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Applying Stress and Coping Models to Ethnic/Racial Identity, Discrimination, and Adjustment among Diverse Adolescents

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Abstract

Adopting the constructs of exposure, reactivity, and recovery, from stress and coping frameworks, the study investigates three models of discrimination, adjustment, and ethnic/racial identity among 76 African American, 145 Asian American, and 129 Latinx adolescents who were majority United States-born. The sample includes adolescents sampled from public schools in a large urban area in the northeastern United States, 62% female and with an average age of 14.3 years. Multilevel analyses support an exposure effect (Model 1) where a higher level of ethnic/racial identity (ERI) commitment was associated with a 28% reduction in experiencing discrimination stress. The negative effects of discrimination were attenuated by ERI commitment and centrality/private regard, while effects were exacerbated by ERI exploration (Model 2). Two approaches investigated next-day and longer-term recovery from discrimination (Model 3). With the exception of positive mood and anxiety, the data support recovery from discrimination stress. Discrimination is discussed in the development and maintenance of health disparities.

Keywords

Discrimination; Ethnic/racial identity; stress and coping

The negative impact of ethnic/racial discrimination (ERD) stress has received substantial empirical attention over the past few decades with a notable concentration of interest in the past several years. Meta-analyses and systematic reviews conclude that ERD stress compromises a host of adjustment outcomes (Benner et al., 2018; Pascoe & Richman, 2009; Priest et al., 2013; Schmitt, Branscombe, Postmes, & Garcia, 2014). Recognizing the robust impact of ERD, developmental scientists are increasing focused on resources to modulate

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vulnerabilities. One such resource is ethnic/racial identity (ERI). Research has explored how ERI might (a) have a direct association with how frequently individuals experience ERD (i.e., exposure), and (b) serve as an individual difference to moderate the association between ERD and adjustment (i.e., reactivity). While most of the existing research has modeled and analyzed ERD as a source of chronic, or stable stress; researchers have begun to employ intensive longitudinal methods to capture the daily-level dynamics of ERD stress facilitating more proximal investigations of the impact of discrimination stress (Seaton & Douglass, 2014; Torres & Ong, 2010; Yip, Cheon, et al., 2019). Developmental scientists are especially interested in how adolescents respond to and recover from daily ERD stress, investigating carry-over effects (i.e., recovery). Both ERI and ERD are developmentally salient experiences for ethnic/minority youth (Hughes, Del Toro, Harding, Way, & Rarick, 2016; Yip, 2014); and theories of ethnic/racial child development have long emphasized the importance of ethnicity/race and discrimination for youth outcomes (Garcia Coll et al., 1996; Spencer, Dupree, & Hartmann, 1997). The current study employs a multilevel framework to explore theoretical and empirical support for three conceptual models of stress and coping (i.e., exposure, reactivity, recovery) in a sample of ethnic/racial minority adolescents.

Definitions and Data Structure

Ethnic/racial discrimination (ERD) has been described as “all means of expressing and institutionalizing social relationships of dominance and oppression…intended to maintain privileges for members of dominant groups at the cost of deprivation for others” (Krieger, 1999, p. 301). Priest et al. (2013; pg. 2) describe ERD as “avoidable and unfair inequalities in power, resources and opportunities across racial or ethnic groups…expressed through beliefs, emotions or behaviors/practices, ranging from open threats and insults to phenomena deeply embedded in social systems and structures.” The current study focuses on interpersonal ERD which is most psychologically proximal, the most commonly researched form (Krieger et al., 2010), and the form that has been shown to have consistent and robust associations with youth adjustment (Benner et al., 2018; Pascoe & Richman, 2009; Priest et al., 2013; Schmitt et al., 2014).

