.74
$F(5, 214) = 16.92$, $p < .0001$, $R^2 = .28$						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 14. *Model 4: Total and Indirect Effects of Sexualization Microaggressions Subscale on Poor Sleep Quality*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t* *(df = 219)*	*p*
Total effect	**0.35**	**0.09**	**0.18, 0.52**	**.25**	**3.87**	**.0001**
	Unstandardized Coeff	*SE*	95% CI	Standardized *ß*	*SE*	95% CI
Total indirect effect	**0.14**	**0.05**	**0.07, 0.24**	**.10**	**0.03**	**0.05, 0.17**
Through rumination	**0.14**	**0.05**	**0.06, 0.24**	**.10**	**0.03**	**0.05, 0.17**
Through racism-related vigilance	0.00	0.01	-0.02, 0.04	.00	0.01	-0.01, 0.03

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

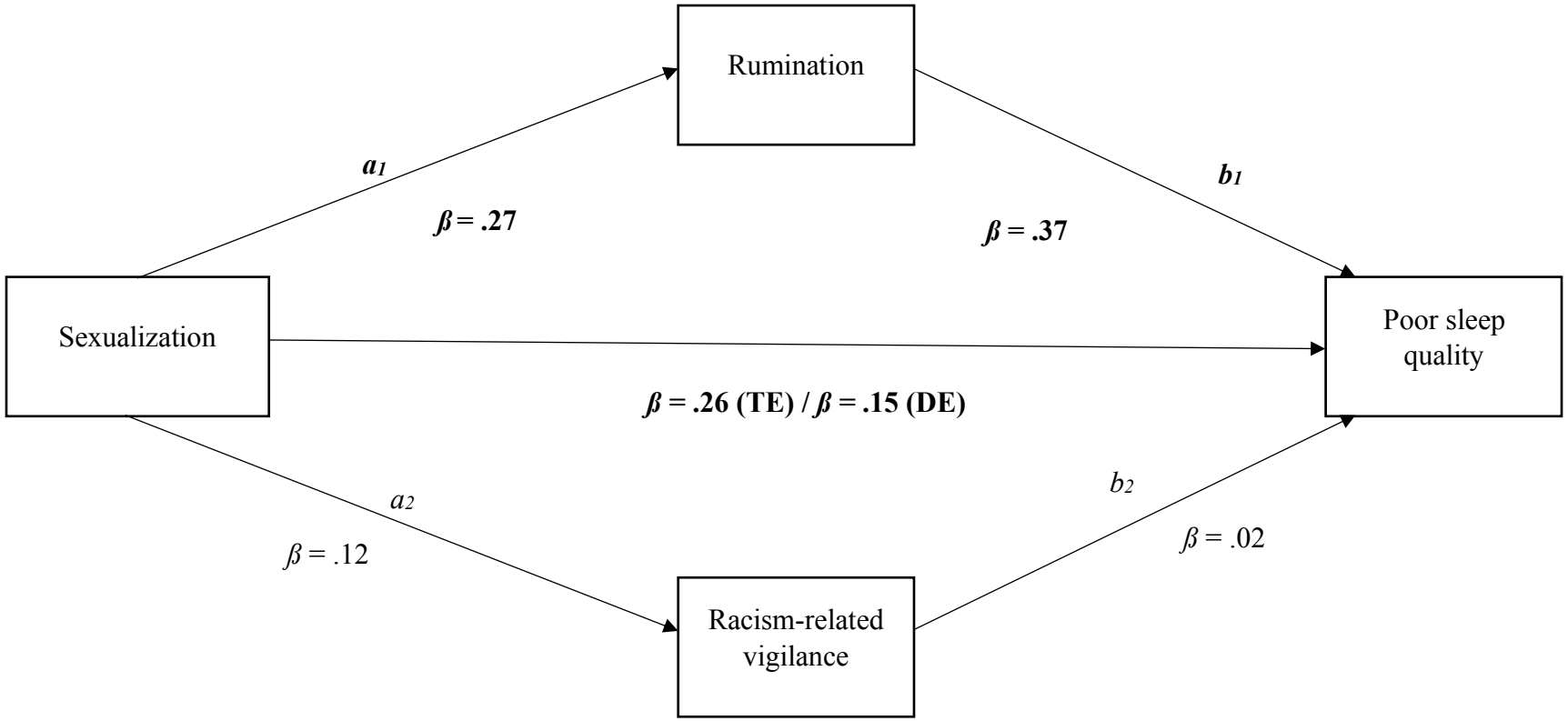


Figure 9. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of Sexualization microaggressions subscale on poor sleep quality; beta-coefficients for the effects of each path are included (β = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

Model 5: Low-Achieving/Undesirable Microaggressions Subscale on Poor Sleep Quality.

Model 5 tested a parallel mediation of the Low-Achieving/Undesirable microaggressions subscale through rumination and racism-related vigilance to poor sleep quality (Tables 15 & 16; Figure 10). The overall model was significant. Furthermore, path a_1, from Low-Achieving/Undesirable to rumination, was significant and there was a significant relationship between rumination and poor sleep quality (path b_1). In addition, path a_2 Low-Achieving/Undesirable to racism-related vigilance was significant, but path b_2, from racism-related vigilance to poor sleep quality, was not significant. Furthermore, path *c'*, the relationship of Low-Achieving/Undesirable to poor sleep quality after controlling for paths through rumination and racism-related vigilance, was not significant. The total effect was significant as well as the total indirect effect; the indirect effect through rumination was significant, but not the indirect effect through racism-related vigilance.

Table 15. *Model 5: Coefficients of Low-Achieving/Undesirable Microaggressions Subscale on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* (*df* = 219)	*p*
X (Low-Achieving/Undesirable) →M_1 (rumination)	**a_1**	**0.56**	**0.14**	**0.29, 0.83**	**4.08**	**.0001**
$F(3, 216) = 10.58$ $p < .0001$, $R^2 = .13$						
X (Low-Achieving/Undesirable) →M_2 (racism-related vigilance)	**a_2**	**0.27**	**0.06**	**0.16, 0.38**	**4.85**	**<.0001**
$F(3, 216) = 12.58$, $p < .0001$, $R^2 = .15$						
X (Low-Achieving/Undesirable) → *Y* (poor sleep quality)	**c'**	**0.08**	**0.04**	**0.01, 0.15**	**2.34**	**.02**
M_1 (rumination) → *Y* (poor sleep quality)	**b_1**	**0.10**	**0.02**	**0.07, 0.13**	**6.07**	**<.0001**
M_2 (racism-related vigilance) → *Y* (poor sleep quality)	b_2	-0.01	0.04	-0.09, 0.07	-0.16	.86
$F(5, 214) = 16.92$, $p < .0001$, $R^2 = .28$						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 16. *Model 5: Total and Indirect Effects of Low-Achieving/Undesirable Microaggressions Subscale on Poor Sleep Quality.*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t* (*df* = 219)	*p*
Total effect	**0.14**	**0.04**	**0.07, 0.21**	**.25**	**3.87**	**.0001**
	Unstandardized Coeff	*SE*	95% CI	Standardized *ß*	*SE*	95% CI
Total indirect effect	**0.05**	**0.02**	**0.02, 0.09**	**.10**	**0.03**	**0.03, 0.17**
Through rumination	**0.06**	**0.02**	**0.02, 0.09**	**.10**	**0.03**	**0.05, 0.16**
Through racism-related vigilance	-0.00	0.01	-0.02, 0.03	-.00	0.02	-0.04, 0.05

