



# Sleep and Fatigue as Mediators of Racial Discrimination and Internalizing Symptoms in Black Adolescent-Caregiver Dyads

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## Abstract

While the association of racial discrimination and internalizing symptoms in Black individuals is well established, we still have a limited understanding of mechanisms and contextual factors influencing this association, such as sleep and the family context. The present study examined sleep and fatigue as mediators underlying the relationship between racial discrimination and internalizing symptoms within Black adolescent-caregiver dyads. Using data from a larger survey study of risk and resilience in Black adolescents ( $M_{\text{age}} = 14.36$ , 49.5% female) and their caregivers ( $M_{\text{age}} = 39.25$ , 75.9% female), we used the Actor-Partner Interdependence Model extended Mediation (APIMeM) to test associations of racial discrimination, sleep factors, and internalizing symptoms among 179 dyads. Significant actor effects revealed that sleep disturbance and fatigue independently mediated the association of racial discrimination and internalizing symptoms among adolescents and caregivers. Additionally, partner effects were found, such that adolescents' experiences of discrimination were indirectly associated with their caregivers' internalizing symptoms via caregiver fatigue. No direct or indirect effects of caregiver experiences of discrimination on adolescent outcomes were found. The findings highlight the important role sleep and fatigue play in the link between racial discrimination and internalizing symptoms among Black adolescents and adults; and the role that the family context may play in this association. Mental health and sleep interventions for Black individuals should address the impact of racial discrimination on internalizing symptoms, with an emphasis on family-focused interventions.

**Keywords** Black adolescents · Black family · Racial discrimination · Sleep · Anxiety · Depression

Black adolescents and adults report significant internalizing symptoms relative to their non-Black counterparts (Alegria et al., 2010). According to the 2018 National Survey of Drug Use and Health (SAMHSA, 2020), annual rates of major depressive episodes have steadily increased among Black Americans from 2015 to 2018, with rates changing from 9 to 10.3% among adolescents; 6.3 to 9.4% among adults aged 18-25; and 5.7 to 6.3% among adults aged 26 to 49. These elevated rates of depression could explain the increasing rates of suicide among both Black adolescents and

adults. Between 2009 and 2019, past-year suicide attempts increased from 7.9% to 11.8% among Black adolescents (Ivey-Stephenson et al., 2020). Also, suicide rates in Black adults have increased an alarming 30% between 2014 and 2019 (Ramchand et al., 2021). Research on Black adolescent anxiety is mixed (Washington et al., 2017). However, some researchers have found Black adolescents to be at a significantly higher risk of developing an anxiety or mood disorder during their lifetime, with lower treatment rates (Georgiades et al., 2018). Further, while stigma and ethnic/racial identity may partially explain variability in the literature around rates of anxiety in Black adults (Hopkins & Shook, 2017), studies have found that when Black adults experience anxiety, they report higher rates of symptom severity and impairment than White adults (Himle et al., 2009). To improve mental health outcomes for Black adolescents and adults, it is necessary to identify major stressors contributing to internalizing symptoms and the mechanisms underlying the associations between these stressors and internalizing symptoms.

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Racial discrimination is a significant and unique chronic stressor associated with internalizing symptoms among Black individuals in the United States. For example, a 2018 meta-analysis of adolescents found that racial discrimination was associated with more depressive symptoms and psychological distress across racial/ethnic samples (Benner et al., 2018). More recent studies focused on Black adolescents have found racial discrimination is associated with higher depressive and anxious symptoms in cross-sectional (Pachter et al., 2018; Smith & Nicholson, 2022) and longitudinal samples (Lavner et al., 2022). In adults, meta-analytic reviews indicate that racial discrimination is strongly associated with poorer mental health across racial groups (Paradies et al., 2015), specifically among Black adults (Pieterse et al., 2012).

While the association between racial discrimination and internalizing symptoms has been well established, we still have a limited understanding of the mechanisms underlying this association. Sleep may be a critical bio-behavioral pathway through which racism influences health among people of color (Levy et al., 2016; Slopen et al., 2016). However, few studies have empirically explored sleep as a mediator of racial discrimination and internalizing symptoms among Black individuals. Additionally, while the experiences of adolescents and their caregivers are often intertwined, limited studies have explored how racial discrimination experienced by one's caregiver or child may impact their health. The current study addresses these gaps by using the Actor-Partner Interdependence Model extended Mediation (APIMeM: Ledermann et al., 2011) to examine sleep and fatigue as mediators of the association of racial discrimination and internalizing symptoms within the context of the Black adolescent-caregiver relationship.

## Racial Discrimination as a Stressor among Black Individuals

Racial discrimination is a common experience for both Black adolescents and adults. A recent daily diary study indicated that Black adolescents experience racial discrimination an average of five times daily (English et al., 2020). Data from the Pew Research Center's Racial Attitudes in America Survey published in 2016 found that over 73% of their nationally representative sample of Black adults reported experiencing at least one race-related discriminatory incident in their lifetime, with 11% reporting that they experienced racial discrimination regularly (Lee et al., 2019). Furthermore, according to the 2020 report of the American Psychological Association's (APA) Stress in America™ survey, 67% of Black adults report discrimination as a significant source of stress (American Psychological Association, 2020).

Clark and colleagues' Biopsychosocial Model for Perceived Racism explains that once an individual perceives their experience of racial discrimination as stressful, it triggers a sequence of physiological and psychological stress responses, which remain activated until the stressor is removed (Clark et al., 1999). However, racism is systemic, interwoven into every aspect of Black Americans' lives at structural and individual levels (Bonilla-Silva, 2021). Thus, racial discrimination is a chronic stressor (Ong et al., 2009; Troxel et al., 2003; Williams et al., 2003). Building on Clark's (1999) model, the Race-Based Disparities in Stress and Sleep in Context Model (RDSSC: Levy et al., 2016) proposes that race-related stressors contribute to health disparities via the disruption of psychological and biological processes, including sleep.

## Sleep and Fatigue as Mediators of Racial Discrimination and Internalizing Symptoms

Sleep and fatigue are essential biobehavioral factors that may play critical roles in mediating the well-documented association between the experience of racial discrimination and health outcomes. Black adolescents and adults are more likely to have shorter sleep durations and poorer sleep quality than their White counterparts (Guglielmo et al., 2018; Johnson et al., 2019). A 2016 systematic review found strong evidence linking more experiences of discrimination to poor sleep outcomes across racial and ethnic groups (Slopen et al., 2016). These findings are consistent with recent studies in racial/ethnic minority adolescents linking racial/ethnic discrimination to poorer sleep quality and longer sleep latency (Goosby et al., 2018); and greater sleep disturbances, more daytime dysfunction, and sleepiness (Yip et al., 2020). In adults, racial/ethnic discrimination was associated with greater sleep-onset latency and poorer sleep quality in Black and Latinx young adults (Davenport et al., 2021), and with shorter sleep duration and poor sleep in Black, White, and Latinx women (Gaston et al., 2020).

Though fatigue—which is defined as “an overwhelming, debilitating and sustained sense of exhaustion that decreases one's ability to carry out daily activities, including the ability to work effectively and to function at one's usual level in family or social roles” (Riley et al., 2010)—is sometimes examined as a component of overall sleep, it has also been independently linked to experiences of racial discrimination for Black Americans. In a community sample of Black and White adults, individuals who reported more racial discrimination also reported more fatigue (Thomas et al., 2006). In addition, Black adults reported more physical fatigue than White adults, and racial discrimination significantly mediated the association of race and physical fatigue. Results from a later study of Black and White adults were consistent

with this earlier study, indicating that racial discrimination experienced in the healthcare system is associated with greater sleep disturbances and daytime fatigue (Grandner et al., 2012). Overall, these findings support racial discrimination as a significant stressor that influences sleep and fatigue for Black individuals.

