SOCIUS

Original Article

Socius: Sociological Research for a Dynamic World
Volume 5: 1–16

DOI: 10.1177/2378023119842728
srd.sagepub.com
SAGE

Mental Health Outcomes of Discrimination among College Students on a Predominately White Campus: A Prospective Study

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Abstract

Racial discrimination is a social stressor harmful to mental health. In this paper, we explore the links between mental health and interpersonal discrimination-related social events, exposure to vicarious racism via social media, and rumination on racial injustices using a daily diary design. We utilize data from a racially diverse sample of 149 college students with 1,489 unique time observations at a large, predominantly white university. Results show that interpersonal discrimination-related social events predicted greater self-reported anger, anxiety, depressive symptoms, and loneliness both daily and on average over time. Vicarious racism from day to day was associated with increased anxiety symptoms. In contrast, rumination was not associated with negative mental health outcomes. These findings document an increased day-to-day mental health burden for minority students arising from frustrating and alienating social encounters experienced individually or learned about vicariously.

Keywords

interpersonal discrimination, vicarious racism, rumination, stress process, mental health, college students

The college years are a time of expanding intellectual opportunities and newfound social freedoms. Simultaneously, however, college-attending young adults also navigate the stress of increasing academic expectations (e.g., Misra and McKean 2000) and the challenges that come with new flexibility and expanding social roles (e.g., Crosnoe and Johnson 2011). Many of these challenges may be exacerbated for racial-/ethnic-minority students who must also navigate the sometimes-hostile social milieu at predominately white colleges and universities (Cabrera et al. 2000; Swim et al. 2003). For example, experiences with daily discrimination on predominately white college campuses are common among racial-/ethnic-minority students (e.g., Johnston-Guerrero 2016; Swim et al. 2003). Moreover, these experiences can adversely affect mental health and indicators of well-being, including depressive symptoms, anxiety, and heightened feelings of anger and isolation (e.g., Hope, Hoggard, and Thomas 2015; Swim et al. 2003).

Internet news and media are also relevant sources from which college students learn about discrimination and racism vicariously, which can serve as additional sources of stress during the college years (e.g., Tynes, Rose, and Markoe 2013). Additionally, vicarious exposures to racism may contribute to students also dwelling and ruminating on their own and others' experiences, which may also have long-term health consequences (Borders and Liang 2011; Hicken et al. 2013). Studies addressing vicarious racism and rumination on racial injustices are particularly salient given the increased attention in recent years accorded to race-related events, such as the Unite the Right rally, the shootings of unarmed black males (e.g., Michael Brown, Philando Castile, and others), and heightened anti-immigrant sentiment. Examining the associations between the stress of interpersonal

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discrimination, vicarious racism, and rumination for mental health outcomes is thus an important step toward understanding how different facets of discrimination progressively harm health as negative social experiences accumulate during young adulthood.

In this study we apply a stress process model to examine the association between interpersonal discrimination–related social events, vicarious racism (i.e., learning about racial injustice through online social media), and rumination on (i.e., thinking about) racial injustices and mental health outcomes using a diverse sample of college students attending a predominately white university. We expand upon prior literature in two key ways. First, most prior studies of college students have utilized cross-sectional designs (e.g., Nadal et al. 2014; Prelow, Mosher, and Bowman 2006). This study advances prior research by utilizing a daily diary design, which allows discriminatory experiences to be linked dynamically to psychological states as they are simultaneously coupled in time and place. Second, because interpersonal discrimination is but one way that America's legacy of racism is experienced, this study also examines daily and over-time variability in vicarious racism and rumination on racial injustices.

Background

The Stress Process: Discrimination, Vicarious Racism, and Rumination

The stress process model posits that one's placement within a status hierarchy regulates stress exposure and therefore psychosocial health risks (Pearlin 1999). For African Americans and other racial-ethnic minorities, race-related discriminatory stressors are a key pathway linking racial inequality with psychosocial well-being as racial-ethnic minorities are at disproportionately higher risk for experiencing such stressors (e.g., Sternthal, Slopen, and Williams 2011). Exposure to different forms of race-related stressors, such as interpersonal discrimination, vicarious racism, and rumination, can be emotionally taxing. We define these key stressors below.

Interpersonal racial discrimination (hereafter discrimination) is defined as the actions (verbal and nonverbal) and differential treatment of individuals based on race and whose treatment surfaces from a system of racism (e.g., Williams, Yu, and Jackson 1997). This concept is often considered as perceived discrimination (e.g., being followed in stores, being treated as if one is suspicious) and relatedly as microaggressions, or the subtle verbal or nonverbal slights that are often unconsciously or consciously directed at marginalized racial-ethnic minorities, which are linked to implicit biases and common prejudices about racial groups (Priest and Williams 2018; Sue et al. 2007). Moreover, because both perceived discrimination and microaggressions can be recognized as racially discriminatory acts during or immediately following the event, both are thought to involve a subjective process of attributing the negative event to race or racism (Kessler, Mickelson, and Williams 1999; Schmitt and Branscombe 2002). Thus, interpersonal discrimination involves not only the event itself but also the extent that one's perceptions of the racial motivations are linked with an individual's response to the event (Chae, Lincoln, and Jackson 2011; Schmitt and Branscombe 2002).

Racism and discrimination can be experienced in different forms, including vicarious racism and as rumination. Harrell (2000) defines vicarious racism as the experiences and events of racism that are encountered through observation or learning, such as witnessing someone else being treated in a racially discriminatory way or learning about racism and racial injustice through the news and other sources. Vicarious racism is oftentimes considered an indirect form of discrimination (e.g., Truong, Museus, and McGuire 2016), although it can be a significant source of stress (Harrell 2000; Priest et al. 2013). In fact, vicarious racism may be one of the most frequent ways that young adults experience racism (Alvarez, Juang, and Liang 2006) and is linked with outcomes such as anger, anxiety, and feelings of isolation and rejection (Mendoza-Denton et al. 2002; Truong et al. 2016).