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

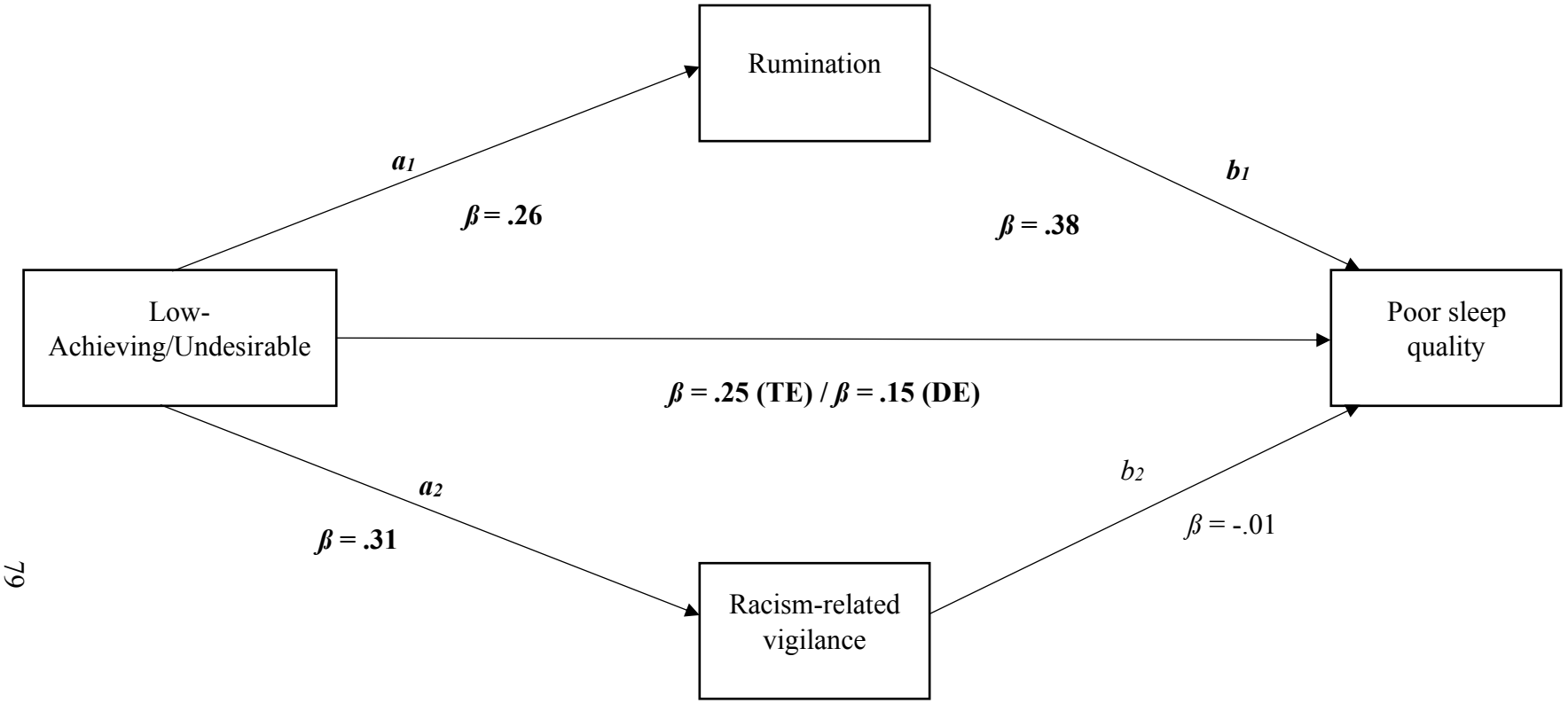


Figure 10. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of Low-Achieving/Undesirable microaggressions subscale on poor sleep quality; beta-coefficients for the effects of each path are included (*ß* = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

Model 6: Invisibility Microaggressions Subscale on Poor Sleep Quality.

Model 6 tested a parallel mediation of the Invisibility subscale through rumination and racism-related vigilance to poor sleep quality (Tables 17 & 18; Figure 11). The overall model was significant. Furthermore, path a_1, from Invisibility to rumination, was significant and there was a significant relationship between rumination and poor sleep quality (path b_1). Path a_2, from Invisibility to racism-related vigilance was significant, but not path b_2, from racism-related vigilance to poor sleep quality. Finally, path *c'*, the relationship of Invisibility to poor sleep quality after controlling for paths through rumination and racism-related vigilance, remained significant. The total effect was significant as well as the total indirect effect; the indirect effect through rumination was significant, but not the indirect effect through racism-related vigilance.

Table 17. *Model 6: Coefficients of Invisibility Microaggressions Subscale on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* (*df* = 219)	*p*
X (Invisibility) →M_1 (rumination)	**a_1**	**0.99**	**.14**	**0.70, 1.27**	**6.86**	**<.0001**
$F(3, 216) = 21.38$ $p < .0001$, $R^2 = .23$						
X (Invisibility) →M_2 (racism-related vigilance)	**a_2**	**0.28**	**0.06**	**0.16, 0.40**	**4.46**	**<.0001**
F **$F(3, 216) = 11.25$, $p < .0001$, $R^2 = .14$**						
X (Invisibility) → *Y* (poor sleep quality)	**c'**	**0.11**	**0.04**	**0.03, 0.19**	**2.59**	**.01**
M_1 (rumination) → *Y* (poor sleep quality)	**b_1**	**0.09**	**0.02**	**0.06, 0.12**	**5.22**	**<.0001**
M_2 (racism-related vigilance) → *Y* (poor sleep quality)	b_2	-0.01	0.04	-0.08, 0.07	-0.14	.88
$F(5, 214) = 17.16$, $p < .0001$, $R^2 = .29$						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 18. *Model 6: Total and Indirect Effects of Invisibility Microaggressions Subscale on Poor Sleep Quality.*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t (df = 219)*	*p*
Total effect	**0.20**	**.04**	**0.12, 0.27**	**.33**	**5.06**	**<.0001**
	Unstandardized Coeff	*SE*	95% CI	Standardized *β*	*SE*	95% CI
Total indirect effect	**0.09**	**.02**	**0.05, 0.14**	**.15**	**0.04**	**0.08, 0.22**
Through rumination	**0.09**	**0.02**	**0.05, 0.14**	**.15**	**0.04**	**0.08, 0.23**
Through racism-related vigilance	-0.00	0.01	-0.02, 0.03	-.00	0.02	-0.04, -.04

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

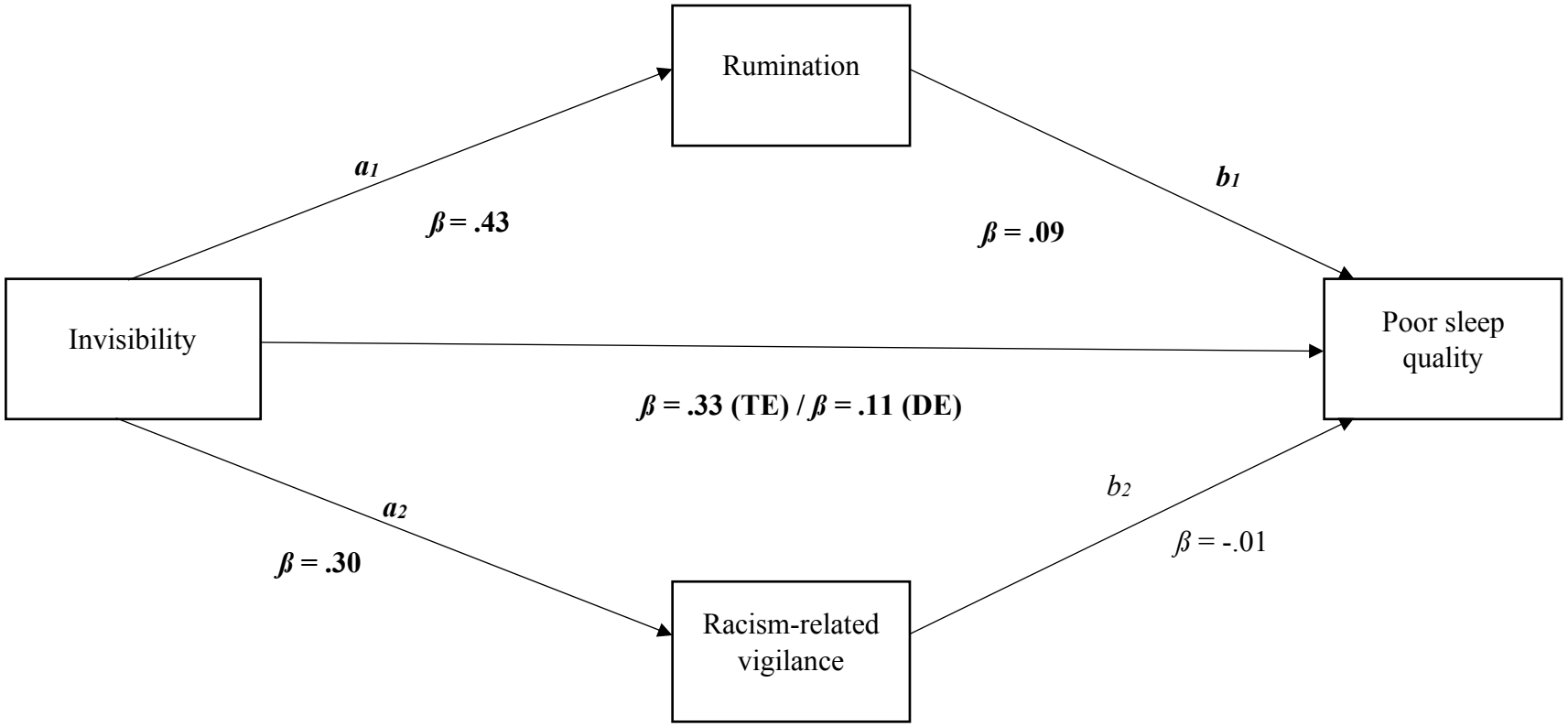


Figure 11. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of Invisibility microaggressions subscale on poor sleep quality; beta-coefficients for the effects of each path are included (β = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

Model 7: Environmental Invalidations Microaggressions Subscale on Poor Sleep Quality.

Model 7 tested a parallel mediation of the Environmental Invalidations subscale through rumination and racism-related vigilance to poor sleep quality (Tables 19 & 20; Figure 12). The overall model was significant. Furthermore, path a_1, from Environmental Invalidations to rumination, was significant and there was a significant relationship between rumination and poor sleep quality (path b_1). However, paths a_2 and b_2, from Environmental Invalidations to racism-related vigilance and from racism-related vigilance to poor sleep quality were not significant. Finally, path *c'*, the relationship of Environmental Invalidations to poor sleep quality after controlling for paths through rumination and racism-related vigilance, was not significant. The total effect was not significant. The total indirect effect, however, and the indirect effect through rumination were significant, but not the indirect effect through racism-related vigilance.