There is also abundant evidence linking sleep and fatigue to poor health outcomes. Sleep influences—and is influenced by—numerous psychological and physiological systems (Grandner, 2017). Poor sleep is associated with many poor mental and physical health outcomes among adolescents and adults, including depression, obesity, and cardiovascular disease (Grandner, 2017; Tarokh et al., 2016). Fatigue has also been independently linked to cognitive dysfunction and poor cardiometabolic and psychological health (Lock et al., 2018).

Few studies have investigated whether sleep mediates the association between racial discrimination and mental health in Black adolescents and adults. A daily diary study of Black, Asian, and Latinx adolescents (Yip et al., 2022) found sleep disturbance, daytime dysfunction, and daytime sleepiness independently mediated the association of racial discrimination with subsequent internalizing symptoms. In White, Black, Hispanic, and Asian adults, poor sleep quality mediated the relationship between racial/ethnic discrimination in health care or housing and having a diagnosis of a mental health condition (Yang & Park, 2015). Sleep duration also mediated the association of racial/ethnic discrimination in health care or housing and self-rated stress. Results from a study using a racially diverse sample of adults that included Black adults (Chen & Yang, 2014) found poor sleep quality mediated the link between racial discrimination and the likelihood of being diagnosed with a chronic health condition or depression.

In contrast, findings from a longitudinal study of Black caregivers and their children (aged 9 to 14 years) indicated that for both Black adolescents and their caregivers' greater experiences of racial discrimination were significantly associated with greater future sleep problems and depressive symptoms for each of the subgroups. Still, sleep problems did not mediate the association between racial discrimination and depressive symptoms (Hart et al., 2021). Of note, the sample of youth was primarily pre-adolescent, and the researchers did not investigate dyadic relationships between adolescents and their caregivers.

While most of the limited research supports poor sleep as a mediator of the relationship between racial discrimination and mental health among Black individuals, there are still significant gaps in our understanding of this mechanism. Only one study (Yip et al., 2022) explored fatigue separately from sleep, although the association between fatigue and poor health is well-established (Lock et al., 2018). Additionally, except for Hart and colleagues (2021), studies exploring

the mediating role of sleep in adults did not examine internalizing symptoms. There is a further need to examine sleep factors, including fatigue, as pathways through which racial discrimination impacts internalizing symptoms among Black adolescents and adults.

## Racial Discrimination in the Context of the Black Adolescent-Caregiver Relationships

The adolescent-caregiver relationship is a meaningful context to consider when studying the relationships between racial discrimination and internalizing symptoms. Interdependence theory (Van Lange & Rusbult, 2012) states that our experiences impact our outcomes and those with whom we have close relationships. Consistent with this idea of interdependence, Family Systems theory (Kerr et al., 1988) describes the family as a complex system in which individuals' experiences are interwoven, influencing each other's outcomes. Thus, racial discrimination experienced by Black adolescents and their caregivers may “spill over” to impact the health of each other.

Findings from previous studies support these spillover effects of racial discrimination in Black families. More specifically, studies focused on the role of caregivers' racial discrimination experiences on their children's internalizing symptoms have consistently found that children whose caregivers reported greater experiences of racial discrimination were at higher risks for internalizing symptoms. Black caregivers' experiences of racial discrimination were associated with more symptoms of depression in Black adolescents (Ford et al., 2013) and more psychological distress among Black youth aged 10–12 (Gibbons et al., 2004). Consistent with these findings, in youth of color (ages 4–18), parents' experiences of racial/ethnic discrimination were associated with greater child mental health concerns reported by parents (Tran, 2014). Finally, Galan and colleagues (2022) found an indirect association between Black parent racial discrimination and youth depression and anxiety via parent-child conflict, such that greater parent experiences of racial discrimination were associated with greater parent-child conflict, which was then associated with higher child anxiety and depressive symptoms.

Turning to the role of children's experiences of racial discrimination on their caregivers' health outcomes, research has shown that Black youth experiences of racial discrimination directly impact the internalizing symptoms of their caregivers. For example, experiences of racial discrimination reported by youth aged 10–12 were positively and directly associated with distress reported by their parents (Gibbons et al., 2004). Additionally, Holloway and Varner (2021) found that parents' experience of “vicarious discrimination

through their adolescents” was associated with greater parental depressive symptoms.

Although initial evidence supports the spillover effects of racial discrimination in families, analyses focused only on one particular association (e.g., caregiver experiences of racial discrimination and youth outcomes), which does not fully capture the complex dyadic relationships between caregivers and children. The Actor-Partner Interdependence Model (APIM; Cook & Kenny, 2005) allows exploration of the associations between individuals’ experiences on their outcomes (the actor effects) and the outcomes of another (the partner effects) while accounting for the non-independence of their social relationship. One published study has used the APIM to examine the dyadic association between caregiver and adolescent racial discrimination experiences and health outcomes in 341 Latinx, Asian, and White adolescent-parent dyads (Huynh et al., 2021). Caregiver experiences of racial/ethnic discrimination were associated with greater adolescent depressive symptoms but not anxiety. In contrast, adolescent experiences of racial discrimination were not associated with caregiver internalizing symptoms. These findings suggest that when accounting for the non-independence of the caregiver-child relationship, caregivers’ experiences may negatively impact their adolescents. However, their adolescents’ experiences of racial discrimination may have little impact on their caregivers. Of note, the study did not include Black adolescent-parent dyads.

## The Current Study

To date, no study has used the APIM to explore the dyadic associations of racial discrimination, sleep, and internalizing symptoms among Black adolescents and their caregivers. Given strong evidence of the influence of racial discrimination on internalizing symptoms for both Black adolescents and adults, the current study extends the literature by (1) investigating dyadic relations of racial discrimination and internalizing symptoms in a sample of Black adolescents and their caregivers and (2) investigating adolescents’ and caregivers’ sleep factors (sleep disturbance and fatigue) as mediators of the associations between racial discrimination and internalizing symptoms in these dyadic pairs. Consistent with the Biopsychosocial Model for Perceived Racism (Clark et al., 1999) and Family Systems Theory (Kerr et al., 1998), we hypothesized that greater racial discrimination reported by Black adolescents and their caregivers would be associated with their internalizing symptoms (i.e., actor effects) and each other’s internalizing symptoms (i.e., partner effects). Also, in line with the Race-Based Disparities in Stress and Sleep in Context Model (Levy et al., 2016) and Family Systems Theory (Kerr et al., 1998), adolescents’ and

caregivers’ sleep factors will mediate the two actor effects (adolescent experience of racial discrimination-adolescent internalizing symptoms; caregiver experience of racial discrimination-caregiver internalizing symptoms) and the two partner effects (adolescent experience of racial discrimination-caregiver internalizing symptoms; caregiver experience of racial discrimination-adolescent internalizing symptoms). To test these hypotheses, we used the APIMeM (Ledermann et al., 2011).

## Method

### Procedures

Data originated from a larger study of Black adolescents (aged 12–17) and their caregivers recruited from communities in a southeastern state in the United States (VCU CCEP, 2020). Study personnel partnered with a community organization for recruitment and data collection. Participants were recruited via verbal and print advertisements in community locations (e.g., churches and community advocacy organizations), social media, and by word of mouth. After providing written caregiver informed consent and adolescent assent, participants completed surveys on a tablet in a group setting. Surveys included the Patient Reported Outcomes Measurement Information System® (PROMIS) self-report surveys for sleep disturbance, fatigue, anxiety, and depression and the 5-item Perceived Personal-Level Discrimination measure. The surveys were administered via REDCap (Harris et al., 2009, 2019) and took approximately 45 minutes to complete. Adolescents and their caregivers were each compensated \$20 cash for their time. Data collection occurred between August 2019 and March 2020. This study was approved by the Institutional Review Board (IRB) of Virginia Commonwealth University.