Discrimination and vicarious racism are also linked to rumination. Rumination is defined as perseverating thoughts or feelings on negative experiences (Borders and Liang 2011; Nolen-Hoeksema, Wisco, and Lyubomirsky 2008). Rumination may negatively influence mental and physical health through continual arousal of the physiological stress response (Brosschot 2010) and is linked to poorer mental health outcomes, such as depressive symptoms (Borders and Liang 2011; Nolen-Hoeksema et al. 2008). Furthermore, rumination may be a common response to events of discrimination and vicarious racism, and individuals may continue to further ruminate on their negative feelings resulting from these experiences (e.g., Borders and Liang 2011).

Discrimination and Mental Health on Predominately White College Campuses

Predominately white college campuses are places where racial-/ethnic-minority students encounter discrimination and vicarious racism. In their qualitative study, Solorzano, Ceja, and Yosso (2000) found that African American college students' experiences of discrimination and microaggressions on college campuses led students to feel angry, lonely, self-doubting, and disconnected from opportunities and participation afforded to white students. African American students reported feeling like the only black person in class, that they were "called out" on questions about black people, and that their peers and others held negative views about their ability and contributions to the classroom and wider campus culture (Solorzano et al. 2000). Discrimination on predominately

white college campuses has also been linked to more negative forms of stress coping (e.g., isolation, alcohol use; Utsey et al. 2000), depressive symptoms (Ong, Fuller-Rowell, and Burrow 2009), anger, (Swim et al. 2003), and lower self-esteem (Nadal et al. 2014).

Vicarious racism and rumination on the racial mistreatment of marginalized racial-ethnic minorities during the college years can serve as additional sources of stress for students. College campuses are places where students increasingly encounter and learn about discrimination and racism (Johnston-Guerrero 2016). In addition, the Internet is a platform by which college students both encounter and learn about racial discrimination. In recent years, with increasing coverage of race-related events and violence, college students are more likely to be vicariously exposed to racial discrimination frequently. Moreover, experiences with vicarious racism may influence the mental health of college students via similar mechanisms of stress and distress (Priest et al. 2013; Tynes et al. 2012, 2013). Taken together, these factors broaden our understanding of the mental health consequences of life in a racialized social system.

Current Study

Racial-/ethnic-minority students on predominantly white campuses are a group that, while socially advantaged in making it to college, are at elevated risk for race-related stressors, given their increased contact with whites as the dominant racial group (e.g., Davis et al. 2004; Gusa 2010). Racial-/ethnic-minority students are at higher risk for experiencing both acute and chronic forms of discrimination relative to whites, and these exposures help explain a significant portion of their general health (e.g., Goosby, Cheadle, and Mitchell 2018). Moreover, the college years are key transitional years for young minority adults that will shape their subsequent mental health, health physiology, and socioeconomic trajectories (e.g., Hope et al. 2015). Addressing how various dimensions of discrimination influence health and well-being on predominately white college campuses is therefore critical to understanding broader racial health inequities for young adults across the life course.

Despite the widespread documented associations between facets of discrimination-related processes and mental health, there remain important limitations. First, most prior research is cross-sectional in nature, and summaries of experience are retrospective and potentially endogenous with mental health. Prospectively examining mental health following discrimination events in repeated daily diary designs does not completely resolve this challenge. However, daily diary designs colocate experiences, attributions, and feelings in time, greatly minimizing retrospective and heuristic biases (Bolger and Laurenceau 2013). Second, most research has focused on interpersonal discrimination, and fewer studies have singly or simultaneously examined vicarious racism exposure or rumination. This study thus attempts to fill these gaps, leading to a better understanding of how interpersonal discrimination, vicarious racism, and rumination on racial injustices on predominately white college campuses influence the mental health outcomes of college students as events and feelings are co-occurring from day to day. In this study, we account for whether the negative interpersonal event was attributable to race or racism and how bothered the student was by the event. Prospectively examining the mental health consequences of discrimination as events and feelings occur in time is an important step toward understanding the experiential phenomenology of discrimination as well as broader implications for population health inequities.

Data and Methods

Data for this study come from the StudentHD pilot project, which was conducted on a large, predominantly white, midwestern research university campus during the fall of 2016 and spring of 2017.[1] The goal of StudentHD was to prospectively examine the dynamic experiences of stress exposure and psychological, physiological, and behavioral outcomes associated with interpersonal discrimination, vicarious exposure, and rumination among racial-/ethnic-minority students. Students participated in intake and exit interviews, sandwiching a two-week (fall, $n = 31$) or one-week (spring, $n = 118$) daily diary protocol with a short morning diary for sleep and a detailed evening diary on student experiences and feelings over the day. This study draws on data collected from the intake and evening daily diary surveys. The full sample comprised 149 students who collectively contributed 1,489 unique time observations. Students provided on average 13.7 days in the fall and 6.8 days in the spring. All study procedures were approved by the university institutional review board.

