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Daily Experiences of Discrimination and Ethnic/Racial Minority Adolescents' Sleep: The Moderating Role of Social Support

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Abstract

Using data from a 14-day diary study of 95 ethnic/racial minority adolescents, this study examined the within-person effect of daily discrimination tied to multiple social identities on adolescents' daily sleep quality and duration and whether daily support from important others (i.e., friends, parents, and teachers) would moderate these links. We found that daily discrimination was a low-frequency, but high-impact event associated with shorter sleep duration. Results pointed to the nuanced roles of daily support. Support from *friends* was negatively related to sleep duration, whereas support from *parents* appeared to be promotive to sleep quality. Support from *teachers* protected adolescents from the negative effects of discrimination on sleep duration. Implications for future interventions targeting sleep disturbances associated with discrimination are discussed.

Keywords

discrimination; adolescents; sleep; social support

Discrimination is woven into the fabric of the everyday life of ethnic minorities in the United States (U.S.). A national survey suggests that as many as 76% of Black, Asian, and Latino/a/x experience some form of ethnic/racial discrimination (Horowitz, Brown, & Cox, 2019). The detrimental effects of ethnic/racial discrimination as well as general unfair treatment on individuals' health are well-established (Benner et al., 2018; Pascoe & Smart Richman, 2009) and adolescents are particularly vulnerable to its deleterious effects (Schmitt, Branscombe, Postmes, & Garcia, 2014). Emerging research has documented the biological toll of ethnic/racial discrimination and other unfair treatment on ethnic/racial minority youth' health, such as disrupting sleep duration and quality (Fuller-Rowell et al.,

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CONFLICT OF INTEREST

The authors report no conflict of interests.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

2020; Yip, Cheon, et al., 2020). Given that sleep is an important developmental behavior during adolescence and that sleep problems have negative consequences for adolescents' overall well-being (El-Sheikh, Kelly, Buckhalt, & Hinnant, 2010), it is imperative to gain a deeper understanding of how ethnic/racial minority adolescents' experiences of discrimination tied to their various intersecting identities are associated with sleep.

Prior studies have mostly focused on the between-person associations between discrimination and sleep and found that ethnic/racial minority adolescents who report high levels of ethnic/racial discrimination tend to experience more sleep disturbance (Fuller-Rowell et al., 2017; Huynh & Gillen-O'Neel, 2016; Yip, Cham, Cham, Wang, & El-Sheikh, 2020). Although these works provide insights into the aggregate relations between ethnic/racial discrimination and sleep, they neglect to account for *daily* fluctuations in experiences of discrimination and its effects on sleep—the central foci of this study. Unlike major life events, daily stressors like general forms of discrimination accumulate over time and may lead to more serious stress reactions, including anxiety, depression, and persistent sleep disruptions (Almeida, 2005; Wang & Yip, 2020; Yip, Cheon, et al., 2020). Although social support from important others in ethnic/racial minority adolescents' lives can play a buffering role in the face of ethnic/racial discrimination (DeGarmo & Martinez, 2006; Gonzalez, Stein, Kiang, & Cupito, 2014; Huynh & Gillen-O'Neel, 2016), these supports are seldomly examined in a way that captures daily variations. Moreover, the different sources of social support have rarely been examined simultaneously to distinguish their unique protective roles (Pascoe & Smart Richman, 2009). Addressing these salient gaps in the literature, this study employs a daily diary approach with an ethnically/racially diverse sample of adolescents to examine: (a) whether discrimination tied to multiple identities (i.e., race, sexual minority status, socioeconomic status, weight, or other) are associated with adolescents' daily sleep quality and duration and (b) the extent to which daily support from important others in adolescents' lives (i.e., friends, parents, and teachers) attenuates the detrimental consequences of discrimination on sleep.

Discrimination and Sleep

Sleep is a basic biological need and critical to adolescents' development. Poor sleep—characterized by short sleep duration and low sleep quality—compromises adolescents' academic performance, cognitive functioning, and physical and mental health (Buckhalt, El-Sheikh, & Keller, 2007; Dewald, Meijer, Oort, Kerkhof, & Bögels, 2010; El-Sheikh et al., 2010). There are also salient ethnic/racial disparities in sleep: Black and Latino/a/x adolescents report higher levels of sleep disturbance relative to their White counterparts (Fuller-Rowell et al., 2017). According to the stress and sleep disparities model (Levy, Heissel, Richeson, & Adam, 2016), one of the central contributors to these sleep disparities is the discrimination experiences that ethnic/racial minorities frequently encounter. Ethnic/racial discrimination experiences are prevalent in the everyday life of ethnic/racial minority adolescents (Benner et al., 2018), which suggests that disparities in sleep disturbance begin long before adulthood.

Ethnic/racial minority adolescents' discriminatory experiences are not confined to those stemming from ethnicity or race, and other identities may be more salient during

adolescence or in certain contexts of adolescents' lives (Byrd & Carter Andrews, 2016). For example, ethnic/racial minority adolescents may experience discrimination because of their sexual minority status (Mallory & Russell, 2021), socioeconomic status (Grollman, 2012), and weight (Rosenthal et al., 2015). A discrimination measure such as the Every Day Discrimination Scale (EDS) allows researchers to capture social exclusion associated with a variety of identity groups (Goosby, Cheadle, Strong-Bak, Roth, & Nelson, 2018). Adolescents' intersecting identities can affect the frequency and type of discriminatory events they encounter and may increase the biological toll that discrimination has on their well-being (Huynh, Guan, Almeida, McCreath, & Fuligni, 2016; Majeno, Tsai, Huynh, McCreath, & Fuligni, 2018).