Table 19. *Model 7: Coefficients of Environmental Invalidations Microaggressions Subscale on Poor Sleep Quality.*

Antecedent → Consequent	Path	*b*	*SE*	95% CI	*t* (*df* = 219)	*p*
X (Environmental Invalidations) → M_1 (rumination)	**a_1**	**0.73**	**.23**	**0.27, 1.19**	**3.13**	**.0001**
$F(3, 216) = 8.14$, $p < .0001$, $R^2 = .10$						
X (Environmental Invalidations) → M_2 (racism-related vigilance)	a_2	0.08	0.10	-0.11, 0.04	1.10	0.27
$F(3, 216) = 4.48$, $p = .005$, $R^2 = .06$						
X (Environmental Invalidations) → *Y* (poor sleep quality)	c'	0.05	0.06	-0.06, 0.16	0.90	.37
M_1 (rumination) → *Y* (poor sleep quality)	**b_1**	**0.11**	**.02**	**0.07, 0.14**	**6.42**	**<.0001**
M_2 (racism-related vigilance) → *Y* (poor sleep quality)	b_2	0.02	0.04	-0.06, 0.10	0.50	.62
$F(5, 214) = 15.56$, $p < .0001$, $R^2 = .27$						

Note. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied. Results reflect outcomes after controlling for pandemic stress and annual income.

Table 20. *Model 7: Total and Indirect Effects of Environmental Invalidations Microaggressions Subscale on Poor Sleep Quality.*

	Unstandardized Coeff	*SE*	95% CI	Standardized total effect	*t* (*df* = 219)	*p*
Total effect	0.13	0.06	0.01, 0.25	.14	2.14	.03
	Unstandardized Coeff	*SE*	95% CI	Standardized *ß*	*SE*	95% CI
Total indirect effect	**0.08**	**0.03**	**0.03, 0.14**	**0.08**	**0.03**	**0.03, 0.15**
Through rumination	**0.08**	**0.03**	**0.03, 0.14**	**0.08**	**0.03**	**0.03, 0.15**
Through racism-related vigilance	0.00	0.01	-0.01, 0.02	0.00	0.01	-0.01 0.02

Note. Indirect effects are calculated based on bootstrapped samples of 5000. Parameters in **bold** font are significant with the Hochberg's False Discovery Rate correction applied.

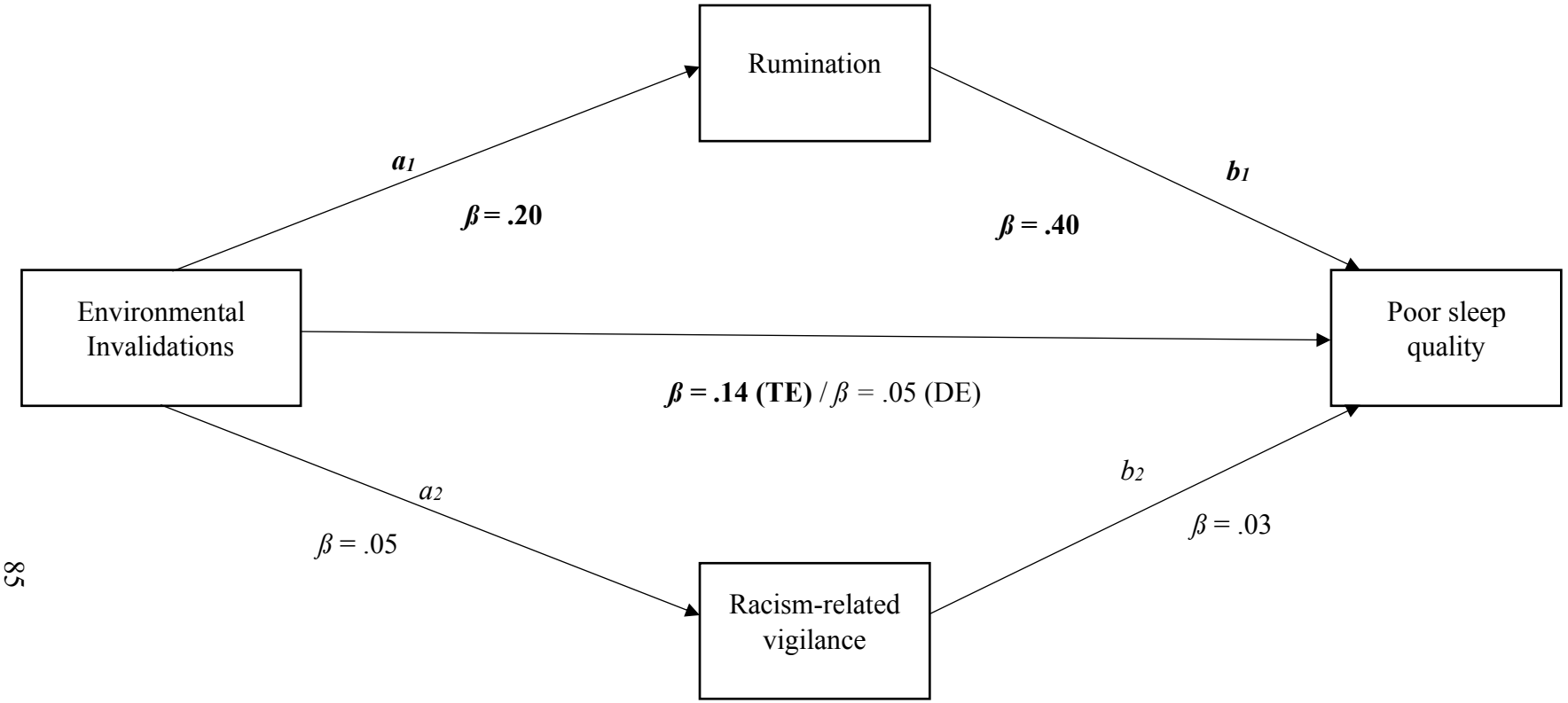


Figure 12. Diagram for the parallel mediator model including the total effect (TE) and direct effect (DE) of Environmental Invalidations microaggressions subscale on poor sleep quality; beta-coefficients for the effects of each path are included (β = standardized coefficient). Income and pandemic stress were included in model as covariates but not depicted in diagram.

In sum, results from models 2 through 7 partially support hypothesis 3; across all microaggression subscales, rumination partially mediated relationships between the experience of microaggressions and poor sleep quality. That is, each microaggression sub-scale was positively related to rumination, and in turn, rumination was positively related to poor sleep quality; in each model, the indirect effect of microaggressions on poor sleep quality through rumination was significant, while the direct relationship from each microaggressions subscale to poor sleep quality also remained significant. However, hypothesis 4 was not supported, as racism-related vigilance did not mediate relationships between microaggressions and poor sleep quality. While some microaggression sub-scales were positively related to racism-related vigilance, racism-related vigilance was not associated with poor sleep quality and no indirect effects through racism-related vigilance were significant.

CHAPTER 5
DISCUSSION

Using Myers' (2009) meta model as a theoretical framework, this dissertation investigated the relationships between experiences of race-specific stress (e.g., discrimination and microaggressions), perseverative cognition, and poor sleep quality. Hypotheses were based on a large body of literature demonstrating a link between discrimination, one form of race-specific stress, and poor sleep quality, as well as findings linking rumination and worry, another kind of perseverative cognition, to poor sleep quality. Furthermore, studies have suggested that worry and rumination mediate the relationship between discrimination and poor sleep quality (e.g., Hoggard & Hill, 2018). Based on this evidence, I hypothesized that rumination and racism-related vigilance would mediate the link between discrimination and poor sleep quality in Black Americans. Additionally, I hypothesized that rumination and racism-related vigilance would mediate a relationship between microaggressions, another form race-specific stress, and poor sleep quality.

Therefore, I conducted parallel mediation models to test whether rumination and racism-related vigilance mediate the relationship between experiences of discrimination and poor sleep quality, as well as models to test whether rumination and racism-related vigilance mediate relationships between six different subscales of microaggressions (Foreigner/Not Belonging, Criminality, Sexualization, Low-Achieving/Undesirable, Invisibility, and Environmental Invalidations) and poor sleep quality. Results were mixed. Contrary to my predictions, neither rumination nor racism-related vigilance mediated relationships between experiences of discrimination and poor sleep quality; therefore, neither hypothesis 1 nor hypothesis 2 was supported. However, rumination partially mediated a significant indirect relationship between all six microaggression subscales and poor sleep quality, providing

partial support for hypothesis 3. Finally, racism-related vigilance did not mediate any relationships between microaggressions and poor sleep quality, and therefore hypothesis 4 was not supported. Despite these mixed findings, each of the overall models resulted in large effect sizes, indicating that discrimination, microaggressions, and perseverative cognition, in addition to pandemic stress and income, accounted for a large proportion of the variance in poor sleep quality in this sample. This study collected sufficient participants to detect overall model effects and direct effects; therefore, model variance and main effects can be interpreted with confidence, whereas findings or lack thereof regarding indirect effects should be interpreted with caution.

Hypothesis 1: Mediation of Discrimination through Rumination to Poor Sleep Quality

Hypothesis 1 was tested with a mediation model predicting poor sleep quality from discrimination through rumination; that is discrimination was predicted to be positively related to rumination, which in turn was predicted to be positively related to poor sleep quality. This was a parallel mediation model that included another mediator, racism-related vigilance, as well as income and pandemic stress as covariates. Results showed that while the overall model was significant, and the paths from discrimination to rumination and from rumination to sleep were significant, the indirect effect through rumination was not significant.