Dependent Variables

The mental health outcomes examined included five scales: (1) anger, (2) anxiety, (3) loneliness, (4) depressive symptoms, and (5) positive affect. Items for each of the scales were from the National Institutes of Health (NIH) Toolbox and the Center for Epidemiologic Studies Depression Scale (CES-D) (National Institutes of Health 2017; see Appendix A for scale

[1]Institutional demographics in 2018 indicated that approximately 15 percent of students (e.g., approximately 2.6 percent black, 6.0 percent Hispanic, 2.7 percent Asian, 2.9 percent two or more races) and 20 percent of faculty belonged to a racial-/ethnic-minority group. Approximately 48 percent of students and 41 percent of faculty were women. Year 2012 data indicated that approximately 69 percent of students graduated within 100 to 150 percent of normal time (i.e., four to six years). In addition, we note the data were collected during a time of heightened political and racial contention in the United States (e.g., 2016 presidential election, attempted rollback of Deferred Action for Childhood Arrivals in 2016 and 2017).

items). Confirmatory factor analysis in Mplus 7 was used to create the factor scores for each of the scales. Root mean square error of approximation (RMSEA) and comparative fit index (CFI) scores for each mental health scale indicated adequate model fit (e.g., Acock 2013). The anger scale was created using five measures (e.g., "I felt angry"; RMSEA = .051, CFI = .999, alpha = .83). The anxiety scale was created using seven measures (e.g., "I felt anxious"; RMSEA = .056, CFI = .997, alpha = .87). The loneliness scale uses five measures (e.g., "I felt lonely"; RMSEA = .058, CFI = .998, alpha = .83). The depressive symptoms scale includes 14 items (e.g., "I felt depressed"; RMSEA = .059, CFI = .995, alpha = .93). Last, the positive affect scale, which had marginal model fit, includes nine measures, such as "I felt calm" and "I felt energetic" (RMSEA = .111, CFI = .983, alpha = .53). Despite poorer fit for the positive affect scale, it was included in the study for comparison purposes (Ong and Burrow 2018). Each item included in the five scales was coded from 1 = *never* to 4 = *often*, and scales were standardized so that both the within and between variances equaled 1 independently to facilitate parameter interpretation.

Predictor Variables

Three main predictor variables are used in the analysis: (1) interpersonal discrimination, (2) vicarious racism, and (3) rumination. Additionally, the analysis accounts for stable trait (control) variables including race-ethnicity, gender, age, and within-level time of week. Interpersonal discrimination was created using the following three measures drawn from the Racism and Life Experiences Scale (RaLES; Harrell 1997): (1) an event based self-report of daily discrimination experiences across 17 items (0 = no, 1 = yes; see Appendix B for items included in the RaLES), (2) an item asking if the respondent attributed the event to race/racism (1 = *no*, 2 = *maybe*, and 3 = *yes*) for each reported event, and (3) an item asking how bothered the respondent was by the event (1 = *none*, 2 = *some*, and 3 = *lots*). The interpersonal discrimination measure was created by calculating the product across each of the three items (Event × Attribution × Bothered) and summing the product for each day.[2] In this way, the contribution of each event to the total score serves as a function of attribution and the extent to which the participant was distressed by the event. The square root of the summed product score was taken to reduce the dispersion due to the multiplicative scaling. In doing so, minimum values reflect no events, while larger values reflect a combination of multiple events, degree of racism attribution, and the extent the student was bothered by the event. The measure has two realizations, one capturing day-to-day variability, which was standardized ($M = 0$, $SD = 1$), and average over days, which was also standardized.

Second, measures for vicarious racism and rumination were created using the two following variables: (1) "Over the course of the day, did you learn about racial injustices or the mistreatment of people of color on social media?" (vicarious racism; 1 = yes) and (2) "Over the course of the day, did you think about racial injustices and the mistreatment of people of color in the US?" (rumination; 1 = yes). If the respondent answered yes to either question, they were asked how bothered they were by learning or thinking about racial injustice (1 = *none*, 2 = *some*, 3 = *lots*).[3] Similar to the event discrimination product measure, the summed over-day product for measures of vicarious racism and rumination were standardized.

Last, four stable trait (control) variables are included in the analysis. Race-ethnicity was measured categorically for whether the respondent identified as U.S.-born black or African American, first-generation black or continental African, Hispanic/Latino, Asian, or white.[4] In line with prior research that suggests U.S.-born and first-generation black Americans may differ in terms of their experiences and responses to daily discrimination (e.g., Pachter et al. 2018; Seaton et al. 2010), U.S.-born black students are the omitted reference group. We also include variables for gender (women = 1) and age (range 18–31) and a dichotomous measure for whether the day of the week during the study period was strongly associated with socializing (i.e. Thursday, Friday, Saturday = 1) to account for dimensions of mental health and activities that likely differ among college students during the course of a week.

Analytic Strategy

This study employs a two-level random intercept model (days nested within students) to assess whether interpersonal discrimination, vicarious racism, and rumination are associated

[2]For the interpersonal discrimination measure, a raw score of 0 indicates no event. A raw score of 1 indicates the student reported an event but did not attribute the event to race/racism and was not bothered by the event. A raw score of 9 indicates the student reported an event, attributed the event to race/racism, and was very bothered by the event (1 × 3 × 3).

[3]For vicarious racism and rumination, a raw score of 0 indicates no event. A raw score of 1 indicates the student encountered racial discrimination online (vicarious racism) or thought about racial injustices over the day (rumination) but was not bothered by the event. A raw score of 3 indicates the student encountered racial discrimination online or thought about racial injustices and was very bothered by the event (1 × 3).

[4]Students were allowed to select more than one racial-ethnic category, with their first choice being the one in which they most closely identified (i.e., self-perceived race; Lopez et al. 2018). Racial-ethnic categories were constructed by selecting the student's first choice. Furthermore, because students were asked about nativity (i.e., "Were you born in the United States?"), we were able to disaggregate Black students into first-generation black or continental African or U.S.-born black or African American. We note that for eight students with missing information on the nativity item, we used reported parent race-ethnicity to determine generational status. We note our use of the term *first-generation* does not account for age of immigration (for a discussion of "1.5 generation," see Portes and Rumbaut 2001) because we do not have age of arrival in the United States.

with anger, anxiety, loneliness, depressive symptoms, and positive affect among college students from day to day. Time is included as a binary variable for whether it was a heavily social weekday (i.e., Thursday, Friday, Saturday). Day-to-day time-varying covariates at Level 1 are group-mean centered, and Level 2 (student) characteristics are grand-mean centered (Enders and Tofighi 2007; Raudenbush and Bryk 2002).[5] Because of this centering, the within-student model can be interpreted as effectively controlling for all person-specific effects stable over the study duration (Allison 2005). As noted previously, the dependent variables were standardized so that the standard deviations reflect both within and between components, and therefore effects at both levels can be directly interpreted as effect sizes. Together, this partitioning into within-student and between-student effects allows estimation of "state" associations at the day level controlling for fixed effects (Allison 2005) and "trait" associations between individuals over the period of participation, providing insight on fluctuating dynamics as well as stability.