A burgeoning of empirical research has shown the association between discrimination and sleep dysfunction (Goosby et al., 2018; Huynh & Gillen-O'Neel, 2016; Majeno et al., 2018; Slopen, Lewis, & Williams, 2016; Zeiders, Updegraff, Kuo, Umaña-Taylor, & McHale, 2017). A systematic review of 17 studies with mostly adult samples, for example, found that discrimination based on broad social exclusionary and unfair treatment situations was consistently associated with poor sleep outcomes (Slopen et al., 2016). Recent research suggests that a relation between discrimination and sleep dysfunction is not limited to adults. For example, Huynh and Gillen-O'Neel (2016) found that ethnic/racial discrimination was associated with worse sleep quality and reduced sleep duration among a sample of Latino/a/x and Asian American late adolescents. Similarly, using a longitudinal design, ethnic discrimination was prospectively related to sleep disturbance among Mexican-origin young adults (Zeiders et al., 2017). Further, Majeno et al. (2018) found that both ethnic and nonethnic discrimination (i.e., discrimination tied to sex, age, or height/weight) was associated with worse sleep quality, and ethnic discrimination was related to shorter sleep duration among a racially and ethnically diverse sample of adolescents.

Many studies, however, have focused on *between-person* associations, leaving how an individual's daily sleep is affected by daily fluctuations in experiences of discrimination relatively unexplored (Ong & Burrow, 2017). According to the stress and adjustment theory (Abela & Hankin, 2007), it is important to examine the *within-person* associations between discrimination and sleep, as an individual's capacity to adjust to stress is dependent on the stress load they are experiencing. Supporting this notion, Goosby et al. (2018) found that biracial, Black, or White youth with higher *average* discrimination based on a range of social exclusionary and unfair treatment situations reported worse *average* sleep, but *daily* discrimination was associated with better sleep the day of the report. The authors speculated that adolescents may be engaging in "escape to sleep" disengagement coping to manage the stress of experiencing discrimination. Other research that has examined *within-person* associations found that daily experiences of racial and ethnic discrimination (Fuller-Rowell et al., 2020; Yip, Cham, et al., 2020) and general unfair treatment (Yip, Cheon, et al., 2020) are associated with poorer sleep quality, shorter sleep duration, and more sleep problems among ethnic/racial minority adolescents and young adults. Using a daily diary design, this study extends these findings by examining the daily within-person associations between discrimination and sleep and the moderating role of daily contextual buffers: social support from friends, parents, and teachers.

Social Support as a Buffer against Discrimination

Although discrimination is clearly detrimental to health, not all adolescents are equally susceptible to its negative influence. Risk and resilience theory (Fergus & Zimmerman, 2005) proposes a strength-based approach that focuses on the assets and resources in adolescents' lives that allow them to adequately cope with risks. While assets reside within the adolescent (e.g., competence, self-efficacy), resources are external and emphasize the social influences with adolescents' environments that can support well-being in the face of stress. Contextual resources such as social support can promote assets like competence and coping in adolescents and may protect them from the negative effects of stressors such as discrimination. Pascoe and Richman's (2009) meta-analysis documented mixed effects of the role of social support in the link between perceived discrimination and physical health, highlighting the need for additional research to clarify types and sources of support that are most beneficial.

There are three major sources of support in the everyday life of adolescents: friends, parents, and teachers. Support from these sources has been found to benefit adolescents' socioemotional and physical well-being (Luthar, 2006) and buffer the negative effects of discrimination (Adams, Santo, & Bukowski, 2011; Brody et al., 2014; Hershberger, Zapolski, & Aalsma, 2016). For example, support from adults and peers was found to mitigate the negative effects of discrimination on cigarette use among juvenile offenders (Hershberger et al., 2016). Similarly, Brody et al. (2014) found that support from parents and peers buffered the impact of perceived discrimination on biological stress reactions among African American late adolescents living in the rural South. Likewise, peer support attenuated the link between discrimination and depressive symptoms among Latino/a/x middle adolescents (Gonzalez et al., 2014). Support from teachers was positively associated with feelings of school belonging (Gonzalez et al., 2014) and sleep quality (Delaruelle, Dierckens, Vandendriessche, Deforche, & Poppe, 2021). High levels of teacher support were also found to buffer the negative association between in-school racial discrimination from teachers and adolescents' academic persistence (Gale, 2020) and weaken the relation between peer racial discrimination and self- and peer-reported relational aggression (Wright & Wachs, 2019).

These studies, however, were limited in two ways. First, most studies either did not differentiate the sources of support or did not examine the three types of support providers simultaneously, leaving the relative contributions of different sources of support unexplored. As an exception, one prior study examined the moderating effects of social support from friends, parents, and teachers simultaneously and found that parent support, in particular, buffered the negative effects of discrimination on academic outcomes among Latino/a/x adolescents (DeGarmo & Martinez, 2006). The salient role of parent support documented in this study may be partly due to the fact that family connectedness is highly valued in Latino/a/x culture (Stein et al., 2014), leaving open the question of whether family support is particularly salient in a more ethnically/racially diverse sample of youth or whether support from friends and teachers is also protective in the face of discrimination. Middle adolescence is a developmental period in which the roles of friends, parents, and teachers change as adolescents seek greater independence, explore their intersecting identities, and

contemplate their future prospects (Benner, 2011). Identifying the differentiated roles and relative contributions of various support providers in adolescents' life is important for developing timely and effective intervention programs to better promote the well-being of ethnic/racial minority adolescents, especially in the face of discrimination.