### Participants

As shown in Table 1, the sample consists of 179 caregiver-adolescent dyads. Adolescents’ mean age was 14.34 years ( $SD = 1.70$ ), and caregivers’ mean age was 39.38 years ( $SD = 11.12$ ). Approximately 50.3% of adolescents identified as girls, and 78.8% of caregivers identified as women. Approximately 63.7% of caregivers were employed, and 31.8% reported GED/High School diploma as their highest level of education completed. According to caregivers’ report, 49.2% of dyads had a median annual household income of \$20,000–\$30,000. A majority of the sample reported no chronic diseases (81.6% of adolescents and 76.5% of caregivers).

**Table 1** Sample Demographics

Variable	Caregivers		Adolescents	
	M (SD)	N (%)	M (SD)	N (%)
Age	39.38 (11.12)		14.34 (1.70)	
Gender				
Man/Boy		38 (21.2%)		86 (48.0%)
Woman/Girl		141 (78.8%)		90 (50.3%)
Chronic Disease				
Yes		41 (22.9%)		30 (16.8%)
No		137 (76.5%)		146 (81.6%)
Employment				
Employed				114 (63.7%)
Unemployed				51 (28.5%)
Annual Household Income				
Less than 10,000				51 (28.5%)
15,000- 20,000				22 (12.3%)
20,000- 30,000				15 (8.4%)
30,000- 40,000				18 (10.1%)
40,000-50,000				8 (4.5%)
50,000- 60,000				5 (2.8%)
60,000-70,000				10 (5.6%)
70,000-80,000				6 (3.4%)
More than 80, 000				28 (15.6%)
Highest Education Level				
Less than HS				32 (17.9%)
GED/HS Diploma				57 (31.8%)
Some college, no degree				29 (16.2%)
Associate’s Degree				11 (6.1%)
Bachelor’s Degree				28 (15.6%)
Master’s Degree				16 (8.9%)
Professional or Doctorate				3 (1.7%)

**Measures**

**Socio-Demographic Variables** Caregivers reported their age, gender, chronic disease status (yes/no), education level, and annual household income. Adolescents reported their age, gender, and chronic disease status.

**Personal Experience of Racial Discrimination** Adolescents and their caregivers completed the 5-item Perceived Personal-Level Discrimination measure (Hagiwara et al., 2016). The measure asked participants to indicate the extent to which they agree or disagree with items using a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items include “I personally have been a victim of racial discrimination” and “I consider myself a person who is deprived of opportunities that are available to others because of my race.” Scores are averaged across the items (for cases with at least four non-missing values) to generate a composite score of personal racial discrimination. Higher

scores indicate more experiences of racial discrimination at the personal level. Although the scale has consistently exhibited good internal consistency in Black adults ( $\alpha=0.84$ : Hagiwara et al., 2015; Dent et al., 2020; Brown et al., 2022), this is the first study to use the scale in adolescents. In the current sample, this 5-item measure has a Cronbach’s alpha of 0.86 in caregivers and 0.91 in adolescents.

**Sleep-related Measures**

Sleep disturbance, fatigue, and internalizing symptoms were assessed using the Patient Reported Outcomes Measurement Information System® (PROMIS: Ader, 2007), a set of person-centered measures of various health domains, including mental, physical, and social. Funded by the National Institutes of Health (NIH), the PROMIS was developed by applying quantitative, qualitative, and mixed methods approaches to modern measurement theory to provide clinicians and researchers with a precise measure for assessing



patient-reported outcomes (PROs). It has been used among general population samples and pediatric and adult populations living with chronic conditions. Raw scores for each measure were converted to a standardized T-score using the Health Measures Scoring Service ([https://www.assessmentcenter.net/ac\\_scoring-service](https://www.assessmentcenter.net/ac_scoring-service)). This web-based application provides the most accurate method for the PROMIS measures, with higher scores indicating greater sleep/wake disturbance, fatigue, anxiety, and depression.

**Sleep Disturbance** Adolescents and caregivers completed the Sleep Disturbance (PROMIS) Self Report Adult 4-item Short Form to report their experiences of sleep disturbance in the past seven days. The measures of Sleep Disturbance consist of 4 questions each, three of which used a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*) and one using a 5-point Likert scale ranging from 1 (*very poor*) to 5 (*very good*). The PROMIS Sleep Disturbance Adult item bank has exhibited good validity in measuring sleep in adults via its correlation with the Pittsburgh Sleep Quality Index ( $r = 0.85$ ) and self-reported sleep disorders (Yu et al., 2011); and in adolescents via its correlation with actigraphy measured total sleep time ( $r = -0.46$ ,  $p = 0.02$ ) and the Cleveland Adolescent Sleepiness Questionnaire (Spearman's  $r = 0.77$ ,  $p < 0.001$ ; Hanish et al., 2017). The scale has also demonstrated good reliability in adults (reliability  $\geq 0.90$ ; Yu et al., 2011). In the current sample, the 4-item measure had a Cronbach's alpha of 0.82 in caregivers and 0.65 in adolescents.

**Fatigue** Adolescents completed the Fatigue subdomain of the PROMIS-25 Pediatric Youth (Lai et al., 2013; Quinn et al., 2014), while caregivers completed the Fatigue (PROMIS) Self Report Adult 4-item Short Form (Cella et al., 2019; Lai et al., 2011) to report their feelings of fatigue in the past seven days. Each measure consisted of four items using a 5-point Likert scale ranging from 1 (*never*) to 5 (*almost always*) for adolescents and 1 (*not at all*) to 5 (*very much*) for adults. In adults, the 4-item Short Form has demonstrated good reliability (reliability  $\geq 0.90$ ) and construct validity via its negative association with measures of well-being and quality of life (Cella et al., 2019). The Pediatric Fatigue item bank has also exhibited good reliability (reliability  $\geq 0.75$ ; Lai et al., 2013; Varni et al., 2014), and validity across various clinical populations (DeWalt et al., 2015). In the current sample, the 4-item fatigue measures had a Cronbach's alpha of 0.89 in caregivers and 0.81 in adolescents.

### Internalizing Symptom Measures

**Anxiety** Adolescents completed the Anxiety subdomain of the PROMIS-25 Pediatric (Quinn et al., 2014), while caregivers completed the Anxiety (PROMIS) Self Report Adult

4-item Short Form (Cella et al., 2019; Pilkonis et al., 2011) to report their feelings of anxiety in the past seven days. Each measure consisted of four items using a 5-point Likert scale ranging from 1 (*never*) to 5 (*almost always*). Higher T-scores are indicative of greater anxiety. The Adult Self-Report Anxiety domain has demonstrated good validity via its association with the general distress (anxiety) scale from the Mood and Anxiety Symptom Questionnaire (MASQ; Pilkonis et al., 2011), and the 4-item short form has demonstrated reliability greater than 0.90 (Cella et al., 2019). The pediatric anxiety domain has also shown good reliability among children and adolescents aged 8-17 (reliability estimates  $> 0.74$ ; Varni et al., 2014); and validity via associations with clinician-reported anxiety (Freitag et al., 2023). In the current sample, the 4-item measures had a Cronbach's alpha of 0.88 in caregivers and 0.89 in adolescents.