Results are shown across two models for the five mental health outcomes. Model 1 adds within and between measures of interpersonal discrimination, vicarious racism, and rumination. Model 2 adds the between-student characteristics of race-ethnicity, gender, and age as well as the within-level time measure (weekend). Because of the small number of participants constituting the between portion of the model ($N = 149$), we include an indicator (†) for significance at $p < .10$. Final models are estimated after listwise deletion (only two missing values across the dependent variables omitted; $N = 1{,}489$). All analyses were conducted in Stata 13, with the exception of the confirmatory factor analysis of the dependent mental health measures, which was conducted in Mplus 7.

Results

Descriptive Statistics

Table 1 shows descriptive statistics for all study variables. The anger, anxiety, loneliness, and depressive symptoms scales are all right skewed (most students reported relatively low values on the mental health scales), and the positive affect scale is relatively normally distributed. Table 1 shows sufficient variation in the discrimination-related measures prior to standardization but also greater variation in discrimination, vicarious racism, and rumination between than within students. Approximately 24 percent of the sample identified as U.S.-born black or African American ($n = 36$), 44 percent as first-generation black or continental African ($n = 66$), 18 percent as Hispanic/Latino ($n = 27$), 7 percent as Asian ($n = 11$), and 6 percent as white ($n = 9$). Sixty-two percent of the sample identified as female ($n = 93$), and the mean age of respondents was 20.3 years. About 42 percent of all time observations occurred on a higher-social-activity day (i.e., Thursday, Friday, or Saturday) over the study period.

Statistical Models

Table 2 shows the two-level group-mean centered random intercept model results for anger, anxiety, and loneliness across two models. Model 1 includes within and between measures of discrimination, vicarious racism, and rumination. Model 2 then adds between-student characteristics of race-ethnicity (U.S-born black or African American is the omitted reference), gender, and age and the within parameter of time of week (i.e., weekend). In addition, Table 3 shows within and between variance estimates for anger, anxiety, and loneliness with 95% confidence intervals.

Anger. At baseline, Table 2, Model 1, shows a 1-standard-deviation increase in discrimination was associated with a .14-standard-deviation increase in anger symptoms in the within portion of the model (i.e., within students at the day level) and a .53-standard-deviation increase in anger symptoms in the between portion of the model (i.e., between students over days). Additionally, a 1-standard-deviation increase in vicarious racism was associated with a .18-standard-deviation increase in anger symptoms at the aggregate level. Model 2 includes the between-person characteristics of race-ethnicity, gender, and age as well as the within parameter of time of week. In Model 2, a 1-standard-deviation increase in discrimination and vicarious racism continue to be associated with standard deviation increases (.52 for discrimination, .20 for vicarious racism) in anger symptoms between students. In addition, white students reported marginally higher anger (.49) compared to black or African American students after adjusting for measures of discrimination.

Anxiety. For anxiety, baseline Model 1 shows that a 1-standard-deviation increase in discrimination was associated with a .10 increase in anxiety symptoms within students and a .46 increase in anxiety symptoms between students. Additionally, a 1-standard-deviation increase in vicarious racism was associated with a .09-standard-deviation increase in anxiety symptoms within students at the day level and a .16 increase in anxiety symptoms at the aggregate level. Adding characteristics of race-ethnicity, gender, age, and time of week, discrimination and vicarious racism continue to be related to increased anxiety symptoms between students. In fact, after adjusting for between-student characteristics, vicarious racism is associated with a .18 increase in anxiety symptoms over the study period. Rumination, however, was

[5]Following standardization and mean centering, we examined outlier distributions for the discrimination items. We performed winsorization (Ruppert 2006) of values for each of the discrimination measures, capping values less than the 1st percentile and greater than the 99th percentile to these minimum/maximum values. After winsorization, the measures were then restandardized. We conducted analyses with and without the winsorized variables. Results were nearly identical between the approaches and available upon request from the corresponding author.

Table 1. Descriptive Statistics.

Variable	*M*/P	*SD*	Min.	Max.
Level 1 (within-person) descriptive statistics[a]				
Mental health scales				
Anger	0.17	0.64	−0.35	2.28
Anxiety	0.10	0.67	−0.54	2.19
Loneliness	0.25	0.60	−0.17	2.50
Depressive symptoms	0.18	0.63	−0.39	2.48
Positive affect	−0.02	0.80	−1.91	1.37
Discrimination measures				
Interpersonal discrimination	0.63	1.38	0	9.38
Vicarious racism	0.39	0.89	0	3
Rumination	0.58	1.03	0	3
Weekend	0.42		0	1
Level 2 (between-person) descriptive statistics[b]				
Discrimination measures				
Interpersonal discrimination	1.21	1.66	0	6.71
Vicarious racism	0.70	1.12	0	3
Rumination	0.83	1.17	0	3
Race/ethnicity				
U.S.-born black or African American	0.24		0	1
First-generation black or continental African	0.44		0	1
Hispanic/Latino	0.18		0	1
Asian	0.07		0	1
White	0.06		0	1
Female	0.62		0	1
Age	20.33	1.87	18	31

Note: M/P = mean or proportion.
[a]*N* = 1,489.
[b]*N* = 149.