Second, most of these studies examined social support with either retrospective measures or measures that assess general levels of support. However, in the social support literature, there is a well-established paradox: general or global perceptions of social support (i.e., my parents are supportive of me) are nearly always associated with beneficial outcomes including better physical and mental health, however, instances of social support (i.e., my parents gave me support today) are often associated with null or negative outcomes, particularly negative mood (Gleason & Iida, 2015). Given that receiving support can vary on a day-to-day basis and that daily and general support appear to be different constructs, it is important to investigate the daily process of social support and the role it has in buffering the detrimental effects of discrimination. This study seeks to compare the potential buffering roles of daily support from friends, parents, and teachers on the link between discrimination and sleep among ethnic/racial minority adolescents.

CURRENT STUDY

Using 14-day daily diary data, this study examined the daily processes linking discrimination and sleep in an ethnically/racially diverse adolescent sample. The study had two central aims. First, we examined whether daily experiences of discrimination tied to race, sexual minority status, socioeconomic status, weight, or other identities were associated with adolescents' daily sleep duration and quality. We hypothesized that on days in which adolescents experienced discrimination, they would report shorter sleep duration and worse sleep quality that evening, consistent with prior research on discrimination and sleep. Second, we examined the extent to which daily support from friends, parents, and teachers attenuated the detrimental consequences of discrimination on sleep. We hypothesized that daily support from friends, parents, and teachers would serve to mitigate the negative effects of daily discrimination on sleep outcomes. Given the limited research examining the moderating roles of support from the three sources simultaneously, we did not make specific hypotheses on which source would be most salient in buffering the negative effects of discrimination.

METHOD

Participants

From 2017 to 2020, 1010 adolescents from 13 middle schools in the southern United States. participated in a three-wave longitudinal study entitled *Preventing Inequalities in School Climate and Educational Success (PISCES) Project* that examined the influence of discrimination on adolescents' development. During Fall 2018, 161 participants were randomly invited to participate in a 14-day diary study. As the focus of the study is on discrimination experiences tied to multiple social identities among ethnic/racial minority adolescents, White participants were excluded, which resulted in an analytic sample of 95 ethnic/racial minority participants (51% Latino/a/x/a, 18% Asian, 8% Black, 23% biracial;

59% female). Approximately 35% of the participants were in 9th grade and 65% were in 10th grade during the daily diary study. Most students (87%) were born in the United States, but approximately half of their fathers (53%) and mothers (51%) were foreign-born. Around half of the students' parents (53%) had at least an associate degree. Additional demographic information appears in Table 1.

Procedures

Participants in the larger longitudinal study who had parental permission to participate in future waves of data collection and indicated an interest in participating in the daily diary portion of the project were approached via text messages, phone calls, and emails. Adolescents who agreed to participate needed to have access to a valid email address on an internet-enabled device (e.g., smart-phone, tablet, computer). Although researchers were prepared to provide these devices to participants, no participants requested them. Participants received an individualized Qualtrics link via email each afternoon at 3:30 pm and the link expired at 3:30 a.m. the next day. To increase the completion rate, research staff contacted adolescents who had not yet completed the survey by 8:00 pm via text message or phone call. A final nightly reminder email was sent at 9:30 p.m. to all students who had not yet completed that day's survey. Participants who completed at least 3 daily diary surveys were paid \$35 upon completion of the study. To further encourage daily participation, adolescents who completed at least 12 out of the 14 diary surveys were entered in a raffle to win an additional \$25. All procedures were reviewed and approved by the authors' Institutional Review Board.

Daily compliance was high among the analytical sample ($M = 12.61$ completed surveys, $SD = 2.21$). Adolescents ranged in the number of diaries they completed from 3 ($n = 2$) to all 14. Approximately 82% of participating students ($n = 78$) completed at least 12 out of 14 days and almost half (47%; $n = 45$) completed all 14 daily diary surveys. Given that the measure for social support from teachers was only available during weekdays, only weekday data were included in the analyses, which resulted in 950 potential data points in the study (95 participants 9×10 days).

Measures

Daily discrimination.—The daily discrimination measure was adapted from the Everyday Discrimination Scale (EDiS; Williams, Yu, Jackson, & Anderson, 1997). Adolescents responded daily to four yes (1) or no (0) items that assessed whether they experienced a discriminatory event (i.e., being picked on or treated with less respect) by friends, teachers, online, and outside school (e.g., at shops, at restaurants, and by police). Adolescents were also asked to identify the main reason for each discriminatory event they experienced (i.e., race/ethnicity, money, sexual orientation, weight, or other). A sample question was “*Today, I was picked on or treated with less respect by other students at this school.*” On average, adolescents reported 0.09 days ($SD = 0.16$) in which they experienced at least one discriminatory event over the 14-day study period. This is consistent with other research that has found discrimination to be a low-frequency event among adolescents and young adults (Goosby et al., 2018; Yip, Cheon, et al., 2020; Zeiders, 2017; Zeiders et al., 2017). Therefore, a dichotomous variable was created representing whether adolescents

experienced discrimination in any context, by any perpetrator, and for any reason on that day (0 = No discrimination, 1 = Discrimination; Yip, Cheon, et al., 2020).

Daily support.—Daily support was assessed with three dichotomous items related to whether adolescents got “*help, advice, or support*” from their friends, parent(s), and teachers (1 = *yes*, 0 = *no*).