**Depression** Adolescents completed the Depression subdomain of the PROMIS-25 Pediatric Youth (Quinn et al., 2014), and caregivers completed the Depression (PROMIS) Self Report Adult 4-item Short Form (Cella et al., 2019; Pilkonis et al., 2011) to report their feelings of depression in the past seven days. Each measure consisted of four items using a 5-point Likert scale ranging from 1 (*never*) to 5 (*almost always*). The PROMIS depression items banks have demonstrated strong validity in adults via significant associations with the Center for Epidemiological Studies Depression Scale (CESD) and the Patient Health Questionnaire (PHQ-9; Pilkonis et al., 2011, 2014), and the 4-item short form has demonstrated reliability greater than 0.90 (Cella et al., 2019). The pediatric depression domain has also shown good reliability (reliability estimates  $> 0.76$ ; Varni et al., 2014) and good validity across various clinical populations (DeWalt et al., 2015). In the current sample, the 4-item depression measures had a Cronbach's alpha of 0.92 in caregivers and 0.86 in adolescents.

### Data Analysis Plan

**Preliminary Analyses** Descriptive statistics (Table 1) were first examined. Next, we evaluated whether household income, caregiver education, caregiver and adolescent gender, chronic disease status, and age were related to primary study variables by conducting independent samples *t*-test and Spearman correlation. Independent sample *t*-tests revealed significant differences in caregiver depression by caregiver gender, such that women reported greater depressive symptoms. Adolescent girls also had greater sleep disturbance, fatigue, and internalizing symptoms than boys. Caregiver sleep disturbance, fatigue, anxiety, and depression also differed by caregiver chronic disease status. A Spearman correlation revealed that both household income and caregiver education were negatively associated with caregiver sleep

disturbance, caregiver anxiety, and caregiver depression. Caregiver and adolescent age were not significantly associated with any primary study variables. These findings support the inclusion of household income; caregiver education; and caregiver and adolescent gender and chronic disease status as covariates in the primary analyses. Partial correlations among primary study variables while controlling for these socio-demographic variables were then examined.

**Primary Analyses** Dyadic mediation models were calculated using SPSS v0.27 with the added MEDYAD module. The MEDYAD (Coutts et al., 2019) macro calculates the extended version of the APIM with distinguishable dyads (i.e., adolescents and caregivers)—the APIMeM (Lederhmann et al., 2011)—in SPSS. Specifically, it estimates two direct actor effects (Caregiver predictor-Caregiver outcome, Adolescent predictor-Adolescent outcome) and two direct partner effects (Caregiver predictor-Adolescent outcome, Adolescent predictor-Caregiver outcome). The model also estimates four indirect actor effects (Caregiver predictor-Caregiver mediator-Caregiver outcome, Caregiver predictor-Adolescent mediator-Caregiver outcome, Adolescent predictor-Adolescent mediator-Adolescent outcome, Adolescent predictor-Caregiver mediator-Adolescent outcome) and four indirect partner effects (Caregiver predictor-Caregiver mediator-Adolescent outcome, Caregiver predictor-Adolescent mediator-Adolescent outcome, Adolescent predictor-Adolescent mediator-Caregiver outcome, Adolescent predictor-Caregiver mediator-Caregiver outcome).

We ran four separate APIMeMs. Each tested model included two predictors (adolescent experience of racial discrimination and caregiver experiences of racial discrimination), two mediators (adolescent sleep disturbance and caregiver sleep disturbance *or* adolescent fatigue and caregiver fatigue), and

two outcomes (adolescent anxiety symptoms and caregiver anxiety symptoms *or* adolescent depressive symptoms and caregiver depressive symptoms). Each model tested a total of 8 indirect paths. Finally, each model included six covariates (adolescent and caregiver gender and chronic disease status, household income, and caregiver education level).

## Results

### Preliminary Analyses

Descriptive statistics for demographic variables are presented in Table 1. Table 2 depicts means, SDs, and correlations among primary study variables while controlling for household income, caregiver education, and caregiver and adolescent gender and chronic disease status.

### APIMeMs Predicting Anxiety

The APIMeM predicting adolescent anxiety and caregiver anxiety via sleep disturbance was significant ( $R^2 = 0.26$ ,  $F = 5.00$ ,  $p < 0.001$  for adolescent anxiety;  $R^2 = 0.23$ ,  $F = 4.98$ ,  $p < 0.001$  for caregiver anxiety). The APIMeM predicting adolescent anxiety and caregiver anxiety via fatigue was also significant ( $R^2 = 0.36$ ,  $F = 7.89$ ,  $p < 0.001$  for adolescent anxiety;  $R^2 = 0.41$ ,  $F = 9.92$ ,  $p < 0.001$  for caregiver anxiety).

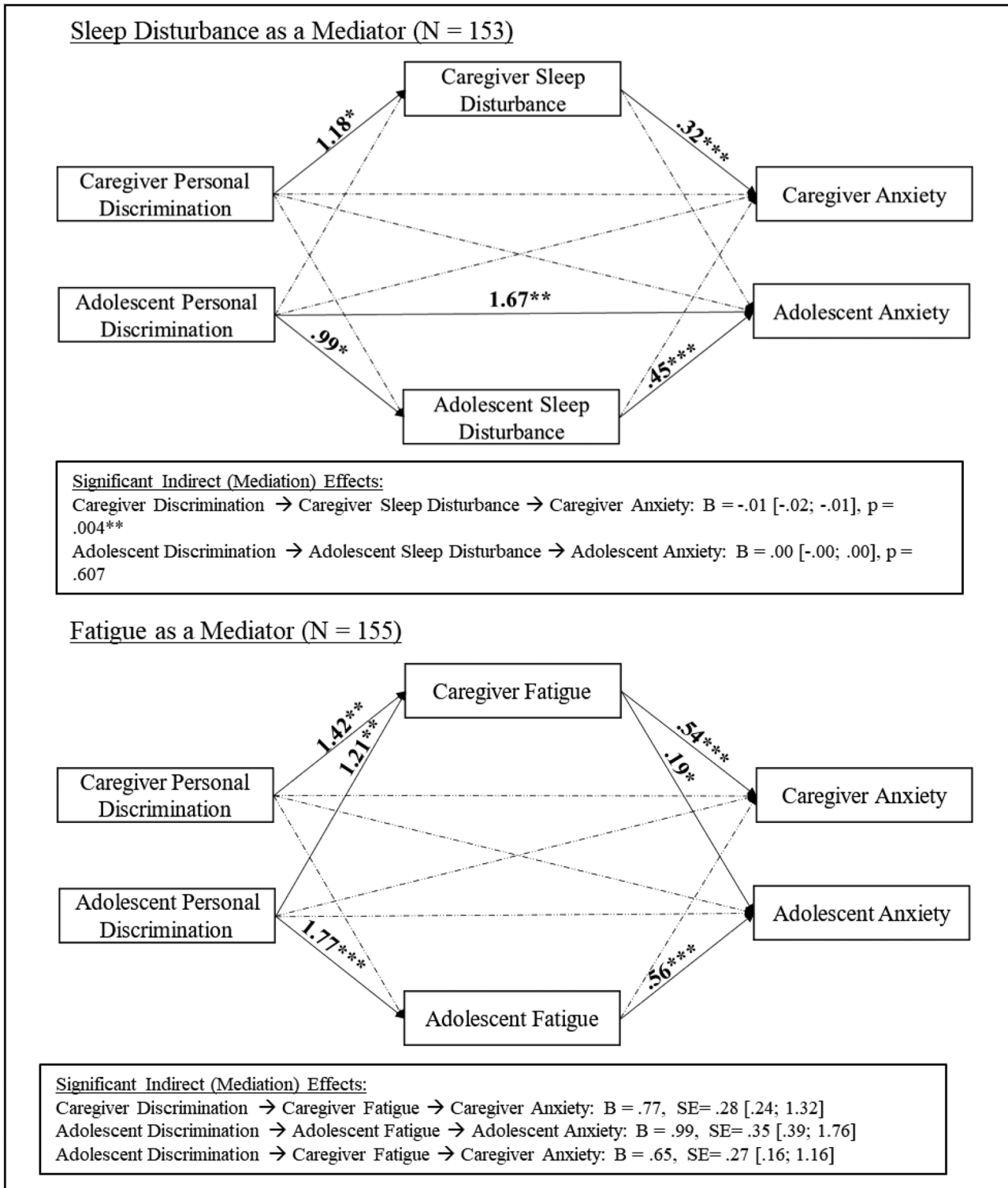
### Caregiver Actor Effects

As shown in Fig. 1 (additional details in Appendix), caregivers’ experiences of racial discrimination were not directly associated with their symptoms of anxiety in either model