While the hypothesized direct effects from discrimination to rumination and from rumination to poor sleep quality were found, consistent with previous studies (e.g., Hoggard & Hill, 2018), this project did not detect indirect effects, in contrast to Hoggard and Hill (2018), who reported significant indirect effects of discrimination on sleep quality through

rumination. However, this null finding should be interpreted in light of the statistical limitations of this project—specifically the low power to detect indirect effects.

In addition to these statistical artifacts, different aspects of measurement should be considered. Hoggard and Hill (2018) measured discrimination with the Ethnic Discrimination Questionnaire-Community Version [PEDQ-CV; (Brondolo et al., 2005)], which includes items assessing a broad range of discriminatory experiences, such as discrimination at work or school, exclusion/rejection, as well as threats or experiences of violence. This measure includes, therefore, experiences that are assessed in the current project by two separate instruments. That is, the measure of discrimination in the current project assessed whether participants experienced discrimination because of their "race, ethnicity, or color" in settings such as school, work, or housing (Krieger et al., p. 1590), whereas aspects of exclusion or rejection are captured in the Racial Microaggressions Scale (RMAS; Torres-Harding et al., 2012). Therefore, the null finding of the indirect effect from discrimination and to poor sleep quality through rumination should be considered in light of the current study's measure which assessed a more limited range of experiences than that of Hoggard and Hill (2018).

Hypothesis 2: Mediation of Discrimination through Racism-Related Vigilance to Poor Sleep Quality

Hypothesis 2 was tested with a mediation model predicting poor sleep quality from discrimination through racism-related vigilance; that is discrimination was predicted to be positively related to racism-related vigilance, which in turn was predicted to be positively related to poor sleep quality. This was a parallel mediation model that included another mediator, rumination, as well as income and pandemic stress as covariates. Results showed

that while the overall model was significant, and there was a significant path from discrimination to racism-related vigilance, the path from racism-related vigilance to poor sleep quality was not significant, and the indirect effect through racism-related vigilance was not significant.

The finding that discrimination is positively related to racism-related vigilance is novel—to the author's knowledge no published studies to date have reported this finding. This finding indicates that experiences of discrimination (e.g., discrimination in housing, work, school, etc.) increase Black Americans' cognitive efforts to monitor and prepare themselves for future experiences of discrimination. For instance, the racism-related vigilance scale assesses how often respondents "feel [they] have to be very careful about [their] appearance (to get good service or avoid being harassed)" or "carefully observe what happens around [them]." The vigilance captured by this scale depletes cognitive resources, redirecting attention and energy from the personal goals and values Black Americans hold to effortfully monitor themselves and their environment in an effort to avoid discrimination. As demonstrated by this finding, experiencing discrimination is related not only in the moment to an unfair denial of rights or opportunities, but to an ongoing cognitive and emotional burden. In the short-term increased racism-related vigilance may be protective for Black Americans, yet, over time, this cognitive burden may perpetuate harm by reducing their ability to focus on meaningful goals and activities.

The null relationship between racism-related vigilance and sleep contrasts with Hicken et al. (2013), who reported that racism-related vigilance, as assessed by an abbreviated three-item scale, was significantly related to sleep quality and mediated a relationship between race and sleep quality. Importantly, Hicken et al. (2013) measured sleep

quality with three items assessing trouble falling asleep, staying asleep, and unplanned early awakenings, while the current study used a well-validated measure of sleep quality which assessed seven domains of sleep. Given the differences in both measures of racism-related vigilance and sleep quality between the current study and Hicken et al. (2013), future studies should seek to clarify which aspects of sleep are related to which aspects of vigilance.

In summary, model 1 results demonstrated a significant relationship between discrimination and sleep, which is not mediated by rumination or racism-related vigilance. Literature has consistently reported a relationship between discrimination and poor self-reported sleep quality (e.g., Slopen et al., 2016), and these findings confirm the established pattern. Importantly, poor sleep quality is a risk factor for chronic disease, including (Gangwisch et al., 2007), cardiovascular disease, coronary heart disease, diabetes, obesity (Patyar & Patyar, 2015; Shankar et al., 2010), and hypertension (Gangwisch et al., 2006). The unequal burden of poor sleep between Black and White Americans (Knutson et al., 2010; Lauderdale et al., 2006; Mezick et al., 2008; Ruiter et al., 2011; Thomas et al., 2006) may partially explain observed health disparities (Centers for Disease Control and Prevention [CDC], 2013; Hopko et al., 2003; Williams, 2012). As conceptualized by Harrell (2000), experiences of discrimination are among a range of race-specific stressors which are both stressors at the time they occur and lead to worsened health in the long term. The findings of this project, therefore, amplify the existing literature suggesting the importance of assessing the burden of discrimination on the health of Black Americans.

Hypothesis 3: Mediation of Microaggressions through Rumination to Poor Sleep Quality

Hypothesis 3 was tested with a mediation model predicting poor sleep quality from six subscales of microaggressions—Foreigner/Not Belonging, Criminality, Sexualization, Low-Achieving/Undesirable, Invisibility, and Environmental Invalidations—through rumination; that is microaggressions were predicted to be positively related to rumination, which in turn was predicted to be positively related to poor sleep quality. These were parallel mediation models that included another mediator, racism-related vigilance, as well as income and pandemic stress as covariates. Results from the six models followed the same pattern. That is, overall models were significant, as well as pathways from each microaggression subscale to rumination and from rumination to sleep; in addition, the indirect effects through rumination were significant. The only exception to this pattern was observed in the model testing the relationships between environmental invalidations to poor sleep quality through rumination. In this model, the total effects were not significant; however, total indirect effects and indirect effects through rumination were signification. The inconsistencies of these finding may be a statistical artifact of corrections for multiple tests of significance, and future research should be conducted to replicate the finding.

This project used the RMAS (Torres-Harding et al., 2012) to measure microaggressions; however, previous research on discrimination and sleep have used measures such as the Perceived Ethnic Discrimination Questionnaire-Community Version (PEDQ-CV; Brondolo et al., 2005) and found a link between these experiences and poor sleep (e.g., Hoggard & Hill, 2018). The PEDQ-CV includes items which assess experiences like those measured on the RMAS, and therefore, the current project's finding that

microaggressions are related to poor sleep quality was expected. However, to the author's knowledge, this is the first finding of its kind to be reported. Just as research has shown connections from stressful events (e.g., delivering a speech to a stoic audience) to poor sleep later that night (Zoccola et al., 2009), microaggressions likely relate to poor sleep by presenting stressful situations in the day which linger and disrupt sleep. While previous literature has linked discrimination to poor sleep (e.g., Ong & Williams, 2019) these findings suggest that observed disparities in sleep quality experienced by Black Americans (e.g., Knutson et al., 2010) may in part be due to the chronic form of racial stress (Harrell, 2000). That is, while relationships between discrimination (e.g., denial of services or opportunities based on race) and poor sleep have been demonstrated in the literature (e.g., Slopen et al., 2016), this finding demonstrates that chronic microstressors are also linked to poor sleep; therefore, it may be that the severity of the stressor does not impact the connection the stressor has to poor sleep. In addition, as poor sleep has been linked to increased risk of poor health outcomes (e.g., Shankar et al., 2010), microaggressions may contribute to the higher burden of disease observed among Black Americans relative to White Americans (Centers for Disease Control and Prevention [CDC], 2013).

Furthermore, the findings of this project demonstrate that the relationship between microaggressions and poor sleep is partially mediated by rumination, a form of perseverative cognition. Rumination, as described by Nolen-Hoeksema (1991) may be considered an emotion-focused coping approach, in which a person focuses their attention on negative moods or events. For Black Americans who experience microaggressions, rumination therefore, may function as an attempt to cope with a problem outside their control. The rumination measure used in this study contains factors of both "symptom-focused

rumination" and "introspection/self-isolation" as well as "self-blame" (Roberts et al., 1998). These cognitive patterns suggest that following microaggressions, Black Americans may spend time processing their emotional reactions (e.g., symptom-focused rumination), retreat or withdraw from social interactions (i.e., introspection/social isolation) to analyze their reactions, and engage in self-blame about their reactions. These cognitive processes may be an attempt to understand oneself and the world better, and to make sense of a stressful event. This meaning making may be an attempt to increase one's sense of control. However as reported in the literature, rumination after stressful events is associated with poor sleep, especially for those who are characteristically likely to ruminate (Guastella & Moulds, 2007). Therefore, these findings provide partial support for Myers' meta-model (2009) linking race/ethnicity to health outcomes via psychosocial adversities (e.g., microaggressions), cognitive processing (rumination) and emotional regulation, and health behaviors (sleep).

Hypothesis 4: Mediation of Microaggressions through Racism-Related Vigilance to Poor Sleep Quality

Hypothesis 4 was tested with six mediation models predicting poor sleep quality from six subscales of microaggressions through racism-related vigilance; that is microaggressions were predicted to be positively related to racism-related vigilance, which in turn was predicted to be positively related to poor sleep quality. This was a parallel mediation model that included another mediator, rumination, as well as income and pandemic stress as covariates. Results varied across models. While the overall models were significant, only three of the models found a significant path from microaggressions to racism-related vigilance. In no models was the path from racism-related vigilance to poor sleep quality significant, nor was the indirect effect through racism-related vigilance significant.