Table 2. Hierarchical Random-effects Linear Regression Models for Anger, Anxiety, and Loneliness by Race-ethnicity and Discrimination.

	Anger				Anxiety				Loneliness			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Variable	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Within												
Interpersonal discrimination (z)	.14***	.03	.14***	.03	.10***	.03	.11***	.03	.13***	.03	.13***	.03
Vicarious racism (z)	.04	.03	.04	.03	.09**	.03	.09*	.03	.01	.03	.01	.03
Rumination (z)	−.01	.03	−.01	.03	−.05	.03	−.05†	.03	−.10***	.03	−.10***	.03
Weekend			−.02	.06			−.10†	.05			.00	.06
Between												
Interpersonal discrimination (z)	.53***	.07	.52***	.07	.46***	.08	.44***	.07	.45***	.08	.43***	.08
Vicarious racism (z)	.18*	.09	.20*	.09	.16†	.09	.18*	.09	.19*	.09	.21*	.09
Rumination (z)	−.05	.09	−.08	.09	.08	.09	.04	.09	.00	.10	−.02	.09
First-generation black or continental African			−.01	.18			.12	.17			.15	.19
Hispanic			.25	.19			.54**	.19			.21	.20
Asian			.44	.27			.88***	.26			.77**	.28
White			.49†	.29			.35	.28			−.19	.30
Female			.21	.13			.34**	.13			.24†	.14
Age			.03	.03			.04	.03			.03	.04
Constant	.00	.06	−.23	.16	.00	.06	−.40*	.16	.00	.07	−.30†	.17

Note: N = 149. Interpersonal discrimination, vicarious racism, and rumination are standardized (z) in the within and between models (*M* = 0, *SD* = 1).
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Within and between Variance Estimates for Anger, Anxiety, and Loneliness with 95% Confidence Intervals.

	Anger				Anxiety				Loneliness			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Variance component	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Within variation (residual)	1.09	[1.01, 1.18]	1.09	[1.01, 1.18]	1.09	[1.01, 1.18]	1.09	[1.01, 1.18]	1.09	[1.01, 1.18]	1.09	[1.01, 1.18]
Between variation (constant)	0.48	[0.36, 0.64]	0.43	[0.32, 0.58]	0.50	[0.38, 0.67]	0.40	[0.30, 0.55]	0.54	[0.40, 0.72]	0.49	[0.36, 0.65]
Intraclass correlation	.30		.28		.32		.27		.33		.31	

Note: $N = 149$. CI = confidence interval.

Table 4. Hierarchical Random-effects Linear Regression Models for Depressive Symptoms and Positive Affect by Race-ethnicity and Discrimination.

	Depressive Symptoms				Positive Affect			
	Model 1		Model 2		Model 1		Model 2	
Variable	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Within								
Interpersonal discrimination (z)	.11***	.03	.11***	.03	.02	.03	.02	.03
Vicarious racism (z)	.05	.03	.05	.03	−.03	.03	−.03	.03
Rumination (z)	−.07*	.03	−.07*	.03	.06*	.03	.07*	.03
Weekend			−.09	.06			.18***	.06
Between								
Interpersonal discrimination (z)	.44***	.08	.43***	.08	−.10	.09	−.09	.09
Vicarious racism (z)	.21*	.10	.23*	.10	−.05	.11	.03	.11
Rumination (z)	−.06	.10	−.09	.10	−.06	.12	−.01	.11
First-generation black or continental African			.19	.19			.49*	.22
Hispanic			.47*	.20			−.30	.24
Asian			.70*	.29			−.15	.34
White			.19	.31			.17	.36
Female			.24†	.14			−.12	.17
Age			.06†	.04			−.06	.04
Constant	−.01	.07	−.35**	.17			−.16	.20

Note: $N = 149$. Interpersonal discrimination, vicarious racism, and rumination are standardized (z) in the within and between models ($M = 0$, $SD = 1$).
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

associated with a .05 decrease in anxiety symptoms at the day level in Model 2. Hispanic/Latino (.54) and Asian (.88) students reported higher anxiety symptoms compared to black or African American students with measures of discrimination controlled for. Female students reported higher anxiety symptoms than male students (.34). Additionally, weekends (i.e., Thursday, Friday, or Saturday) were associated with a marginal .10 decrease in anxiety symptoms.

Loneliness. For loneliness, Table 2, Model 1, shows that discrimination was associated with a .13-standard-deviation increase in loneliness within students and a .45 increase in loneliness between students. Vicarious racism was associated with a .19 increase in loneliness between students, but this association was not present at the day level. Rumination, however, was associated with a .10-standard-deviation decrease in feelings of loneliness within students at the day level. Accounting for race-ethnicity, gender, age, and time of week in Model 2, both interpersonal and vicarious racism continue to be associated with increased loneliness at the aggregate level. Asian students reported higher feelings of loneliness compared to black or African American students (.77). In addition, female students reported marginally higher feelings of loneliness (.24) compared to male students.

Depressive symptoms. Table 4 shows results for depressive symptoms and positive affect. In addition, Table 5 shows within and between variance estimates for depressive

Table 5. Within and between Variance Estimates for Depressive Symptoms and Positive Affect with 95% Confidence Intervals.