**Table 2** Partial correlations of primary study variables while controlling for socio-demographic variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Caregiver Discrimination	-									
2. Adolescent Discrimination	-.02	-								
3. Caregiver Sleep Disturbance	0.20*	0.08	-							
4. Adolescent Sleep Disturbance	0.13	0.19*	0.01	-						
5. Caregiver Fatigue	0.25**	0.22*	0.43***	0.11	-					
6. Adolescent Fatigue	0.02	0.30***	0.15	0.46***	-0.007	-				
7. Caregiver Anxiety	0.17*	0.09	0.40***	0.09	0.58***	0.04	-			
8. Adolescent Anxiety	0.07	0.30***	0.10	0.37***	0.19*	0.51***	0.15	-		
9. Caregiver Depression	0.17*	0.14	0.48***	0.21*	0.57***	0.04	0.70**	0.17*	-	
10. Adolescent Depression	0.13	0.20*	0.18*	0.31***	0.16	0.41***	0.13	0.63***	0.19*	-
M	3.99	2.70	50.10	46.51	47.73	48.27	52.78	50.15	49.84	48.63
SD	1.61	1.62	9.53	8.45	9.14	9.48	8.54	11.21	8.67	10.06

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$



Note: The box summarizes the significant mediation effects. Models controlled for caregiver and adolescent gender and chronic disease status, household income, and caregiver education.  
 $*p < .05$ ,  $**p < .01$ ,  $***p < .001$ .

Fig. 1 APIMeM Predicting Caregiver and Adolescent Anxiety



testing sleep disturbance or fatigue as mediators ( $\beta = 0.50$ ,  $SE = 0.41$ ,  $p = 0.22$ ;  $\beta = 0.09$ ,  $SE = 0.37$ ,  $p = 0.79$ , respectively). However, there were significant indirect effects of caregiver experiences of racial discrimination to caregiver anxiety through caregiver sleep disturbance ( $\beta = 0.38$ ,  $SE = 0.18$ , [0.05, 0.76]) and caregiver fatigue ( $\beta = 0.77$ ,  $SE = 0.28$ , [0.24, 1.32]). Specifically, caregivers who reported greater experiences of racial discrimination reported higher levels of greater sleep disturbance ( $\beta = 1.18$ ,  $SE = 0.47$ ,  $p = 0.01$ ) and fatigue ( $\beta = 1.42$ ,  $SE = 0.45$ ,  $p = 0.002$ ), both of which were independently associated with more symptoms of anxiety ( $\beta = 0.32$ ,  $SE = 0.7$ ,  $p < 0.001$ ;  $\beta = 0.54$ ,  $SE = 0.07$ ,  $p < 0.001$  respectively). Finally, there was no indirect effect of caregiver experiences of racial discrimination to caregiver anxiety through adolescent sleep disturbance ( $\beta = -0.002$ ,  $SE = 0.07$ , [-0.17, 0.14]) or through adolescent fatigue ( $\beta = 0.01$ ,  $SE = 0.04$ , [-0.08, 0.10]).

### Adolescent Actor Effects

In the fatigue model, the direct effect of adolescents' experiences of racial discrimination on their symptoms of anxiety was not significant ( $\beta = 0.86$ ,  $SE = 0.52$ ,  $p = 0.10$ ). However, in the sleep disturbance model, adolescent experiences of racial discrimination were significantly associated with their anxiety symptoms ( $\beta = 1.67$ ,  $SE = 0.53$ ,  $p = 0.002$ ). There were indirect effects of adolescent experiences of racial discrimination on adolescent anxiety through adolescent sleep disturbance ( $\beta = 0.45$ ,  $SE = 0.23$ , [0.07, 0.95]) and adolescent fatigue ( $\beta = 0.99$ ,  $SE = 0.35$ , [0.39, 1.76]). Specifically, adolescents' greater experiences of racial discrimination were associated with higher levels of adolescent sleep disturbance ( $\beta = 0.99$ ,  $SE = 0.41$ ,  $p = 0.02$ ) and adolescent fatigue ( $\beta = 1.77$ ,  $SE = 0.46$ ,  $p = 0.0002$ ), which in turn, were independently associated with greater adolescent symptoms of anxiety ( $\beta = 0.45$ ,  $SE = 0.11$ ,  $p < 0.001$ ;  $\beta = 0.56$ ,  $SE = 0.09$ ,  $p < 0.001$  respectively). Finally, there was no indirect effect of adolescent experiences of racial discrimination to adolescent anxiety through caregiver sleep disturbance ( $\beta = -0.005$ ,  $SE = 0.06$ , [-0.13, 0.13]) or through caregiver fatigue ( $\beta = 0.23$ ,  $SE = 0.16$ , [-0.01, 0.61]).

### Caregiver Partner Effects

There was no direct partner effect of adolescent's experiences of racial discrimination on caregiver symptoms of anxiety for the model testing sleep disturbance ( $\beta = -0.14$ ,  $SE = 0.36$ ,  $p = 0.70$ ) or fatigue ( $\beta = -0.14$ ,  $SE = 0.36$ ,  $p = 0.70$ ). However, there was an indirect effect of adolescent racial discrimination on caregiver symptoms of anxiety through caregiver fatigue ( $\beta = 0.65$ ,  $SE = 0.26$ , [0.16, 1.16]). That is, adolescent experiences of racial discrimination were

associated with greater fatigue among their caregivers ( $\beta = 1.21$ ,  $SE = 0.44$ ,  $p = 0.006$ ), which was then associated with greater caregiver anxiety ( $\beta = 0.54$ ,  $SE = 0.07$ ,  $p < 0.001$ ). There was no indirect partner effect of adolescent racial discrimination on caregiver anxiety via adolescent sleep disturbance ( $\beta = -0.003$ ,  $SE = 0.09$ , [-0.22, 0.17]), adolescent fatigue ( $\beta = 0.10$ ,  $SE = 0.13$ , [-0.11, 0.41]) or caregiver sleep disturbance ( $\beta = 0.15$ ,  $SE = 0.16$ , [-0.15, 0.47]).

### Adolescent Partner Effects

There were no significant direct or indirect effects of caregivers' experiences of racial discrimination on adolescents' anxiety symptoms.