The following microaggressions subscales were positively associated with racism-related vigilance: Criminality, Low-Achieving/Undesirable, and Invisibility. The finding that a sub-set of microaggressions (Criminality, Low-Achieving/Undesirable, and Invisibility) are positively related to racism-related vigilance is novel—to the author's knowledge no published studies to date have reported this finding. It is important to consider that the levels of microaggressions reported in the current sample were higher than those reported in other studies. It may be that high levels of microaggressions that fall into these categories, Criminality, Low-Achieving/Undesirable, and Invisibility, increase Black Americans' cognitive efforts to avoid these experiences. For instance, participants may engage in vigilance to avoid some of the experiences captured in items on the Criminalization subscale (e.g., "*People act like they are scared of me because of my race*"), Low-Achieving/Undesirable subscale ("*Others focus only on the negative aspects of my racial background*."), and Invisibility subscale ("*My contributions are dismissed or devalued because of my racial background*.").

As with experiences of discrimination, this finding indicates that experiences of certain microaggressions tax the cognitive resources of Black Americans, who may engage in racism-related vigilance to avoid future microaggressions. Again, it appears that the overall severity of the experience (i.e., discrimination or microaggressions) is not important in terms of its cognitive toll. That is, both major experiences of discrimination and microaggressions of these categories are sufficiently stressful for the target person to engage in cognitive efforts (i.e., vigilance) to avoid future instances. Therefore, while microaggressions are less overt, and may result in less severe immediate harm to the target than experiences of discrimination (e.g., subtle implications of criminality do not have the same material impact

as unfair treatment by the police), their relatively high frequency has an outsized impact on the cognitive resources of Black Americans.

On the other hand, there were three subscales of microaggressions not associated with racism-related vigilance: Sexualization, Foreigner/Not Belonging, and Environmental Invalidations. There may be some intersectional aspects to the Sexualization subscale; that is, perhaps certain identities, such as gender or sexual identity, may interact with race, resulting in more experiences of sexualization and thus vigilance. In terms of Foreigner/Not Belonging, this project recruited Black Americans who were born in the U.S. and who had at least one parent also born in the U.S. It is conceivable, then, that this type of microaggression may be less frequent, or less troubling, to the participants in the current study. Regarding Environmental Invalidations, this subscale primarily assesses how much participants experience a lack of representation of others of their race in workplaces, educations, and authority figures. While these microaggressions may lead to rumination, as found by this project, it may be that vigilance is a less frequent response to these experiences. That is, these microaggressions are more related to what an individual sees in their environment rather than how they are perceived or treated by others, which then may not lead to increased self-monitoring to avoid unwanted treatment. Again, the means on these subscales were higher than those in previous studies; therefore, it may be that only certain types of microaggressions are associated with racism-related vigilance. This finding aligns with Torres-Harding et al. (2012) who identified a multidimensional scale of microaggressions and further supports the conceptual distinctions between subscales.

The null relationship between racism-related vigilance and sleep contrasts with Hicken et al. (2013), who reported that racism-related vigilance, as assessed by an

abbreviated three-item scale, was significantly related to sleep quality and mediated a relationship between race and sleep quality. Importantly, that study measured sleep quality with three items assessing trouble falling asleep, staying asleep, and unplanned early awakenings, while the current study used a well-validated measure of sleep quality which assessed seven domains of sleep. Given the differences in both measures of racism-related vigilance and sleep quality between the current study and Hicken et al. (2013), future studies should seek to clarify which aspects of sleep are related to which aspects of vigilance.

Previous literature has found an inconsistent relationship between worry and sleep (Beatty et al., 2011; Hoggard & Hill, 2018). Therefore, this study sought to assess an aspect of perseverative cognition, racism-related vigilance. Based on findings from Hicken et al. (2013), I hypothesized that racism-related vigilance may function similarly to worry, as it is a form of future oriented perseverative cognition. However, given the current study's results, it may be that racism-related vigilance is in fact a distinct form of perseverative cognition, perhaps best conceptualized as having a *present* orientation. That is, vigilance involves active monitoring and preparation for immediate circumstances, whereas worry is a more future-focused perseverative cognition.

Therefore, vigilance may be an actionable type of cognition, whereas present and past focused perseverative cognition (e.g., worry and rumination) does not easily lead to preventive or corrective action. The self-monitoring and work on cultivating appearances, assessed by the racism-related vigilance measure, would be most likely to occur immediately prior to or during potentially troubling interactions. As these experiences are likely to occur outside the home and during non-sleeping hours, the vigilance would occur at those times, rather than in the evening or while in bed. Therefore, racism-related vigilance may be

temporally separated from sleep, thus limiting its interference with sleep quality. This does not suggest, however, that the cognitive toll of racism-related vigilance is without health implications; as reported by Hicken et al. (2014), increases in vigilance are associated with increased odds of hypertension among Black Americans.

The findings of this project expand on research documenting a connection between experiences of discrimination, a form of race-specific stress, and rumination, a type of perseverative cognition (e.g., Hoggard & Hill, 2018), suggesting a broader link between racial stress and perseverative cognition. This finding, then, indicates there is a cognitive load which results from racial microstressors such as microaggressions. Although in the current project this cognitive load (e.g., racism-related vigilance) was not associated with poor sleep, research should assess whether there are other physical or mental health outcomes related to microaggressions mediated by racism-related vigilance.

Pandemic Stress

This project's finding of the connection between pandemic stress and poor sleep quality highlights how health disparities were deepened by the COVID-19 pandemic. Kujawa et al. (2020) reported that emerging Black adults experienced more stressful events related to the pandemic relative to the majority group. While there is limited normative data to compare the sample in the current project, the levels of pandemic stress may also have been heightened. The psychosocial stressors captured by the pandemic stress scale may therefore represent a stressor that amplified race-related stressors. This is supported by the significant associations between pandemic stress and all forms of race-related stress in this study (i.e., experiences of discrimination and all sub-scales on the microaggressions scale).

Implications

Findings from this project have theoretical and practical implications for academic and clinical settings. The finding that rumination mediates the association between microaggressions and poor sleep quality provides support for the meta-model proposed by Myers (2009). The link between cognitive processes and health behaviors is proposed in part to explain health disparities in morbidity and mortality. While this study is limited in making causal inferences, these findings build a case for longitudinal research into perseverative cognition and sleep. While this study supports the role of perseverative cognition (e.g., rumination) with sleep, it also demonstrated that different types of cognitions affect sleep in unique ways. That is, while rumination appears to have strong links to sleep quality (e.g., Hoggard & Hill, 2018), various types of anticipatory cognition (i.e., general worry vs. racism-related vigilance) may be differentially associated with sleep (Beatty et al., 2011; Hicken et al., 2013). This study's results further refine this distinction, as racism-related vigilance did not have an association with poor sleep quality.

Furthermore, this study adds a more fine-grained understanding of the types of discriminatory experiences—as measured by the EOD and RMAS—and how they may differ in regard to sleep quality. For example, in this project, experiences of discrimination were not associated with rumination, but forms of microaggressions were. While most studies have focused on the role of discrimination, this study then provides new evidence of the relationship of microaggressions to poor sleep quality in Black Americans. Future research should seek to replicate these findings in a broad range of participants, as the current study only included Black Americans born in the U.S. with at least one parent also born in the U.S. Furthermore, as the current sample reported very high levels of microaggressions, it will be

important to determine to what extent the frequency of microaggressions affects how they related to sleep.

In addition to theoretical implications, this project points toward clinical applications to ameliorate the burden that racial microstressors take on Black Americans. That is, the results of this study suggest that perseverative cognition could be a useful target for clinical intervention in Black Americans who have poor sleep quality—rumination focused on experiences of microaggression interferes with sleep quality. Therefore, while clinicians should validate an individual's experience and reactions, therapeutic interventions may be tailored to address the toll these experiences take on a patient's sleep quality.

For instance, it may be helpful to equip Black Americans who are targets of microaggressions with responses that can buffer their impact in the moment; this may include formulating effective verbal or behavioral responses which enhance their sense of control and validate their perspective. Sue et al. (2019) proposed a variety of responses to microaggressions that range from subtly undermining the implied message of a microaggression (e.g., "Relax, I'm not dangerous."), explicitly naming the implication (e.g., ""You assume I am dangerous because of the way I look."), to directly challenging the stereotype ("I might be Black, but that does not make me dangerous.") (p. 136). These approaches may provide targets of microaggressions a sense of control in the moment and reduce or prevent rumination afterwards. Research should investigate the impact of equipping Black Americans on rumination and sleep quality.

Furthermore, Cognitive Behavioral Therapy (CBT) includes assisting patients to identify troubling thoughts and bringing awareness to the connections between thoughts and negative emotional experiences (Beck & Dozois, 2011). CBT often begins with identifying

thoughts that are unhelpful and moves toward challenging them (Beck & Dozois, 2011); however, challenging cognitions about microaggressions may be perceived as invalidating and could be harmful. Therefore, therapeutic approaches should instead focus on reducing the impact of rumination, rather than seeking to alter participants' perceptions of microaggressions. That is, rumination can result in social withdrawal and depressed mood (Roberts et al., 1998); clinicians can challenge this through guiding patients toward identifying, scheduling, and accomplishing activities to enhance mood. In addition, CBT for Insomnia (CBT-I) is well supported as a treatment for insomnia (Wang et al., 2005). However, it may be beneficial to culturally-tailor the intervention to incorporate an explicit acknowledgment of the connection between discriminatory experiences and perseverative cognition which is connected to poor sleep among Black Americans. Research should be conducted with Black Americans to identify which aspects of CBT-I are most beneficial and what changes would be most appropriate.