	Depressive Symptoms				Positive Affect			
	Model 1		Model 2		Model 1		Model 2	
Variance component	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Within variation (residual)	1.10	[1.02, 1.18]	1.10	[1.02, 1.18]	1.11	[1.03, 1.19]	1.10	[1.02, 1.19]
Between variation (constant)	.57	[0.43, 0.76]	.50	[0.38, 0.67]	.83	[0.64, 1.08]	.73	[0.56, 0.96]
Intraclass correlation	.34		.31		.43		.40	

Note: $N = 149$. CI = confidence interval.
$^{\dagger}p < .10$. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

symptoms and positive affect with 95% confidence intervals. For depressive symptoms, a 1-standard-deviation increase in discrimination was associated with a .11-standard-deviation SD increase in depressive symptoms within students and a .44 increase in depressive symptoms between students. Vicarious racism was associated with a .21-standard-deviation increase in depressive symptoms at the aggregate level. Rumination, however, was associated with a .07-standard-deviation decrease in depressive symptoms within students. In Model 2, discrimination, vicarious racism, and rumination between students continue to be associated with increased depressive symptoms. Hispanic/Latino (.47) and Asian (.70) students reported higher depressive symptoms compared to black or African American students after accounting for measures of discrimination. Female students reported marginally higher depressive symptoms (.24) than male students. In addition, each year-age increase was associated with a marginal .06 increase in depressive symptoms.

Positive affect. For positive affect, Table 4, Model 1, shows that a 1-standard-deviation increase in rumination was associated with a .07-standard-deviation increase in feelings of positive affect at the day level. Adjusting for between-student characteristics in Model 2, first-generation black or continental African students reported higher feelings of positive affect (.49) than black or African American students. Weekends were also significantly associated with increased positive affect during the study period (.18).

Discussion

This study uses a high-frequency daily diary design to prospectively assess the mental health consequences of interpersonal discrimination, vicarious racism, and rumination among college students attending a predominately white university. This study also accounts for racial attribution and the degree to which the student was bothered by the event. Together, the findings demonstrate that daily discriminatory events were a robust predictor of anger, anxiety, loneliness, and depressive symptoms both at the daily level and over time between students. Below, we discuss study implications.

First, this study shows that interpersonal discrimination is linked to negative mental health variability both day to day and on average over time, thus supporting previous discrimination literature. Although the magnitude of these effects was generally not large at the day level, these small effects demonstrated repeated deflections to positive mental health over a short time period. It is therefore not surprising that the aggregate associations between students were substantially larger in magnitude. Thus, these results suggest that the day-to-day distress associated with discrimination is likely one means through which discrimination progressively harms health over the life course (e.g., Goosby et al. 2018; Ong et al. 2009). For instance, daily discrimination can lead to chronic feelings of anger or anxiety, progressively harming physical health by upregulating the stress response and increasing allostatic load (Sterling 2012). This study finds that distress associated with discrimination can increase feelings of anger, anxiety, loneliness, and depressive symptoms at any time and, moreover, do so consistently as the respondents in this study experienced a considerable number of these events over the relatively narrow participation time periods (see Appendix C). These results are therefore consistent with the hypothesis that the accumulation of negative feelings grounded in day-to-day experience serves as a foundation upon which broader population racial health disparities emerge and are maintained (Brody et al. 2014; Goosby and Heidbrink 2013; Williams and Mohammed 2009).

Second, similar to mechanisms linking interpersonal discrimination and mental health, vicarious racism likely leads to poorer mental health through feelings of racial injustice and threats to identity and physical harm (e.g., Rivas-Drake et al. 2014; Williams, Neighbors, and Jackson 2003). Vicarious racism may also increase mental distress by intensifying feelings of collective racial threat (Harrell 2000) or by increasing the negative perceptions that individuals believe others have about their own racial group (i.e., public regard; e.g., Chan 2017; Sellers and Shelton 2003). In addition, Truong et al. (2016) notes that talking with others about vicarious experiences of racism can further aggravate mental well-being by reactivating negative feelings. Thus, both interpersonal discrimination and vicarious racism adversely influence the mental health (and potentially physical health) of minority students attending predominately white universities as they traverse the already-stressful higher education environment.

Third, contrary to expectations, rumination was negatively associated with loneliness and depressive symptoms and positively associated with positive affect from day to day. This suggests that students who thought more about the racial injustices from day to day reported generally better mental health than students who thought less about these issues. A few factors might help explain this unexpected finding. First, it is possible that students who ruminated (i.e., thought more) on racial injustices over the study period were also concurrently involved in social groups or activities that were motivated by issues of race and racism in the United States or abroad (e.g., Black Lives Matter). Involvement in groups such as Black Lives Matter may have increased attention to race-related issues in the United States (and abroad) while simultaneously increasing feelings of support, potentially offsetting negative consequences of rumination. Additionally, ruminators may be more likely to identify supportive individuals or groups and mobilize social support to offset the distressful consequences of interpersonal discrimination (e.g., Nolen-Hoeksema and Davis 1999). Research should continue to unravel the links between rumination on racial injustices and social support mobilization among college students.

Unique to this study, we also identified several differences in interpersonal discrimination and mental health between racial-ethnic groups. For example, in this study, first-generation black or continental African students reported higher overall positive affect than U.S.-born black or African American students after accounting for measures of discrimination. While our sample design and sample size limit our ability to offer generalizations about these patterns, future research should continue to examine how college students of different racial-ethnic backgrounds perceive and respond to potentially discriminatory events on predominately white campuses.

As with any study, ours is not without limitations. StudentHD is a small convenience sample. Stronger sampling design and larger samples are needed to increase generalizability and more confidently identify effect sizes. In particular, our samples of racial-ethnic subgroups were small, thus limiting our power to draw conclusions about differences in mental health between racial-ethnic groups (e.g., Seaton et al. 2010; Williams and Mohammed 2009). Additionally, the Asian and white subsamples were small, reducing our power to detect relationships among these groups, much less generalize.[6] The results presented here are therefore preliminary and point to novel avenues for future research on the dynamics of discrimination and mental health. For this reason, we indicated suggestive relationships at $p < .10$ that could provide additional targets for exploration in future research. Our daily diary study also followed students for only one- or two-week periods, thus limiting our ability to examine these relationships further over time and to account for evolving identities and changing events over the college years. In this way, combining high-frequency data collections with traditional longitudinal designs may be particularly informative. Notably, because of the high frequency of questions about negative events and attributions of racism, participating in the study may have led participants to be more attentive to these issues as they were repeatedly prompted to report on them over the study period. This issue is not unique to our study; it is a potential issue for any study utilizing intensive data collection paradigms.