Daily sleep.—Sleep duration was calculated from two items. The first item asked, “About what time did you go to sleep last night?” with 14 response options in half-hour increments ranging from “before 8:30 pm” to “after 2 am.” The second item asked, “About what time did you wake up this morning?” with 20 response options in half-hour increments ranging from “before 5 am” to “after 2 pm.” To calculate sleep duration, the number of hours elapsed between bedtime and wake-up time was calculated. The general nature of the response options at the two ends of the response scale (e.g., after 2 am, before 8:30 pm) resulted in missing data in the calculated sleep duration variable. To reduce missingness, we top-coded sleep duration to “10 hr or more” and bottom-coded the sleep duration to “5 hr or less.” The choice of 5- and 10-hr thresholds were intentional as the American Academy of Sleep Medicine (Paruthi et al., 2016b) notes that sleeping 5 hr or less or 10 hr or more is considered as maladaptive sleep behavior. The recoded sleep duration variable was normally distributed (kurtosis = -0.63 , skewness = -0.26). Sleep quality was assessed with a single daily item (i.e., “*how well did you sleep last night?*”) on a 5-point scale ranging from 0 (*very bad*) to 4 (*very good*). Because adolescents responded to sleep quality and duration questions about the previous day, lagged variables were created to indicate same-day sleep duration and quality. This resulted in a reduction of valid sleep data points.

Covariates.—At the daily level, and as recommended by Bolger and Laurenceau (2013) and others (Kiang & Buchanan, 2014), we controlled for confounding in the within-subject relations related to the passage of time by including a day variable centered around the midpoint of the diary period. At the person level, we controlled for adolescent sex (1 = *female*, 0 = *male*), grade level (1 = *9th grade*, 0 = *10th grade*), race (Latino/a/x was the reference group), and nativity (1 = *U.S.-born*, 0 = *foreign-born*) because these variables are known to be associated with adolescent sleep outcomes (Guedes et al., 2016; Kann et al., 2018; Yip, Cheon, et al., 2020). Parental education was not included as a covariate because of a high rate of missing data (14%).

Analysis Plan—Multilevel modeling (MLM) was used to analyze daily-diary data nested within individuals. We estimated two-level linear models to consider both the student level (*level 2*) and the day level (*level 1*) using SAS PROC MIXED (version 9.4; SAS Institute, 2020). At level 1, we included predictors of daily discrimination and daily support from friends, parents, and teachers. Following the recommended statistical procedures for examining within-person effects (Bolger & Laurenceau, 2013), we also included variables to capture the between-person (BP) effects. That is, we included between-person-centered discrimination and support variables to adjust for possible differences between participants (e.g., whether participants who report high levels of discrimination on average had worse sleep). The between-person centered variables were calculated by subtracting the grand

mean (i.e., the means of all participant means) from each participant's average across the study period.

To examine the moderating effect of support, interaction terms between daily discrimination and daily support from friends, parents, and teachers were included. For significant interactions, contrast analyses were conducted to examine whether the coefficient between daily discrimination and sleep differed by whether the student received support on that day. Same-day sleep duration and quality were analyzed in separate models. In all analyses, a first-order autoregressive AR (1) error structure was used to adjust for the autocorrelation of the outcome variables that were adjacent in time. We also included adolescents' sex, grade level, race, nativity, and study day as covariates.

RESULTS

Descriptive Statistics

Participants reported between 0 and up to 7 discriminatory events during the study period, with 34% of the students reporting at least one discriminatory experience during the study period. Across the reported discrimination events, most discriminatory experiences were perpetrated by peers (60%) and attributed most frequently to an identity other than race, socioeconomic status, sexual orientation, or weight (44%), followed by racial discrimination (18%). Among the discriminatory experiences that were attributed to other identities ($N = 48$), we qualitatively coded the incidents that had text responses ($n = 46$) based on a coding scheme developed using an inductive coding approach. Results showed that 26% of these discriminatory experiences were attributed to physical appearance (e.g., voice, body, height), 15% were attributed to mental health (e.g., depression), and another 15% were attributed to bullying, followed by age (7%) and eating behaviors (7%). The full description of results from the qualitative coding can be found in Table S1.

On average, students in this sample slept 7.73 hr per night ($SD = 0.89$ hr) and reported sleeping *okay* ($M = 2.42$, $SD = 0.64$) during the weekdays in this study. For support, participants reported receiving support between 0 and up to 10 days across the study period for each source. Most students reported receiving at least one day of support from friends (88%) and teachers (86%), with parent support occurring less often (68% reporting receiving parent support on at least one day). On average, students reported receiving support from friends on 3.63 days of the 10 days of the study, support from teachers on 3.77 days, and support from parents on 2.59. Descriptive statistics and correlations of the primary study variables averaged within each person (i.e., between-person correlation) are reported in Table 2. Daily discrimination was correlated with shorter same-day sleep duration ($r = -.22$, $p = .04$) but not with same-day sleep quality ($r = -.01$, $p = .97$).

Multilevel Models

Unconditional means models were first conducted separately for same-day sleep duration and quality to calculate the intraclass correlations (ICC), which suggested that 69% of the variance in sleep duration and 65% in sleep quality was explained by level-1 daily variation, whereas 31% of sleep duration and 35% of sleep quality was explained by level-2

individual differences. These ICCs supported the use of two-level models. Separate models were conducted to examine whether discrimination was related to same-day sleep duration and quality (Research Question 1). Models 1 and 3 include all primary study variables and covariates. Models 2 and 4 integrate interactions between daily discrimination and each source of support. As shown in Table 3, daily discrimination was significantly associated with same-day sleep duration ($b = -0.58, p = .01$), such that on days where adolescents reported experiencing discrimination, they reported around 30 min less sleep time that evening. Average discrimination across the study period was not significantly related to sleep duration or quality. In terms of covariates, Black adolescents reported significantly shorter sleep duration compared to Latino/a/x adolescents ($b = -0.72, p = .04$). The day variable was positively associated with same-day sleep duration ($b = 0.03, p = .02$), which suggests that as the study progressed students' reports of sleep duration modestly increased.