There are other approaches to addressing the toll of discrimination and microaggressions on sleep quality in Black Americans. These include affirming a positive racial identity and encouraging patients to pursue accountability for those involved in racist incidents (Forsyth & Carter, 2012). Jones et al. (2020) also offer a range of individual and collective coping approaches that may be beneficial for Black Americans to cope with race-related stress. Individual approaches include developing racial pride and identity, which may buffer against the harmful effects of microaggressions on sleep, or coping through healthy behaviors, such as exercise, which may result in improved sleep quality. Jones et al. (2020) also note a range of collective coping strategies, including self-help support groups and protesting racism at institutional and cultural levels. Future research should be conducted to

evaluate whether these clinical and community applications improve symptoms of rumination and whether that then leads to improved sleep quality.

Limitations and Future Directions

While this project may contribute valuable information to a body of research, it faces some limitations. Importantly, though the analyses tested for mediation, the project cannot make causal or temporal inferences (e.g., that discrimination causes or precedes rumination, which then causes or precedes poor sleep), since the data were collected in a cross-sectional fashion. While this allowed for more rapid data collection, it means that longitudinal relationships cannot be established, nor is causation established. Future research should verify the project's findings with longitudinal designs. Furthermore, the use of bootstrapping to create confidence intervals of indirect effects limits inferences of these parameters beyond the current sample. In addition, this project had very low power to detect indirect effects, and future research should seek to collect data from a larger number of participants.

Second, the self-report methodology applied by this study is a limitation; while self-reports of sleep quality, discrimination, and perseverative cognition likely represent subjective constructs, objective measures of sleep can be obtained via polysomnography (PSG) and actigraphy. These measures have been used in prior research, and future studies could extend findings from this study with objective measures of sleep quality. Other methodological concerns include monomethod bias, since all measures are self-report; combining multiple measures of a single construct (e.g., both objective and subjective measures of sleep) would strengthen the study's findings. In addition, the response options on the measure of racism-related vigilance used in this study were listed out of order; this may have confused participants and could have impacted findings related to this scale.

In addition, the scale used to measure rumination is general, since, to the author's knowledge, there are no published scales of racism-specific rumination. It may be that rumination on experiences of racism functions differently than general rumination, so future research should investigate more specific measurement of racism-related rumination. Similarly, the measure used to assess racism-related vigilance was developed with an adolescent sample; further research should examine the psychometric properties of the measure with adults.

Another limitation of this project is the use of an online survey; again, this methodology allows for a larger sample of adults than a convenience sample of university students, but it also presents potential issues. It is possible that participants did not actually meet inclusion criteria, though the screening procedure was designed to exclude potential participants who did not qualify. In addition, since the survey was taken by participants in a variety of settings (versus in a controlled, laboratory setting), extraneous environmental factors may influence the outcomes. In addition, as this study excluded Black people who are first generation immigrants to the Unites States, the results of this project do not apply to that population. Likewise, as the study did not recruit participants older than 65, the results may not generalize to older Black Americans. In addition, given the relatively high levels of income and education in this sample, these results may not generalize to Black Americans with lower SES. Furthermore, since this sample was collected from online workers, the results may not apply to Black Americans who do not have reliable access to the internet.

Conclusion

With predictions based on Myers' (2009) meta-model, this project found significant associations between two forms of racial stressors, microaggressions and experiences of

discrimination, and rumination, and between rumination and poor sleep quality among Black Americans. Furthermore, results demonstrated that rumination mediated relationships between microaggressions and poor sleep. Additionally, three kinds of microaggressions were found to be significantly related to racism-related vigilance (Criminality, Low-Achieving/Undesirable, and Invisibility). These results amplify literature documenting the toll of racial stressors on Black Americans and indicate mechanisms which may lead to health damaging behaviors and poor health outcomes. This project indicates the need for interventions to prevent and ameliorate the biopsychosocial impact of racial stressors through individual, clinical, and community level approaches.

APPENDIX A. Measures

A-1. Screener Questionnaire

	Inclusion/Exclusion Item	Survey Question	Response Options
1.	Country of residence = United States (excluding territories)	In what country or territory do you live?	Choose from list of countries and territories
2.	Age = 18 – 65	What is your age	Select age
3.	Racial/ethnic identity = Black/African American including biracial or multiracial	What is your race/ethnicity (select as many as may apply)?	1 = African American/Black 2 = Native American or Alaska Native 3 = Asian 4 = Native Hawaiian or Pacific Islander 5 = Latino/Hispanic 6 = White 7 = Middle Eastern
4.	Place of birth = U.S.	Where were you born?	1 = U.S. 2 = Outside U.S.
5.	At least one parent born in U.S.	Where were your parents born?	1 = Both born in U.S. 2 = One born in U.S., one born outside of U.S. 3 = Both born outside U.S.

A-2. Demographics

	Demographic Category	Survey Question	Response Options
1.	State	In what state do you live?	Choose from list of 50 states and D.C.
2.	Year born	In what year were you born?	Select year
3.	Sex	What was your sex assigned at birth?	1 = Female 2 = Male
4.	Gender	With what gender do you primarily identify?	1 = Woman 2 = Man 3 = Non-binary 4 = Prefer to self-describe:
5.	Education	How many years of school have you completed?	1 = Less than 9th Grade 2 = Some high school, did not finish 3 = High School diploma/GED 4 = Technical school 5 = Some college 6 = 4-year college degree 7 = Graduate degree
6.	Relationship status	What is your relationship status?	1 = Divorced 2 = Serious relationship and living together 3 = Serious relationship and living apart 4 = Single 5 = Married 6 = Separated 7 = Widowed
7.	Employment	What is your current employment status?	1 = Working full-time 2 = Working one part-time job 3 = Working multiple part-time jobs 4 = I am retired 5 = Unemployed, but looking 6 = Unemployed, not looking 7 = I am a student 8 = Other, please specify

8.	Income	About how much money do you bring home each year?	1 = $0 – $9,999 2 = $10,000 - $20,000 3 = $20,001 - $30,000 4 = $30,001 - $40,000 5 = $40,001 - $50,000 6 = $50,001 - $60,000 7 = $60,001 - $70,000 8 = $70,001 - $80,000 9 = $80,001 - $90,000 10 = $90,001 - $100,000 11 = more than $100,000

A-3. Discrimination

Experiences of Discrimination (EOD) Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your race, ethnicity, or color?			
1.	At school?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
2.	Getting hired or getting a job?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
3.	At work?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
4.	Getting housing?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
5.	Getting medical care?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
6.	Getting service in a store or restaurant?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
7.	Getting credit, bank loans, or a mortgage?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
8.	On the street or in a public setting?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times
9.	From the police or in the courts?	No Yes	1 = Once 2 = Two to three times 3 = Four or more times

A-4. Microaggressions

Racial Microaggressions Scale (RMAS)		
Please indicate how often you have encountered each situation listed below. For each experience you have encountered (that is, those you rate as 1 or greater), please indicate how stressful, upsetting, or bothersome it was for you.		
1.	Because of my race, other people assume that I am a foreigner.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
2.	Because of my race, people suggest that I am not a "true" American.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
3.	Other people often ask me where I am from, suggesting that I don't belong.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
4.	Other people treat me like a criminal because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
5.	People act like they are scared of me because of my race.	0 = not at all 1 = a little 2 = moderate level

		3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
6.	Others assume that I will behave aggressively because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
7.	I am singled out by police or security people because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
8.	People suggest that I am “exotic” in a sexual way because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
9.	Other people view me in an overly sexual way because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
10.	Other people hold sexual stereotypes about me because of my racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level

	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
11.	Other people act if they can fully understand my racial identity, even though they are not of my racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
12.	Other people act as if all of the people of my race are alike.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
13.	Others suggest that people of my racial background get unfair benefits.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
14.	Others assume that people of my background would succeed in life if they simply worked harder.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
15.	Other people deny that people of my race face extra obstacles when compared to Whites.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never

		1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
16.	Other people assume that I am successful because of affirmative action, not because I earned my accomplishments.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
17.	Others hint that I should work hard to prove that I am not like other people of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
18.	Others suggest that my racial heritage is dysfunctional or undesirable.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
19.	Others focus only on the negative aspects of my racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
20.	Others prefer that I assimilate to the White culture and downplay my racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely

		2 = sometimes/a moderate amount 3 = often/frequently
21.	I am mistaken for being a service worker or lower-status worker simply because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
22.	I am treated like a second-class citizen because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
23.	I receive poorer treatment in restaurants and stores because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
24.	Sometimes I feel as if people look past me or don't see me as a real person because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
25.	I feel invisible because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely

		2 = sometimes/a moderate amount 3 = often/frequently
26.	I am ignored in school or work environments because of my race.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
27.	My contributions are dismissed or devalued because of my racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
28.	When I interact with authority figures, they are usually of a different racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
29.	I notice that there are few role models in my racial background in my chosen career.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
30.	Sometimes I am the only person of my racial background in my class or workplace.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely

		2 = sometimes/a moderate amount 3 = often/frequently
31.	Where I work or go to school, I see few people of my racial background.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently
32.	I notice that there are few people of my racial background on the TV, books, and magazines.	0 = not at all 1 = a little 2 = moderate level 3 = high level
	... how stressful, upsetting, or bothersome was it for you?	0 = never 1 = a little/rarely 2 = sometimes/a moderate amount 3 = often/frequently

A-5. Rumination

Response Style Questionnaire – Ruminative Responses Scale (RSQ-RSS)		
1.	Think about how alone you feel	1 = almost never 2 = sometimes 3 = often 4 = almost always
2.	Think "I won't be able to do my job if I don't snap out of this"	1 = almost never 2 = sometimes 3 = often 4 = almost always
3.	Think about your feelings of fatigue and achiness	1 = almost never 2 = sometimes 3 = often 4 = almost always
4.	Think about how hard it is to concentrate	1 = almost never 2 = sometimes 3 = often 4 = almost always
5.	Think "What am I doing to deserve this?	1 = almost never 2 = sometimes 3 = often 4 = almost always
6.	Think about how passive and unmotivated you feel.	1 = almost never 2 = sometimes 3 = often 4 = almost always
7.	Analyze recent events to try to understand why you are depressed	1 = almost never 2 = sometimes 3 = often 4 = almost always
8.	Think about how you don't seem to feel anything anymore personality to try to understand why you are depressed	1 = almost never 2 = sometimes 3 = often 4 = almost always
9.	Think "Why can't I get going?"	1 = almost never 2 = sometimes 3 = often 4 = almost always
10.	Think "Why do I always react this way?"	1 = almost never 2 = sometimes 3 = often 4 = almost always

11.	Go away by yourself and think about why you feel this way	1 = almost never 2 = sometimes 3 = often 4 = almost always
12.	Write down what you are thinking about and analyze it	1 = almost never 2 = sometimes 3 = often 4 = almost always
13.	Think about a recent situation, wishing it had gone better	1 = almost never 2 = sometimes 3 = often 4 = almost always
14.	Think "I won't be able to concentrate if I keep feeling this way."	1 = almost never 2 = sometimes 3 = often 4 = almost always
15.	Think "Why do I have problems other people don't have?"	1 = almost never 2 = sometimes 3 = often 4 = almost always
16.	Think "Why can't I handle things better?"	1 = almost never 2 = sometimes 3 = often 4 = almost always
17.	Think about how sad you feel.	1 = almost never 2 = sometimes 3 = often 4 = almost always
18.	Think about all your shortcomings, failings, faults, mistakes	1 = almost never 2 = sometimes 3 = often 4 = almost always
19.	Think about how you don't feel up to doing anything	1 = almost never 2 = sometimes 3 = often 4 = almost always
20.	Analyze your personality to try to understand why you are depressed	1 = almost never 2 = sometimes 3 = often 4 = almost always
21.	Go someplace alone to think about your feelings	1 = almost never 2 = sometimes 3 = often 4 = almost always
22.	Think about how angry you are with yourself	1 = almost never 2 = sometimes

		3 = often 4 = almost always

A-6. Racism-Related Vigilance

Racism Related Vigilance Scale (RRV) In dealing with these experiences listed previously, how often do you . . .		
1.	Think in advance about the kinds of problems you are likely to experience?	1 = Almost everyday 2 = At least once a day 3 = A few times a month 4 = A few times a year 5 = Less than once a year 6 = Never
2.	Try to prepare for possible insults before leaving home?	1 = Almost everyday 2 = At least once a day 3 = A few times a month 4 = A few times a year 5 = Less than once a year 6 = Never
3.	Feel that you always have to be very careful about your appearance (to get good service or avoid being harassed)?	1 = Almost everyday 2 = At least once a day 3 = A few times a month 4 = A few times a year 5 = Less than once a year 6 = Never
4.	Carefully watch what you say and how you say it?	1 = Almost everyday 2 = At least once a day 3 = A few times a month 4 = A few times a year 5 = Less than once a year 6 = Never
5.	Carefully observe what happens around you?	1 = Almost everyday 2 = At least once a day 3 = A few times a month 4 = A few times a year 5 = Less than once a year 6 = Never
6.	Try to avoid certain social situations and places?	1 = Almost everyday 2 = At least once a day 3 = A few times a month 4 = A few times a year 5 = Less than once a year 6 = Never

A-7. Sleep Quality

Pittsburgh Sleep Quality Index (SLEEP QUALITY)		
Instructions: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.		
1.	During the past month, what time have you usually gone to bed at night?	
2.	During the past month, how long (in minutes) has it usually taken you to fall asleep each night?	
3.	During the past month, what time have you usually gotten up in the morning?	
4.	During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)	
5.	During the past month, how often have you had trouble sleeping because you...	
a.	Cannot get to sleep within 30 minutes	Not during the past month Less than once a week Once or twice a week Three or more times a week
b.	Wake up in the middle of the night or early morning	Not during the past month Less than once a week Once or twice a week Three or more times a week
c.	Have to get up to use the bathroom	Not during the past month Less than once a week Once or twice a week Three or more times a week
d.	Cannot breathe comfortably	Not during the past month Less than once a week Once or twice a week Three or more times a week
e.	Cough or snore loudly	Not during the past month Less than once a week Once or twice a week Three or more times a week
f.	Feel too cold	Not during the past month Less than once a week Once or twice a week

		Three or more times a week
g.	Feel too hot	Not during the past month Less than once a week Once or twice a week Three or more times a week
h.	Have bad dreams	Not during the past month Less than once a week Once or twice a week Three or more times a week
i.	Have pain	Not during the past month Less than once a week Once or twice a week Three or more times a week
j.	Other reason(s), please describe:	Not during the past month Less than once a week Once or twice a week Three or more times a week
6.	During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?	Not during the past month Less than once a week Once or twice a week Three or more times a week
7.	During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	Not during the past month Less than once a week Once or twice a week Three or more times a week
8.	During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	No problem at all Only a very slight problem Somewhat of a problem A very big problem
9.	During the past month, how would you rate your sleep quality overall?	Very good Fairly good Fairly bad Very bad
10.	Do you have a bed partner or room mate?	No bed partner or room mate Partner/room mate in other room Partner in same room but not same bed Partner in same bed
	If you have a room mate or bed partner, ask him/her how often in the past month you have had:	
a.	Loud snoring	Not during the past month Less than once a week Once or twice a week Three or more times a week
b.	Long pauses between breaths while asleep	Not during the past month

		Less than once a week Once or twice a week Three or more times a week
c.	Legs twitching or jerking while you sleep	Not during the past month Less than once a week Once or twice a week Three or more times a week
d.	Episodes of disorientation or confusion during sleep	Not during the past month Less than once a week Once or twice a week Three or more times a week
e.	Other restlessness while you sleep, please describe:	Not during the past month Less than once a week Once or twice a week Three or more times a week

A-8. Pandemic Stress

Pandemic Stress Questionnaire (PSQ)

Instructions: Below is a list of events related to the pandemic that may or may not have happened to you. Please decide whether you have had each of these experiences as a result of the recent coronavirus pandemic. For each event which has happened, please decide how bad it was when it happened to you. When rating how bad each event was when it happened, please consider how much of a negative impact it had on your life, how often the event occurred, and how long it was a problem for you.

1.	I had difficulty obtaining basic supplies because of the coronavirus pandemic (e.g., food, medicine, toilet paper).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
2.	I had to move unexpectedly because of the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
3.	I was unexpectedly separated from family, friends, or others close to me because of the coronavirus pandemic (e.g., due to moves or travel restrictions).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
4.	I was unable to be with close family, friends, or partners because of the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
5.	I had problems with my visa or the Student and Exchange Visitor Information System because of the coronavirus pandemic (e.g., unable to renew).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
6.	I had to cancel travel or experienced a major disruption in travel plans because of the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
7.	I had to cancel or postpone important events because of the coronavirus	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad

	pandemic (e.g., events for a club, sporting events, major celebrations).		4 = Very bad 5 = Extremely bad
8.	I had to take on additional responsibilities caring for others (e.g., children, other family members) due to the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
9.	I experienced significant financial strain due to the pandemic (e.g., due to travel, purchasing supplies, paying for housing).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
10.	I temporarily or permanently lost a job or had my work hours greatly reduced due to the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
11.	My workload increased substantially because of the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
12.	Someone I rely on for financial support (e.g., partner, parent) temporarily or permanently lost a job or had their work hours greatly reduced because of the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
13.	I was unable to complete important requirements for my education or professional goals due to the coronavirus pandemic (e.g., coursework, taking the SAT or GRE, thesis).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
14.	I had problems with online courses and/or remote work (e.g., slow connection, no computer or internet access, major differences in time zone).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
15.	I had conflicts or arguments with my partner or family members due to coronavirus (e.g., conflicts about living arrangements, shared work space, schedule expectations).	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
16.	I experienced racism or discrimination due to the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad

			4 = Very bad 5 = Extremely bad
17.	I had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
18.	I was tested for COVID-19.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
19.	I was diagnosed with COVID-19.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
20.	I had difficulty accessing or paying for physical or mental health care for myself or my dependents due to the coronavirus pandemic.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
21.	I was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
22.	Someone close to me had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
23.	Someone close to me was diagnosed with COVID-19.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
24.	Someone close to me was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad 4 = Very bad 5 = Extremely bad
25.	Someone close to me died from COVID-19.	No Yes	1 = Not at all bad 2 = Slightly bad 3 = Somewhat bad