Despite these limitations, this study has a number of unique strengths. The advantage of using a daily diary design is that participants are able to report on events and experiences shortly after taking place, tightly syncing psychological and experiential reality in time. This design allowed us to adjust for temporally invariant factors in our model when estimating within-student associations at the daily level across multiple dimensions of discrimination and mental health. Furthermore, our study simultaneously accounts for discrimination event exposure, attribution, and stress appraisal, which helps to advance prior research that has addressed only one or two of these factors involved in discrimination experiences (e.g., Chae et al. 2011). In addition, including measures of vicarious racism and rumination is particularly salient given the increases in race-related events and heightened anti-immigrant sentiment occurring during the period of this study. Vicarious racism and rumination about racial injustice may increasingly influence the mental health of young people who are learning or thinking about these events, perhaps for the first time. In addition, the ability of social media to disseminate current events quickly allows people to learn about many things, including racial discrimination, with greater ease and perhaps more motivating interest.

Conclusion

Racial-/ethnic-minority students in primarily white contexts must navigate the complexities of race and ethnicity, in addition to the array of other challenges experienced at this transitional stage of the life course. Discrimination, whether experienced directly or vicariously, elevates the stress of social life for racial-/ethnic-minority students. We show that discrimination increases distress on local time scales—that is, over the course of daily life—modulating distress and decreasing mental health outcomes. These experiences appear to accumulate over time, leading to consistently poorer mental health outcomes (e.g., Williams and Mohammed 2009). Racism not only heightens the risks that racially/ethnically marginalized students will experience social exclusion either directly or vicariously; it also increases the likelihood that social encounters are less rewarding and more frustrating. Together, these factors represent a systematic denial of positive social interactions that make social life rewarding and that promote positive mental and physical health.

[6]Because the Asian and white subsamples were small, we reestimated the analytic models with these groups omitted. Results are consistent with those reported here (see Appendix D).

Appendix A

Table A1. Dependent Scale Items.

Scale	Measure
Anger (NIH Toolbox)	1. I was irritated more than people knew.
	2. I felt angry.
	3. I felt like I was ready to explode.
	4. I was grouchy.
	5. I felt annoyed.
Anxiety (NIH Toolbox)	1. I felt fearful.
	2. I felt anxious.
	3. I felt worried.
	4. I found it hard to focus on anything other than my anxiety.
	5. I felt nervous.
	6. I felt uneasy.
	7. I felt tense.
Loneliness (NIH Toolbox)	1. I felt alone and apart from others.
	2. I felt left out.
	3. I felt that I am no longer close to anyone.
	4. I felt alone.
	5. I felt lonely.
Depressive symptoms (CES-D)	1. I felt worthless.
	2. I felt that I had nothing to look forward to.
	3. I felt helpless.
	4. I felt sad.
	5. I felt like a failure.
	6. I felt depressed.
	7. I felt unhappy.
	8. I felt hopeless.
	9. I felt like I couldn't do anything right.
	10. I felt everything in my life went wrong.
	11. I felt lonely.
	12. I felt alone.
	13. It was hard for me to have fun.
	14. I could not stop feeling sad.
Positive affect (NIH Toolbox)	1. I felt attentive.
	2. I felt delighted.
	3. I felt calm.
	4. I felt at ease.
	5. I felt enthusiastic.
	6. I felt interested.
	7. I felt confident.
	8. I felt energetic.
	9. I felt able to concentrate.

Note: Rated from 1 = *never* to 4 = *often*. NIH = National Institutes of Health; CES-D = Center for Epidemiologic Studies Depression Scale.

Appendix B

Table B1. Racism and Life Experiences Scale (Harrell 1997) Items.

1. Been ignored, overlooked, or not given service (in a restaurant, store, etc.)
2. Being treated rudely or disrespectfully
3. Being accused of something or treated suspiciously
4. Others reacting to you as if they were afraid or intimidated
5. Being observed or followed while in public places
6. Being treated as if you were "stupid," being "talked down to"
7. Having your ideas ignored
8. Overhearing of being told an offensive joke
9. Being insulted, called a name, or harassed
10. Others expecting your work to be inferior (not as goods as others)
11. Not being taken seriously
12. Being left out of conversations or activities
13. Being treated in an "overly" friendly or superficial way
14. Other people avoiding you
15. Being stared at by strangers
16. Being laughed at, made fun of, or taunted
17. Being mistaken for someone else of your same race

Appendix C

Table C1. Descriptive Statistics: Events and Attribution by Race-ethnicity.