### APIMeM Predicting Depression

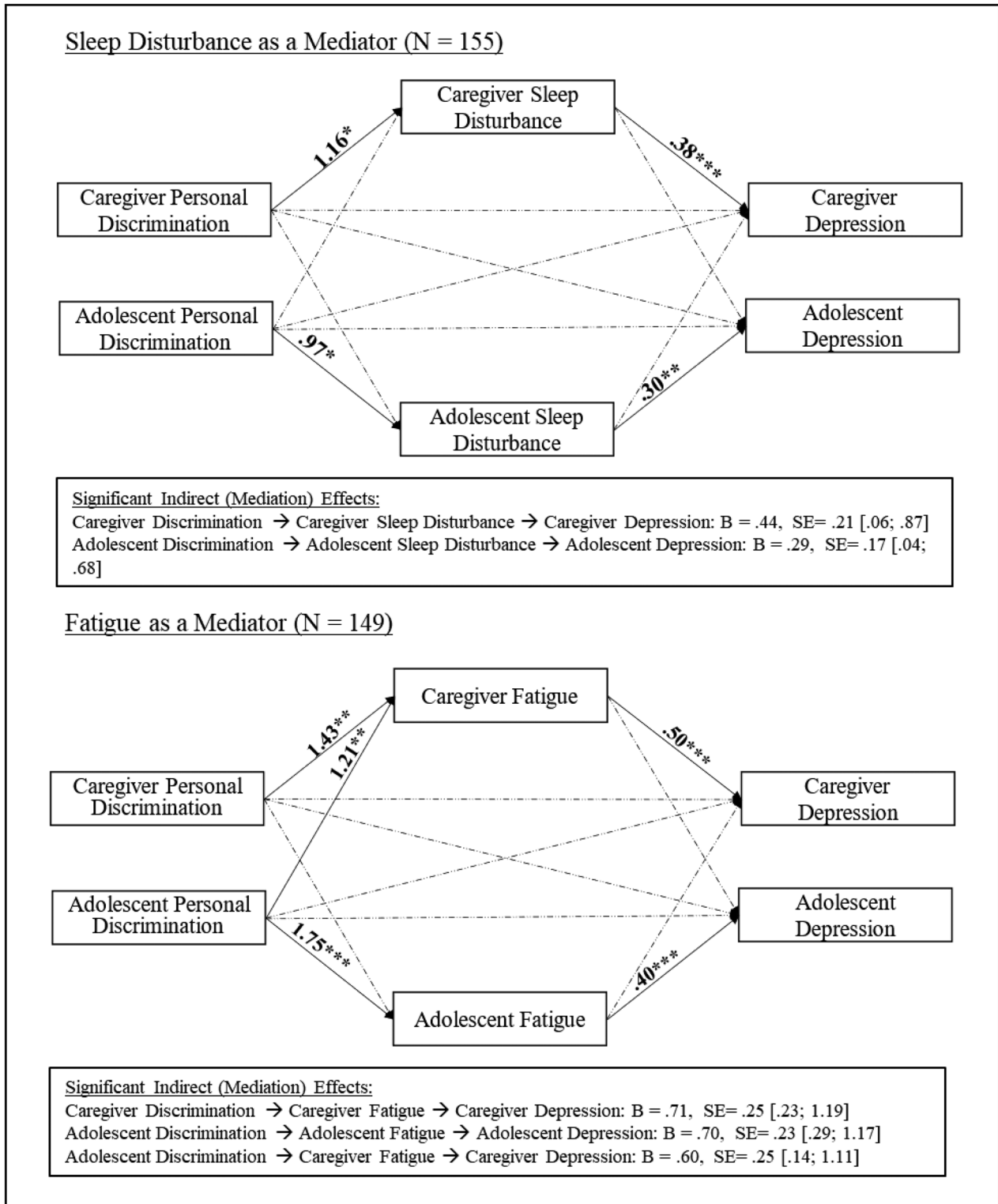
The APIMeM predicting depression via sleep disturbance was significant ( $R^2 = 0.27$ ,  $F = 5.24$ ,  $p < 0.001$  for adolescent depression;  $R^2 = 0.40$ ,  $F = 9.39$ ,  $p < 0.001$  for caregiver depression). The APIMeM predicting adolescent and caregiver depression via fatigue was also significant ( $R^2 = 0.33$ ,  $F = 6.67$ ,  $p < 0.001$  for adolescent depression;  $R^2 = 0.45$ ,  $F = 11.51$ ,  $p < 0.001$  for caregiver depression).

### Caregiver Actor Effects

As Fig. 2 shows (see Appendix for additional information), there was no direct effect of caregivers' experiences of racial discrimination and their symptoms of depression in either model ( $\beta = 0.33$ ,  $SE = 0.37$ ,  $p = 0.38$ ;  $\beta = 0.15$ ,  $SE = 0.36$ ,  $p = 0.69$ , respectively). There were significant indirect effects of caregiver experience of racial discrimination on caregiver depression via their sleep disturbance ( $\beta = 0.44$ ,  $SE = 0.21$ , [0.06, 0.87]) and their fatigue ( $\beta = 0.71$ ,  $SE = 0.25$ , [0.23, 1.19]). More specifically, caregivers who reported greater experiences of racial discrimination reported greater sleep disturbance ( $\beta = 1.17$ ,  $SE = 0.48$ ,  $p = 0.02$ ) and higher levels of fatigue ( $\beta = 1.43$ ,  $SE = 0.45$ ,  $p = 0.002$ ), both of which were independently associated with more symptoms of depression ( $\beta = 0.38$ ,  $SE = 0.06$ ,  $p < 0.001$ ;  $\beta = 0.50$ ,  $SE = 0.07$ ,  $p < 0.001$  respectively). Finally, there was no significant indirect effect of caregiver experience of racial discrimination and caregiver depression via adolescent sleep disturbance ( $\beta = 0.06$ ,  $SE = 0.08$ , [-0.05, 0.26]) or adolescent fatigue ( $\beta = 0.005$ ,  $SE = 0.04$ , [-0.08, 0.08]).

### Adolescent Actor Effects

Adolescents' experiences of racial discrimination were not directly associated with their symptoms of depression in



Note. The box summarizes the significant mediation effects. Models controlled for caregiver and adolescent gender and chronic disease status, household income, and caregiver education. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Fig. 2 APIMeM Predicting Caregiver and Adolescent Depression

either model ( $\beta = 0.83$ ,  $SE = 0.47$ ,  $p = 0.08$ ;  $\beta = 0.29$ ,  $SE = 0.48$ ,  $p = 0.54$ , respectively). However, there were indirect effects of adolescent experiences of racial discrimination on adolescent depression through their sleep disturbance ( $\beta = 0.29$ ,  $SE = 0.17$  [0.04, 0.68]) and their fatigue ( $\beta = 0.70$ ,  $SE = 0.23$  [0.29, 1.17]). Specifically, adolescents' greater experiences of racial discrimination were associated with greater sleep disturbance ( $\beta = 0.97$ ,  $SE = 0.41$ ,  $p = 0.02$ ) and higher levels of fatigue ( $\beta = 1.75$ ,  $SE = 0.46$ ,  $p = 0.0002$ ), which in turn were independently associated with greater symptoms of anxiety ( $\beta = 0.30$ ,  $SE = 0.09$ ,  $p = 0.002$ ;  $\beta = 0.40$ ,  $SE = 0.08$ ,  $p < 0.001$ , respectively). Finally, there was no indirect effect of adolescents' experience of racial discrimination and adolescents' depression via caregivers' sleep disturbance ( $\beta = 0.05$ ,  $SE = 0.07$ , [-0.06, 0.23]) or caregivers' fatigue ( $\beta = 0.16$ ,  $SE = 0.11$ , [-0.006, 0.42]).