Next, we examined whether daily support from friends, parents, and teachers moderated same-day associations between discrimination and sleep (Research Question 2). As shown in Table 3, average friend support across the study period was associated with shorter sleep duration ($b = -1.44, p = .01$), average parent support was associated with a 0.75 increase in sleep quality ($b = 0.75, p = .03$), and average teacher support was associated with longer sleep duration ($b = 0.24, p = .04$). Daily support from teachers ($b = 0.72, p = .04$) significantly moderated the association between daily discrimination and sleep duration. Contrast analyses (see Figure 1) indicated that on days in which adolescents experienced discrimination, those who received teacher support reported a significant increase of more than an hour in sleep duration that evening compared to adolescents who did not receive support from teachers ($t = -2.68, p < .01$). In contrast, on days in which adolescents did not report experiencing discrimination, there was no difference in the sleep duration of those students who did or did not receive support from teachers ($t = -1.40, p = .17$).

DISCUSSION

This study extends prior literature on the deleterious effects of discrimination on adolescent sleep (Goosby et al., 2018; Majeno et al., 2018; Seaton & Douglass, 2014; Yip, Cheon, et al., 2020). Guided by risk and resilience theory (Fergus & Zimmerman, 2005), we examined whether experiencing discrimination tied to race, sexual minority status, socioeconomic status, weight, or other social identities was associated with adolescents' sleep duration and quality. We partly replicated previous findings with samples of adolescents from the northeastern (Yip, Cheon, et al., 2020) and southeastern United States (Goosby et al., 2018) that linked discriminatory experiences with sleep disturbances among ethnic/racial minority adolescents. We further identified the daily differentiated roles of social support from significant others when facing discrimination in middle adolescence. Support from friends appears to be negatively associated with sleep duration; support from parents appears to have a general promotive effect on adolescent sleep quality; support from teachers appears to act as a protective factor for sleep duration in the face of discrimination. The findings presented here shed light on possible avenues for future interventions targeting adolescent sleep disturbances associated with discriminatory experiences.

Discrimination and Sleep

In general, students in our sample did not get enough sleep during weeknights. Specifically, students slept an average of 7.73 hr on weeknights during the 14-day study period, with two students sleeping an average of fewer than 6 hr and no students averaging more than 10 hr. The American Academy of Sleep Medicine recommends that adolescents should sleep 8–10 hr every night (Paruthi et al., 2016a), and short sleep is associated with increased risk for a host of mental and physical health problems (Chiu, Lee, Chen, Lai, & Tu, 2018; Paruthi et al., 2016b). For the ethnic/racial minority youth in our study, short sleep is further compounded by the detrimental effects of discrimination stemming from the multiple social identities they embody.

One of our central aims was to investigate how daily discriminatory experiences disturb sleep in a sample of ethnically/racially minority students from the southern United States. Discrimination was a low-occurring event, with only 34% of the sample reporting at least one discriminatory event during the 10 weekdays included in the analyses. Empirical studies using daily diaries with adolescents have similarly found low rates of discrimination in studies with racially/ethnically diverse adolescent samples ($N=35$ for Goosby et al., 2018; $N=601$ for Huynh & Fuligni, 2010; $N=316$ for Majeno et al., 2018). Despite the relatively low frequency of discriminatory experiences among the adolescents in these studies, they all found significant associations with behavioral and psychological outcomes, including links between daily discrimination and depression and distress (Huynh & Fuligni, 2010), sleep efficiency and latency, and total minutes of sleep time (Goosby et al., 2018), and sleep duration and sleep quality (Majeno et al., 2018). Our findings that discrimination is a low frequency, but high impact event is in line with this prior research and provide additional support regarding the deleterious effects that discrimination has on ethnic/racial minority adolescents' well-being.

In addition to establishing a general link between discrimination tied to multiple social identities and sleep among ethnic/racial minority adolescents, we were able to disentangle differences between average and daily discriminatory experiences. Specifically, students who on average reported more instances of daily discrimination during the study period did not report shorter sleep durations or poorer sleep quality. However, we found that on days in which students experienced a discriminatory event, they slept about 30 min less that evening. These findings underscore that the influence of discrimination on sleep is more of an idiographic (within-person) process as prior research suggests (Ong & Burrow, 2017; Yip, Cheon, et al., 2020). This study also contributes to the empirical literature that documents how discrimination may be an important component of the physiological pathways that interrupt individuals' biological systems, which in turn compromises adolescents' developmental outcomes. Several physiological pathways have been established in prior empirical research about discrimination, including through increased the allostatic load (i.e., damage to the systems that control the body's stress response; Brody et al., 2014), and Goosby, Straley, and Cheadle (2017) posit that racial discrimination increases African Americans' cardiometabolic risk via mutually interconnected pathways between sleep quality and physiologic stress responses that, in turn, increase the allostatic load. Our findings that daily discrimination was associated with reductions in same-day sleep duration

provide further evidence that ethnic/racial disparities in health later in the life course may start during adolescence.