Variable	*M*/P	*SD*	Min.	Max.	Total Events
Overall sample (*N* = 149)					
Total RaLES events (day average)	0.58	1.50	0	13	*n* = 332
No. of students reporting at least one event over days					*n* = 108
No. of events attributed to race/racism					*n* = 216
% of all reported events attributed to race/racism					65.06%
U.S.-born black or African American (*N* = 36)					
Total RaLES events (day average)	0.96	1.95	0	10	*n* = 112
No. of students reporting at least one event over days					*n* = 29
No. of events attributed to race/racism					*n* = 67
% of all reported events attributed to race/racism					59.82%
First-generation black or continental African (*N* = 66)					
Total RaLES events (day average)	0.40	1.21	0	11	*n* = 103
No. of students reporting at least one event over days					*n* = 39
No. of events attributed to race/racism					*n* = 78
% of all reported events attributed to race/racism					75.73%
Hispanic/Latino (*N* = 27)					
Total RaLES events (day average)	0.49	1.27	0	13	*n* = 64
No. of students reporting at least one event over days					*n* = 23
No. of events attributed to race/racism					*n* = 44
% of all reported events attributed to race/racism					68.75%
Asian (*N* = 11)					
Total RaLES events (day average)	0.98	2.11	0	12	*n* = 32
No. of students reporting at least one event over days					*n* = 9
No. of events attributed to race/racism					*n* = 16
% of all reported events attributed to race/racism					50%
White (*N* = 9)					
Total RaLES events (day average)	0.39	1.05	0	7	*n* = 21
No. of students reporting at least one event over days					*n* = 8
No. of events attributed to race/racism					*n* = 11
% of all reported events attributed to race/racism					52.38%

Note: M/P = mean or proportion; RaLES = Racism and Life Experiences Scale.

Appendix D

Table D1. Models Omitting Asian and White Students (Table 2).

	Anger				Anxiety				Loneliness			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Variable	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Within												
Interpersonal discrimination (z)	.13***	.03	.13***	.03	.11***	.03	.11***	.03	.14***	.03	.14***	.03
Vicarious racism (z)	.03	.03	.03	.03	.09**	.03	.09**	.03	.01	.03	.01	.03
Rumination (z)	−.01	.03	−.01	.03	−.06†	.03	−.06†	.03	−.09*	.04	−.09*	.04
Weekend			−.01	.06			−.06	.06			.01	.06
Between												
Interpersonal discrimination (z)	.43***	.08	.44***	.08	.41***	.08	.43***	.08	.40***	.09	.41***	.09
Vicarious racism (z)	.21*	.09	.19†	.10	.22*	.09	.19*	.09	.17†	.10	.17†	.10
Rumination (z)	.01	.10	−.01	.10	.04	.10	.00	.10	.03	.11	.01	.11
First-generation black or continental African			−.02	.18			.08	.17			.12	.19
Hispanic			.23	.19			.52**	.18			.20	.20
Female			.16	.14			.32*	.13			.22	.15
Age			.01	.04			.03	.03			.02	.04
Constant	−.07	.07	−.19	.17	−.07	.06	−.39*	.15	−.03	.07	−.28	.17

Note: $N = 129$. Interpersonal discrimination, vicarious racism, and rumination are standardized (z) in the within and between models ($M = 0$, $SD = 1$).
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table D2. Models Omitting Asian and White Students (Table 3).

	Anger				Anxiety				Loneliness			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Variance components	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Within variation (residual)	1.09	[1.01, 1.18]	1.09	[1.00, 1.18]	1.11	[1.03, 1.21]	1.11	[1.02, 1.21]	1.13	[1.05, 1.23]	1.13	[1.05, 1.23]
Between variation (constant)	0.44	[0.32, 0.61]	0.42	[0.31, 0.59]	0.41	[0.30, 0.57]	0.35	[0.25, 0.49]	0.48	[0.35, 0.67]	0.47	[0.34, 0.64]
Intraclass correlation	.29		.28		.27		.24		.30		.29	

Note: $N = 129$. CI = confidence interval.

Table D3. Models Omitting Asian and White Students (Table 4).

	Depressive Symptoms				Positive Affect			
	Model 1		Model 2		Model 1		Model 2	
Variable	β	*SE*	β	*SE*	β	*SE*	β	*SE*
Within								
Interpersonal discrimination (z)	.12***	.03	.12***	.03	.01	.03	.01	.03
Vicarious racism (z)	.06†	.03	.06†	.03	−.03	.03	−.03	.03
Rumination (z)	−.10**	.04	−.10**	.04	.07*	.04	.07*	.04
Weekend			−.05	.06			.17**	.06
Between								
Interpersonal discrimination (z)	.34***	.09	.36***	.09	−.11	.11	−.12	.11
Vicarious racism (z)	.25*	.10	.24*	.10	−.03	.12	.07	.12
Rumination (z)	−.04	.11	−.07	.11	−.10	.14	−.05	.13
First-generation black or continental African			.17	.19			.51*	.23
Hispanic			.44*	.20			−.31	.25
Female			.20	.15			−.05	.18
Age			.05	.04			−.06	.05
Constant	−.05	.07	−.33†	.18	.03	.09	−.21	.21

Note: $N = 129$. Interpersonal discrimination, vicarious racism, and rumination are standardized (z) in the within and between models ($M = 0$, $SD = 1$).
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table D4. Models Omitting Asian and White Students (Table 5).

	Depressive Symptoms				Positive Affect			
	Model 1		Model 2		Model 1		Model 2	
Variance component	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Within variation (residual)	1.13	[1.04, 1.22]	1.13	[1.04, 1.22]	1.20	[1.11, 1.30]	1.19	[1.10, 1.30]
Between variation (constant)	0.53	[0.39, 0.73]	0.49	[0.36, 0.67]	0.86	[0.65, 1.14]	0.76	[0.57, 1.01]
Intraclass correlation	.32		.30		.42		.39	

Note: $N = 129$. CI = confidence interval.

Acknowledgments

We would like to thank the University of Nebraska–Lincoln for supporting this project. All opinions and errors are the sole responsibility of the authors and do not necessarily reflect those of either the helpful commentators, the University of Nebraska–Lincoln, or other researchers associated with this project.

Authors' Note

This research was presented at the annual conference of the American Sociological Association, Philadelphia, August 2018.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by Grant P2CHD042849 awarded to the Population Research Center at the University of Texas at Austin by the Eunice Kennedy Shriver National Institute of Child Health and Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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