### Caregiver Partner Effects

There was no direct effect of adolescents' experiences of racial discrimination on caregiver symptoms of depression in either model ( $\beta = 0.44$ ,  $SE = 0.36$ ,  $p = 0.23$ ;  $\beta = 0.06$ ,  $SE = 0.37$ ,  $p = 0.87$ , respectively). There was an indirect effect of adolescent racial discrimination on caregiver symptoms of depression through caregiver fatigue ( $\beta = 0.60$ ,  $SE = 0.25$ , [0.14, 1.11]). Adolescent experiences of racial discrimination were associated with high caregiver fatigue ( $\beta = 1.21$ ,  $SE = 0.45$ ,  $p = 0.002$ ), which was then associated with more caregiver symptoms of depression ( $\beta = 0.50$ ,  $SE = 0.07$ ,  $p < 0.001$ ). There was no indirect effect of adolescent racial discrimination on caregiver anxiety via adolescent sleep disturbance ( $\beta = 0.08$ ,  $SE = 0.09$ , [-0.07, 0.27]), adolescent fatigue ( $\beta = 0.06$ ,  $SE = 0.13$ , [-0.17, 0.34]), or caregiver sleep disturbance ( $\beta = 0.18$ ,  $SE = 0.18$ , [-0.17, 0.56]).

### Adolescent Partner Effects

There was no evidence to support any direct or indirect partner effects of caregivers' experiences of racial discrimination on adolescents' symptoms of depression.

### Additional Exploratory Analyses

To investigate the absence of direct actor effects of racial discrimination on internalizing symptoms among both adolescents (with the exception of Model 1) and caregivers, we explored APIM models predicting internalizing symptoms without including sleep factors (See Appendix for additional information). We found significant adolescent and caregiver actor effects such that their experiences of racial discrimination were associated with their own symptoms of anxiety and depression, suggesting that caregiver sleep disturbance and fatigue fully mediated the associations of caregiver

discrimination on both caregiver anxiety and depression; adolescent sleep disturbance fully mediated the association of adolescent discrimination and adolescent depression; and that adolescent fatigue fully mediated the association of adolescent discrimination and both adolescent anxiety and depression. However, we did not find direct partner effects of caregiver discrimination on adolescent internalizing symptoms or adolescent discrimination on caregiver internalizing symptoms. Of note, these models exclude participants who were missing sleep disturbance data.

## Discussion

Examining how racial discrimination contributes to mental health is essential, given the rising rates of internalizing symptoms and suicide among Black adolescents and adults. The current study used the APIMeM to examine sleep disturbance and fatigue as mediators of the association between racial discrimination and internalizing symptoms among Black caregiver-adolescent dyads. Using the APIMeM enabled us to explore sleep and fatigue as mechanisms through which adolescents' and caregivers' experiences of racial discrimination predict their internalizing symptoms both independently and dyadically, accounting for the interdependence of the caregiver-adolescent relationship. This study is the first to explore the dyadic associations of racial discrimination, sleep, and internalizing symptoms among Black adolescents and their caregivers. Overall, findings suggest that self-reported sleep disturbance and fatigue play a role in the association between racial discrimination and the internalizing symptoms of Black adolescents and adults. There were also significant partner effects among the caregiver-adolescent dyads, suggesting the influence of family member experiences of racial discrimination on internalizing symptoms, particularly for caregivers.

### Actor Effects

Adolescents' experiences of racial discrimination were indirectly associated with their anxiety and depression via their sleep disturbance and fatigue, suggesting that their experiences of racial discrimination may be related to disrupted sleep and daytime dysfunction, resulting in greater anxiety and depressive symptomatology. These findings are consistent with previous findings that poor sleep and daytime dysfunction mediated the association of racial discrimination and internalizing symptoms among racial/ethnic minority adolescents (Yip et al., 2022). The experience of discrimination is stressful and a significant source of chronic stress for many Black Americans (Berger & Sarnyai, 2014; Simons et al., 2018). The chronic experience of racial discrimination has been consistently associated with a dysregulated

hypothalamic-pituitary-adrenal axis (Clark et al., 1999; Lee et al., 2018) and heightened allostatic load (Miller et al., 2021), resulting in poor psychological and physical health outcomes. Disrupted sleep and fatigue may result from such strain of racial discrimination on the body of Black individuals, serving as a critical pathway through which racial discrimination contributes to internalizing symptoms.

Caregiver experiences of racial discrimination were also indirectly related via their experiences of sleep disturbance and fatigue. This is consistent with literature establishing the association of racial discrimination and sleep disturbance in Black adults (Davenport et al., 2021; Gaston et al., 2020; Grandner et al., 2012), as well as the literature proposing sleep as a mechanism through which racial discrimination influences health in Black adults (Chen & Yang, 2014; Grandner, 2017; Levy et al., 2016; Yang & Park, 2015). Moreover, these findings extend the previous sleep literature by demonstrating fatigue's important role in this relationship among Black adults.

### Partner Effects

Surprisingly, caregivers' experiences of racial discrimination did not influence their adolescents' outcomes. We found no direct or indirect effects of caregiver racial discrimination on adolescent internalizing symptoms. This is inconsistent with studies finding significant associations between Black caregivers' experiences of racial discrimination on the internalizing symptoms of their adolescents (Ford et al., 2013; Galán et al., 2022; Gibbons et al., 2004; Tran, 2014), although those studies did not account for the interdependence of the caregiver-child relationship. These findings also directly contrast those of the only other study using the APIM, which found that caregivers' experiences of racial discrimination directly influenced their adolescents' depression symptoms (Huynh et al., 2021). Of note, this previous study did not include Black individuals. It may be that Black caregivers who experience racial discrimination have learned not to share those experiences to protect their teens, who they may see as already being burdened by their own experiences of personal racial discrimination. This may limit the vicarious influence of caregivers' experiences of racial discrimination on adolescent sleep and internalizing symptoms. Additionally, we likely did not find associations between caregiver experiences and adolescent outcomes due to the majority of the caregivers identifying as women. Previous work suggests that fathers' discriminatory experiences are more likely to be associated with or exacerbate the association between adolescents' experiences with discrimination and depression (Hou et al., 2017; Park et al., 2018). Future studies should ensure that caregiver samples represent diverse gender identities to further explore the association between caregiver experiences of discrimination and their children's outcomes.

However, we found indirect partner effects for adolescents' experiences of racial discrimination and their caregivers' internalizing symptoms, highlighting the importance of adolescents' experiences on their caregivers' health. Adolescents' experiences of racial discrimination were associated with their caregivers' anxiety and depression through their caregivers' fatigue. Again, these findings contrast earlier findings that Latinx, Asian, and White adolescents' experiences of racial discrimination were not associated with their caregivers' internalizing symptoms (Huynh et al., 2021). Experiencing racial discrimination can be distressing when individually experienced and when experienced vicariously through those closest to us (Harrell, 2000). When Black adolescents share their experiences of racial discrimination with their caregivers, it may be distressing for their caregivers, leading to greater caregiver fatigue. This fatigue may subsequently be associated with more anxiety and depression among caregivers. While previous studies have demonstrated that racial discrimination experienced by Black youth impacts their caregivers' internalizing symptoms (Gibbons et al., 2004; Holloway & Varner, 2021), this study extended the literature by identifying caregiver fatigue as a critical mechanism through which this occurs.

Of note, we only found direct actor effects of the relationship between poor sleep (sleep disturbance & fatigue) and internalizing symptoms and no direct partner effects, such that adolescent sleep did not predict caregiver internalizing symptoms and caregiver sleep did not predict adolescent internalizing symptoms. This may indicate the strong relationship between individuals' own sleep and internalizing symptoms, and the independence of caregiver and adolescent sleep patterns. These findings may support the need to separately target Black caregiver and adolescent sleep patterns as part of sleep interventions.