It is important to note that daily discrimination was not associated with sleep quality. This finding is contrary to prior research that found that racial discrimination had a stronger influence on sleep quality compared to sleep duration (Huynh & Gillen-O'Neel, 2016). A possible explanation for this difference is that, although our sample is comprised of ethnic/racial minority adolescents, only a fifth of those who reported a discriminatory event attributed this experience to their race or ethnicity. In contrast, almost half of the students who experienced discrimination attributed the discriminatory event to an identity other than race, socioeconomic status, sexual orientation, or weight. Studies with large, nationally representative, longitudinal samples have found a similar pattern (Boutwell et al., 2017). It is possible that the more general attributions for discriminatory experiences endorsed by many of our participants are not as strongly linked to an adolescents' central identities and, therefore, such discrimination may influence how long adolescents are sleeping but not exert as strong an influence on sleep quality when compared to racial discrimination. Alternatively, unfair treatment during adolescence may be situationally or contextually bounded and may have not been adequately captured with our more general measure of discrimination. For example, the most endorsed "other" categories related to discriminatory treatment were physical appearance (but not weight) and mental health. It may be that unmeasured characteristics among these students, their homes, their schools, neighborhoods, or even their larger geographic contexts made these social identities more salient. Future daily diary studies could include open-ended questions about unfair and discriminatory treatment to inform quantitative measures of discrimination.

Social Support, Discrimination, and Sleep

The association between daily discrimination and sleep varied by the source of social support. Contrary to our hypotheses, average friend support was associated with shorter sleep duration. It may be that reporting higher rates of friend support is tied to either larger friend groups or more popularity and that students with higher average friend support spend more time with friends—whether in person or through social media—and their sleep duration suffers as a result (Li, Kawachi, Buxton, Haneuse, & Onnela, 2019). Future research should more closely examine the characteristics and behaviors of friend support to clarify this relation.

For support from parents, we found that on days in which students reported receiving support from their parents, they reported sleeping better. This result echoes prior findings that family support has a generally positive effect on adolescents' positive mood and life satisfaction (Brody, Miller, Yu, Beach, & Chen, 2016). Increases in family support may act as a proxy for healthier parent-child relationships (Silva, Ford, & Miller, 2020), and, therefore, it is not surprising that on days in which students reported feeling supported by their parents, their sleep quality increased by almost a quarter of a point. A recent systematic review and meta-analysis of parental factors and adolescent sleep support the idea that healthy parent sleep and family functioning are associated with adolescent sleep quality (Khor, McClure, Aldridge, Bei, & Yap, 2021). Our findings add to this research

by providing additional empirical support to the link between daily parent support and improvements in adolescent sleep quality.

The relations between teacher support, discrimination, and adolescent sleep have received less attention in the research literature to date. To the best of our knowledge, this is the first study to examine whether teacher support has a protective or promotive role in adolescent sleep in the face of daily discrimination. Our findings suggest that on days in which students experienced a discriminatory event *and* felt supported by teachers, their sleep increased by almost an hour. This protective effect was not present when students did not experience a discriminatory event, highlighting how supportive interactions with teachers can serve to offset the pernicious effects of daily discrimination on sleep duration. This result extends prior findings of the beneficial and protective role of teacher support on adolescents' academic (Gale, 2020) and socioemotional adjustment (Wright & Wachs, 2019) to the sleep domain. In one of a few studies to examine teacher support and sleep, albeit within a measure of physical health, teacher support was significantly associated with greater adolescent-reported physical health among an American sample of high school students (Conner, Miles, & Pope, 2014), echoing more recent work linking teacher support and better sleep quality with European samples (Delaruelle et al., 2021; Kjellström, Modin, & Almquist, 2017). The protective effect of teacher support may stem from the central role teachers have in influencing adolescents' feelings of school belonging (Allen, Kern, Vella-Brodick, Hattie, & Waters, 2018) and identity development (Verhoeven, Poorthuis, & Volman, 2019), both of which are important resources for adolescents who face discrimination (Huynh & Gillen-O'Neel, 2016; Wakefield & Hudley, 2007). However, given the general nature of our teacher support measure, future research should delve into what aspects of teacher support (e.g., praises from teachers, affective bonds with teachers) seem to be most effective in protecting students from the detrimental effects of discrimination and developing more promotive sleep health. Results from this needed line of research can provide the basis for more targeted interventions. In sum, we have barely scratched the surface of the potential that teachers have to address sleep disturbances related to adolescents' discriminatory experiences.

Strengths, Limitations, and Future Directions

This study contributes to the extant discrimination literature in several ways. Using a daily diary design, we were able to disentangle the differences between the effects of average and daily discriminatory experiences tied to multiple social identities on ethnic/racial minority adolescents' sleep. The findings highlight the detrimental effect of every discriminatory event notwithstanding their low frequency and emphasize the importance of developing timely intervention and prevention programs to end discrimination in its many forms. In addition, by simultaneously examining daily support from friends, parents, and teachers, we uncovered the nuanced roles of each support provider in moderating the link between discrimination and ethnic/racial minority adolescents' sleep. Results suggest that it is the support from teachers that matters the most in helping ethnic/racial minority adolescents cope with the negative effects of multiple forms of discrimination during the school week. Interventions that increase teacher support more generally may have a greater impact

in curtailing the public health concerns that arise from chronic short sleep among U.S. adolescents.