			4 = Very bad 5 = Extremely bad

APPENDIX B. Data Management

B-1. Hochberg's False Discovery Rate Procedure: Overall Model Parameters

Model 1

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	F_1	**6.26**	**.08**	**.0004**	**.05**
2	F_2	**8.42**	**.10**	**<.0001**	**.033**
1	F_3	**16.80**	**.28**	**<.0001**	**.017**

Model 2

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	F_2	**4.73**	**.06**	**.003**	**.05**
2	F_1	**18.76**	**.21**	**<.0001**	**.033**
1	F_3	**18.16**	**.30**	**<.0001**	**.017**

Model 3

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	F_2	**8.48**	**.10**	**<.0001**	**.05**
2	F_1	**11.60**	**.14**	**<.0001**	**.033**
1	F_3	**18.07**	**.30**	**<.0001**	**.017**

Model 4

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	F_2	**5.34**	**.07**	**.0014**	**.05**
2	F_1	**10.70**	**.13**	**<.0001**	**.033**
1	F_3	**16.92**	**.28**	**<.0001**	**.017**

Model 5

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	$\boldsymbol{F_1}$	**10.58**	**.13**	**<.0001**	**.05**
2	$\boldsymbol{F_2}$	**12.58**	**.15**	**<.0001**	**.033**
1	$\boldsymbol{F_3}$	**16.92**	**.28**	**<.0001**	**.017**

Model 6

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	$\boldsymbol{F_2}$	**11.25**	**.14**	**<.0001**	**.05**
2	$\boldsymbol{F_1}$	**21.38**	**.23**	**<.0001**	**.033**
1	$\boldsymbol{F_3}$	**17.16**	**.29**	**<.0001**	**.017**

Model 7

Rank *I*	Parameter *k*	*F*	R^2	P-value	Adjusted alpha = .05*(*I*/*k*)
3	$\boldsymbol{F_2}$	**4.48**	**.06**	**.005**	**.05**
2	$\boldsymbol{F_1}$	**8.14**	**.10**	**<.0001**	**.033**
1	$\boldsymbol{F_3}$	**15.56**	**.27**	**<.0001**	**.017**

B-2. Hochberg's False Discovery Rate Procedure: Direct and Total Effects

Model 1

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	.98	.05
5	$\boldsymbol{a_1}$	**.04**	**.042**
4	$\boldsymbol{c'}$	**.02**	**.03**
3	**Total Effect**	**.002**	**.025**
2	$\boldsymbol{a_2}$	**.0007**	**.017**
1	$\boldsymbol{b_1}$	**<.0001**	**.008**

Model 2

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	0.650	.05
5	a_2	0.240	.042
4	$\boldsymbol{c'}$	**0.002**	.03
3	$\boldsymbol{b_1}$	**<.0001**	.025
2	$\boldsymbol{a_1}$	**<.0001**	.017
1	**Total Effect**	**<.0001**	.008

Model 3

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	.92	.05
5	$\boldsymbol{c'}$	**.002**	.042
4	$\boldsymbol{a_2}$	**.0006**	.03
3	$\boldsymbol{b_1}$	**<.0001**	.025
2	$\boldsymbol{a_1}$	**<.0001**	.017
1	**Total Effect**	**<.0001**	.008

Model 4

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	0.74	.05
5	a_2	.08	.042
4	***c′***	**.01**	.03
3	**Total Effect**	**.0001**	.025
2	$\boldsymbol{b_1}$	**<.0001**	.017
1	$\boldsymbol{a_1}$	**<.0001**	.008

Model 5

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	.86	.05
5	***c′***	**.02**	.042
4	**Total Effect**	**.0005**	.03
3	$\boldsymbol{b_1}$	**<.0001**	.025
2	$\boldsymbol{a_2}$	**<.0001**	.017
1	$\boldsymbol{a_1}$	**<.0001**	.008

Model 6

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	0.88	.05
5	***c′***	**0.01**	.042
4	$\boldsymbol{b_1}$	**<.0001**	.03
3	$\boldsymbol{a_2}$	**<.0001**	.025
2	$\boldsymbol{a_1}$	**<.0001**	.017
1	**Total Effect**	**<.0001**	.008

Model 7

Rank *I*	Parameter *k*	P-value	Adjusted alpha = .05*(*I*/*k*)
6	b_2	0.62	.05
5	*c′*	0.37	.042
4	a_2	0.27	.03
3	Total Effect	0.0338	.025
2	$\boldsymbol{a_1}$	**<.0001**	.017
1	$\boldsymbol{b_1}$	**<.0001**	.008

Note: Values in **bold** meet the criteria for statistical significance. TE = total effects.

B-3. Hochberg's False Discovery Rate Procedure: Indirect Effects

Model 1

Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	-0.00	0.00	0.00	0.99	.05
2	Indirect effect through RRS	0.03	0.02	1.50	.13	.033
1	Total indirect effect	0.03	0.02	1.50	.13	.017

Model 2

Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	0.0032	0.01	0.30	.76	.05
2	**Indirect effect through RRS**	**0.19**	**0.05**	**4.05**	**<.0001**	**.033**
1	**Total indirect effect**	**0.19**	**0.05**	**4.23**	**<.0001**	**.017**

Model 3

Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	-0.00	0.02	0.09	.93	.05
2	**Indirect effect through RRS**	**0.11**	**0.03**	**3.23**	**.001**	**.033**
1	**Total indirect effect**	**0.11**	**0.03**	**3.18**	**.001**	**.017**

Model 4

Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	0.0031	0.01	0.25	.80	.05
2	**Indirect effect through RRS**	**0.14**	**0.05**	**2.99**	**.003**	**.033**
1	**Total indirect effect**	**0.14**	**0.05**	**3.07**	**.002**	**.017**

Model 5

Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	-0.00	0.01	0.15	.88	.05
2	**Indirect effect through RRS**	**0.06**	**0.02**	**3.12**	**.002**	**.033**
1	**Total indirect effect**	**0.05**	**0.02**	**2.78**	**.005**	**.017**

Model 6

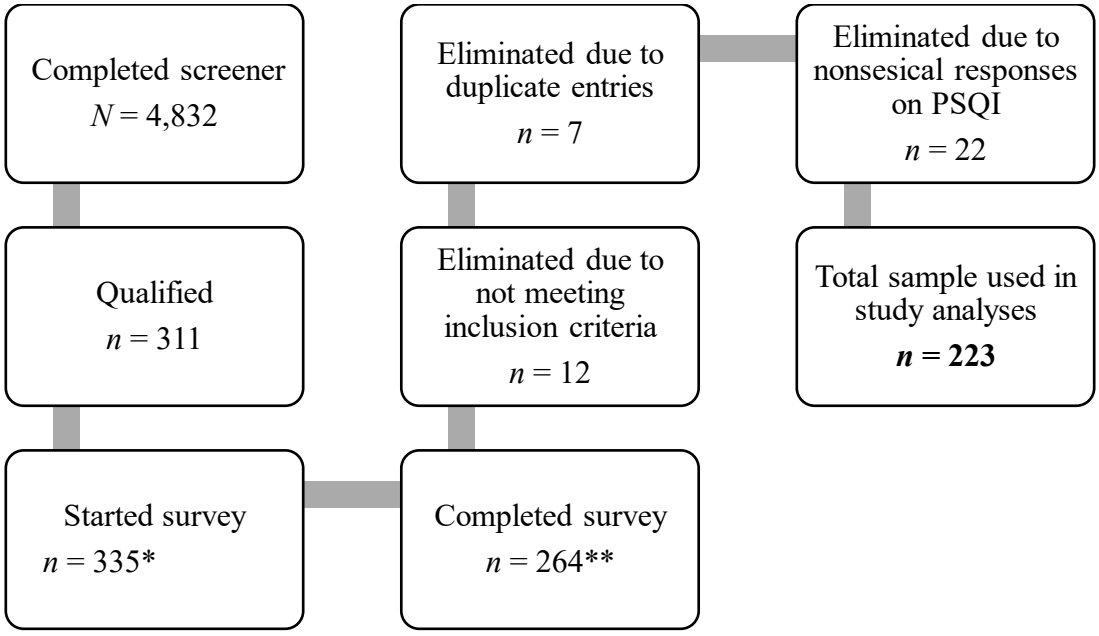
Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	-0.00	0.01	0.13	.90	.05
2	**Indirect effect through RRS**	**0.09**	**0.02**	**3.88**	**.0001**	**.033**
1	**Total indirect effect**	**0.09**	**0.02**	**3.70**	**.0002**	**.017**

Model 7

Rank *I*	Parameter *k*	Coeff	SE	Critical Ratio (z-score)	P-value	Adjusted alpha = .05*(*I*/*k*)
3	Indirect effect through RRV	0.0016	0.01	0.27	.79	.05
2	**Indirect effect through RRS**	**0.08**	**0.03**	**2.68**	**.007**	**.033**
1	**Total indirect effect**	**0.08**	**0.03**	**2.74**	**.006**	**.017**

Note: Values in **bold** meet the criteria for statistical significance. RRV = racism-related vigilance; RRV = ruminative responses scale.

B-4. Participant Flowchart



*Participants can start a survey and not complete it, so the total started is greater than the total qualified for the survey due to potential duplicate entries.

**Includes 13 surveys that had all items complete but did not hit the "submit" button and REDCap did not record those as complete.

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