### Limitations and Future Directions

Despite the strengths of this study, these results should be considered in light of some limitations and interpreted with caution. First, this study is limited to a cross-sectional design, and findings may be representative of a specific snapshot rather than the lifespan of the participants. The cross-sectional study design does not allow us to determine the temporal relationships among racial discrimination, sleep disturbance, fatigue, and internalizing symptoms. Sleep and internalizing symptoms may have a bidirectional relationship, meaning that sleep may not only negatively impact internalizing symptoms, but internalizing symptoms may be associated with poorer sleep and greater fatigue (Alvaro et al., 2013). Given that the determination of mediation involves examining causal processes that occur over time, the use of mediation in cross-sectional design may produce

biased estimates of indirect effects (Maxwell & Cole, 2007). However, we believe the strengths of this study (exploring associations of racial discrimination, sleep, and internalizing symptoms among adolescents and their caregivers both independently and dyadically) outweigh this limitation, particularly among Black individuals, an understudied population. Given elevated internalizing symptoms of both Black youth and adults, this study is timely in establishing how salient experiences may be associated with the mental health of Black families. Longitudinal studies are needed to confirm the influence of caregiver-adolescent experiences of racial discrimination on each other's internalizing symptoms and to confirm the mediating roles of fatigue and sleep disturbance.

Second, the sleep measures were limited to fatigue and sleep disturbance. Sleep is a multi-dimensional construct, and racial discrimination has been associated with various aspects of sleep. Although the sleep measures were self-report, the PROMIS item banks are well validated among pediatric and adult populations (Lai et al., 2011, 2013; Quinn et al., 2014; Yu et al., 2011); thus, using them in the current study will allow for future comparisons with other samples. Future studies should extend this study by including additional indicators of sleep, including objective measures such as actigraphy, to identify the various aspects of sleep that may serve as a pathway from racial discrimination to poor health. Identifying specific aspects of sleep may help inform targeted sleep interventions to improve health outcomes for Black individuals. Third, the data was collected in one state, and approximately 49% of our sample reported a household income at or below \$30,000, and 79% of our caregivers identified as women. To fully understand the dyadic associations of racial discrimination, sleep, and internalizing symptoms among Black families across the United States, future studies should include nationally representative samples of Black individuals from various communities, socioeconomic backgrounds, and gender identities. Moreover, while our study accounted for the additional influence of socio-demographic variables (e.g., gender, income, chronic disease status), we were unable to determine the potential moderating influence these variables have on the relationship between racial discrimination and internalizing symptoms among our sample. While it is essential to understand the pathway (i.e., mediating factor) through which racial discrimination influences the health of Black adolescents and their caregivers, it is also necessary to determine the factors that may modify (i.e., moderating factors) this association. Future studies should explore how various moderators, including socio-demographic characteristics, may impact the association of racism on health for Black individuals.

Future research can also build on this study's findings by examining how family conversations about racial discrimination may explain these relationships and be important

targets for interventions to reduce the effects of racial discrimination within Black families. There is also a need to examine protective factors that may reduce the role of racial discrimination in sleep and internalizing symptoms among Black families. Previous literature has suggested that racial socialization, the process through which children are taught about race and prepared for race-related experiences (Boykin & Toms, 1985), protects youth against the harmful influence of racial discrimination (Jones & Neblett, 2016). Racial socialization can involve discussions around coping with and navigating experiences of racial discrimination, which may help youth develop useful and relevant coping strategies that will offset the overall burden of racial discrimination on the health of family members. Research is needed to explore whether racial socialization can reduce the individual influence of adolescents' experiences of racial discrimination on their fatigue and internalizing symptoms and reduce the impact of their racial discrimination experiences on their caregivers' fatigue.

## Clinical Implications and Conclusion

The findings of this study have several clinical implications. First, these findings support the need for access to high-quality mental health services for Black adolescents and their caregivers that address racial discrimination and its possible mental health consequences. Often, adolescents with or at risk for depression or anxiety may be targeted with one of the gold-standard treatments, cognitive-behavioral therapy (CBT). CBT relies upon teaching the adolescent and their caregivers the origins of the internalizing symptoms and strategies for decreasing them (e.g., deep breathing and cognitive restructuring; Bennett et al., 2016). Most CBT programs do not address racial discrimination. However, there are family-based preventive interventions, such as the Strong African American Families intervention (Berkel et al., 2022), designed specifically for Black adolescents at risk for mental health issues that directly target racial socialization practices of the caregivers. Given the dyadic influences of racial discrimination on sleep and health outcomes, family-centered or family therapy-oriented approaches to mental health are needed. Such approaches would allow for targeting both adolescent and caregiver mental health in therapy, rather than the traditional CBT focus on the individual client. Also, our findings of the association of adolescent experiences with their caregiver's fatigue suggest that there is communication from adolescents to caregivers about their experiences of discrimination, which provides a foundation for family-based prevention and therapy.

Our findings also suggest the need for mental health services and support for Black caregivers specific to parenting in a society where discrimination will happen to their



children. Not only do caregivers need to help their children cope with experiences of racial discrimination, but they also need a safe space to receive support to cope with their children's and their own experiences of discrimination. Additionally, this study supports sleep, particularly fatigue, as a possible mechanism; therefore, intervention targets should emphasize reducing racial discrimination's impact on sleep and mental health outcomes among Black adolescents and adults. Sleep health interventions targeted to Black individuals should include an emphasis on coping with experiences of racial discrimination.

Of note, integrated interventions that simultaneously focus on sleep and mental health issues, including those using a family-based approach, may be particularly beneficial for Black families. For Black families, accessing separate mental health and sleep interventions for these interrelated issues is inefficient and hindered by a host of factors, including stigma (Hatzenbuehler et al., 2013), structural racism (Johnson et al., 2022; Kyere & Fukui, 2022) and the scarcity of mental health providers across the US (USAFacts, 2021). By creating interventions that target multiple health symptoms, we can increase the efficiency of our interventions as well as reduce the effects of stigma. For example, stigma related to seeking mental health treatment among Black individuals may be circumvented by integrating mental health interventions into those focused on sleep problems and other public health programs. And by offering integrated programs as part of or in partnership with systems that already target the health of Black communities, such as primary care settings, schools, faith-based organizations, and other public-serving entities, we can expand the reach and impact of the negative health consequences of racial discrimination.

The present study investigated the dyadic association of racial discrimination, sleep factors (sleep disturbance and fatigue), and internalizing symptoms (anxiety and depression) among Black adolescents and their caregivers. Interestingly, we found that both sleep and fatigue served as pathways through which racial discrimination contributed independently to internalizing symptoms among adolescents and adults. Additionally, while caregivers' experiences of racial discrimination were not associated with their adolescents' outcomes, adolescents' experiences of racial discrimination predicted their caregivers' fatigue, which was further associated with greater internalizing symptoms among their caregivers. The findings highlight fatigue as a critical mechanism through which racial discrimination manifests in the health of Black individuals. Also, our findings provide evidence for the need to examine racial discrimination's influence on Black individuals' health within their social contexts (e.g., family). Thus, future mental health and sleep interventions for Black individuals should emphasize addressing the health consequences of racial discrimination

while recognizing the important role family plays in this relationship.

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**Data Availability** We are opting not to include a data availability statement.

## Compliance with Ethical Standards

**Ethics Approval** This study was approved by Virginia Commonwealth University's Institutional Review Board.

**Informed Consent** Informed consent was obtained for all adult participants. Informed parental/guardian consent and informed assent was obtained for all participants under the age of 18.

**Conflicts of Interest** The authors have no competing interests to declare that are relevant to the content of this article.

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