This study has several limitations that must be acknowledged. First, due to low frequency, we were unable to test whether different types of discrimination differentially impact ethnic/racial minority adolescent sleep. Peer discrimination has been found to have a stronger impact on adolescents' mental health compared to teacher and institutional discrimination (Benner & Graham, 2013). Thus, as sleep is closely tied to mental health (Fernandez-Mendoza & Vgontzas, 2013), peer discrimination may exert a stronger impact on sleep compared to other types of discrimination. Future studies with longer daily diary periods and larger samples are encouraged to further examine the effects of different types of discrimination. Second, sleep was measured subjectively and adolescents may overestimate their weeknight sleep duration or quality by not accounting for time in bed, time spent awake in bed, or because of recall errors associated with falling asleep (Arora, Broglia, Pushpakumar, Lodhi, & Taheri, 2013). Prior research has shown that daily sleep diaries like the one used here are nearer to objective measures of sleep-like polysomnography or actigraphy (Arora et al., 2013; Guedes et al., 2016; Short, Gradisar, Lack, Wright, & Chatburn, 2013), but future studies would benefit from including both subjective daily sleep diaries and actigraphy measurements of sleep to triangulate sleep information. Moreover, integrating measures of physiological reactivity (e.g., salivary cortisol) to daily discrimination would greatly enhance our knowledge of the biopsychosocial pathways between discrimination and sleep among ethnic/racial minority adolescents (van Dalen & Markus, 2018; Mrug, Tyson, Turan, & Granger, 2016; Vargas & Lopez-Duran, 2017). For example, the race-based disparities in stress and sleep in context (RDSSC) model posits that, in addition to the effects of coping responses, biological changes are important factors in understanding academic achievement disparities among ethnic/racial minority students (Levy et al., 2016).

Third, the adolescents in our sample were in 9th and 10th grades, which limits the generalizability of the results because younger and older adolescents may exhibit different patterns of discrimination, sleep, and support (Gillen-O'Neel, Huynh, & Fuligni, 2013; Hughes, Del Toro, Harding, Way, & Rarick, 2016). Future studies with longitudinal data are needed to determine whether the processes found here are consistent across adolescence. Fourth, this study only examined same-day relations between discrimination, social support, and sleep, and thus the temporal order of these constructs cannot be discerned. Prior research found that the previous night's longer and better sleep was related to peer support-seeking behaviors on days in which participants experienced racial discrimination (Wang & Yip, 2020) and that sleep might facilitate the recovery process following negative experiences (Goosby et al., 2018). Thus, future studies that examine different temporal patterns between predictors, moderators, and outcomes can shed light on the order and direction of these relations.

CONCLUSION

This study adds to the burgeoning literature on adolescent discrimination and sleep, identifying the detrimental effects of daily experiences of multiple forms of discrimination

on ethnic/racial minority adolescents' sleep duration. Our findings highlight the nuanced roles that friends, parents, and teachers play in ethnic/racial minority adolescents' lives: support from friends seemingly exacerbates its negative effects, support from parents is promotive to sleep quality, and support from teachers generally protects adolescents from the negative effects of daily discrimination. School may be an important context for the development and implementation of interventions that help ethnic/racial minority adolescents cope with everyday discriminatory events tied to multiple social identities. One component of such interventions should aim to increase and promote teacher support given the potential to positively impact adolescent sleep among youth experiencing discrimination. A second component could address how friends support each other when they encounter a discriminatory event to teach young people positive coping strategies. This study adds to our growing understanding of the social and cultural factors that contribute to the *Perfect Storm* of insufficient sleep during adolescence (Crowley, Wolfson, Tarokh, & Carskadon, 2018).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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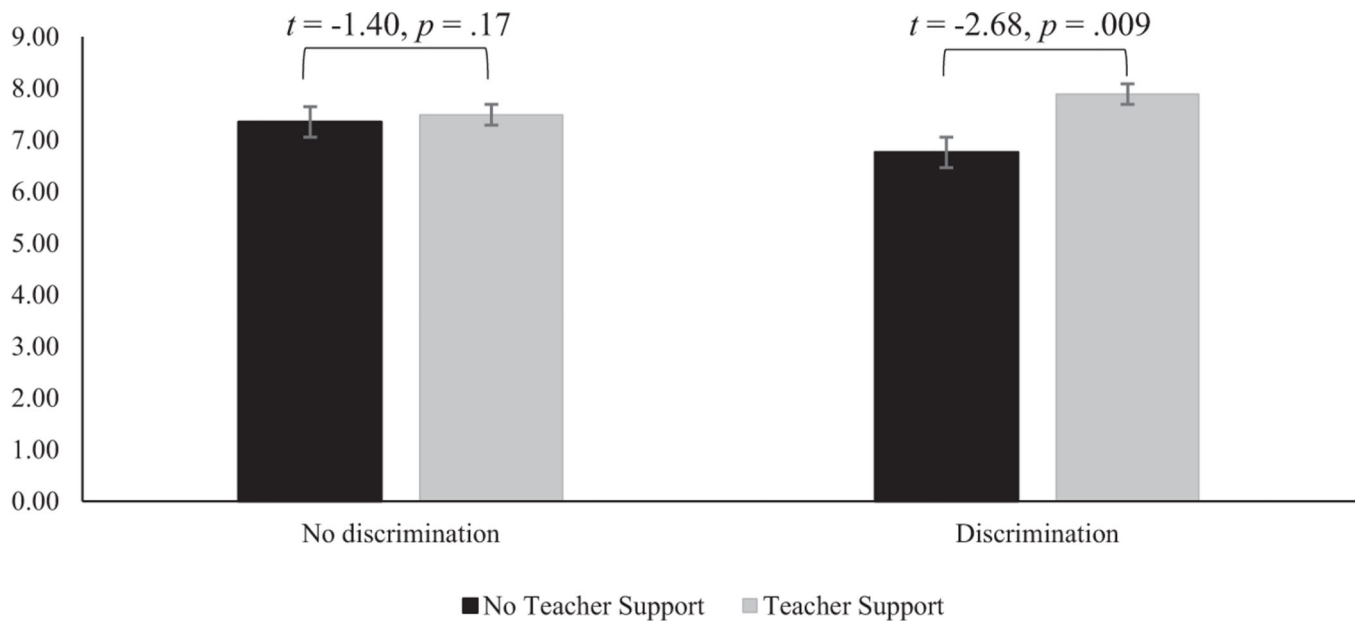


FIGURE 1.
Interaction effects of daily discrimination on adolescents' sleep duration by daily support from teachers.

TABLE 1Sociodemographic Characteristics of Participants ($N=95$)

Characteristic	N	Frequency (%)
Student sex		
Male	39	41.49
Female	55	58.51
Student grade		
9th grade	33	35
10th grade	62	65
Student race/ethnicity		
Black	8	8.42
Latino/a/x	48	50.53
Asian	17	17.89
Biracial	22	23.16
Student nativity		
U.S. born	80	87.00
Foreign-born	12	13.00
Highest parent education		
Less than HS diploma	19	23.46
HS diploma or GED	10	12.35
Some college, no degree	9	11.11
Associate degree	9	11.11
Bachelor's degree or higher	34	41.90

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TABLE 2
Correlations and Descriptive Statistics for Study Variables Averaged within Each Person

	1	2	3	4	5	6
1. Discrimination	–					
2. Parent support	–.07					
3. Teacher support	.05	.44**	–			
4. Friend support	.14	.68**	.48**	–		
5. Sleep duration (hr)	–.22*	.02	.09	–.22*	–	
6. Sleep quality	–.01	.33**	.25*	.20*	.33**	–
<i>M</i>	0.07	0.30	0.45	0.37	2.43	7.73
<i>SD</i>	0.12	0.32	0.32	0.29	0.64	0.89
Range	0–0.5	0–1	0–1	0–1	1.30–3.90	5–9.65

Note.

* $p < .05$

**

$p < .01$

*** $p < .001$.

TABLE 3

Multi-Level Models Predicting Sleep Duration and Sleep Quality

Effect	Sleep Duration				Sleep Quality							
	Unconditional Means Model		Model 1		Model 2		Unconditional Means Model		Model 3		Model 4	
	b (SE)	p	b (SE)	p	b (SE)	p	b (SE)	p	b (SE)	p	b (SE)	p
Fixed effects												
Intercept	7.74 (0.09)	<.001	7.69 (0.31)	<.0001	7.72 (0.32)	<.0001	2.42 (0.07)	<.001	2.52 (0.22)	<.0001	2.51 (0.22)	<.0001
Discrimination			-0.58 (0.18)	.01	-0.69 (0.3)	.03			-0.26 (0.14)	.07	-0.18 (0.21)	.39
Friend support			-0.06 (0.11)	.55	-0.01 (0.11)	.94			-0.02 (0.07)	.74	0 (0.08)	.97
Parent support			0.22 (0.13)	.1	0.22 (0.14)	.12			0.12 (0.09)	.17	0.17 (0.1)	.07
Teacher support			0.24 (0.11)	.04	0.17 (0.11)	.14			0.1 (0.08)	.22	0.07 (0.08)	.4
BPC discrimination			-0.04 (0.86)	.96	0.08 (0.88)	.92			0.89 (0.62)	.15	0.96 (0.62)	.13
BPC friend support			-1.44 (0.51)	.01	-1.44 (0.52)	.01			-0.33 (0.37)	.37	-0.35 (0.37)	.35
BPC parent support			0.55 (0.47)	.24	0.53 (0.47)	.26			0.75 (0.33)	.03	0.71 (0.33)	.04
BPC teacher support			0.25 (0.36)	.49	0.27 (0.37)	.47			0.07 (0.26)	.8	0.08 (0.26)	.76
Discrim. × Friend Supp.					-0.56 (0.31)	.08					-0.24 (0.22)	.28
Discrim. × Parent Supp.					0.07 (0.38)	.86					-0.38 (0.26)	.14
Discrim. × Teacher Supp.					0.72 (0.35)	.04					0.3 (0.25)	.23
Covariates												
Asian American ^a			-0.22 (0.26)	.4	-0.25 (0.26)	.33			-0.25 (0.18)	.18	-0.24 (0.18)	.19
Biracial ^a			0.22 (0.26)	.39	0.21 (0.26)	.43			0.14 (0.18)	.45	0.13 (0.18)	.47
Black ^a			-0.72 (0.34)	.04	-0.73 (0.35)	.04			0.01 (0.25)	.98	0.01 (0.25)	.97
Sex ^b			0.06 (0.2)	.76	0.06 (0.2)	.78			-0.03 (0.14)	.82	-0.04 (0.14)	.8
Day ^c			0.03 (0.01)	.02	0.03 (0.01)	.02			0.01 (0.01)	.37	0.01 (0.01)	.38
Grade level ^d			-0.09 (0.2)	.66	-0.07 (0.21)	.72			0.03 (0.15)	.85	0.03 (0.15)	.86
Nativity ^e			-0.16 (0.29)	.59	-0.17 (0.29)	.56			-0.15 (0.21)	.48	-0.15 (0.21)	.48
Random effects												
AR (1)	0.08 (0.05)	.12	0.09 (0.06)	.13	0.09 (0.06)	.1	0.04 (0.05)	.37	0.07 (0.06)	.22	0.07 (0.06)	.2
Residual	1.30 (0.07)	<.001	1.10 (0.07)	<.001	0.93 (0.06)	<.001	0.56 (0.03)	<.001	0.51 (0.03)	<.001	0.51 (0.03)	<.001

Note. BPC = between-person centered; Discrim = Discrimination; Supp. = support. Significant results are bolded. Degrees of freedom were specified using the Satterthwaite method.

^a Latino/a/x is the reference group.

^b 1 = female and 0 = male.

^c Day centered around the middle point (Day 7).

^d 1 = 9th grade, 0 = 10th grade.

^e 1 = U.S.-born, 0 = foreign-born.