Ethnic/racial identity (ERI) is a constellation of feelings, thoughts, and attitudes related to membership in an ethnic/racial group. ERI is multi-faceted and includes multiple dimensions and approaches (Umana-Taylor, Quintana, et al, 2014). This paper focuses on both developmental statuses (Phinney, 1992b) as well as content and significance (Sellers, Rowley, Chavous, Shelton, & Smith, 1997), since both ERI approaches have been prominently applied to the study of ERD and adolescent development. From the developmental perspective (Phinney & Ong, 2007), we focus on ERI exploration (the search for the meaning of an ethnic/racial identity) and commitment (a sense of certainty regarding one’s ethnic/racial identity and group membership). Tapping content and significance (Sellers & Shelton, 2003), we focus on ERI centrality (the overall importance of ethnicity/race to one’s identity) and private regard (affective dimension of ethnic/racial identity). This paper explores both areas of overlap and distinction between these ERI dimensions in each of the three stress and coping models. Since there is a tension in the ERI literature about whether to focus on “universal versus (ethnic/racial) group-specific” approaches to ERI

scholarship (Schwartz et al., 2014), the current study investigates analyses with the whole sample while also considering possible subgroup differences.

Finally, we detail the multilevel data that test the three stress and coping models. Consistent with research on stress and coping (Bolger & Zuckerman, 1995), and ERD and adjustment (Ong, Fuller-Rowell, & Burrow, 2009), this paper employs a daily diary approach where respondents provide daily reports over two weeks. The multilevel data are purposefully constructed to explore how individual differences in ERI impact daily ERD stress experiences. The repeated-measures design yields data at two levels: the daily level (level-1) where within-person processes are considered (e.g., ERD and adjustment outcomes) and the individual level (level-2) where individual differences are explored (e.g., ERI exploration, commitment, centrality, private regard). Applying a stress and coping framework, ERI is modeled as an individual difference impacting exposure, reactivity, and recovery from daily ERD stress.

Discrimination and Adjustment Outcomes

Meta-analyses and systematic reviews conclude that ERD is associated with higher levels of negative outcomes such as anxiety, psychological distress, stress responses, and cardiovascular disease (Benner et al., 2018; Marks, Ejesi, McCullough, & Coll, 2015; Pascoe & Richman, 2009; Priest et al., 2013; Schmitt et al., 2014), across ethnic/racial groups, ages, countries, gender, and socioeconomic status (Marks et al., 2015). Like other discrete stressors, ERD involves isolated events and researchers have adopted daily diary techniques to explore its day-to-day impact. For example, Burrow and Ong (2010) observed daily ERD to be associated with elevated levels of daily negative affect, depression, and anxiety among African American university students. In other diary studies, daily ERD was associated with higher negative affect, more somatic symptoms, sleep/wake disruptions and lower positive affect (Huynh & Fuligni, 2010; Ong, Burrow, Fuller-Rowell, Ja, & Sue, 2013; Xie, Yip, Cham, & El-Sheikh, 2021). Existing studies link daily ERD to compromised physical and mental adjustment. This study builds upon a foundational assumption that ERD is a form of stress that has a negative effect on adjustment and extends the current literature by probing the role of ERI in this association investigating three stress and coping models (i.e., exposure, reactivity, recovery).

Conceptualizations of Discrimination and ERI in a Stress and Coping Framework

A stress and coping framework (Lazarus & Folkman, 1984) is well suited to the study of ERI, ERD, and adjustment since it provides a mechanism to consider both risk and protective factors (Noh, Beiser, Kaspar, Hou, & Rummens, 1999; Sellers, Caldwell, Schmeelk-Cone, & Zimmerman, 2003). Stress is conceptualized as an everyday, normative occurrence, consistent with the ERD experiences of youths of color (Fisher, Wallace, & Fenton, 2000; Hughes et al., 2016; Umaña-Taylor, 2016). In turn, coping is triggered by stress experiences. Research among African American college students finds that daily ERD is associated with enacting more active problem solving, rumination, and avoidance coping compared to non-race-related stress (Hoggard et al., 2012). In the context of ERD stress,

ERI is conceptualized as an individual-difference, domain-specific coping resource (Sellers, Copeland-Linder, Martin, & Lewis, 2006). As detailed below, the constructs of exposure, reactivity, and recovery are adapted from the stress and coping literature (Ong et al., 2009) to test three conceptual models depicting relationships between ERI, ERD, and adjustment.

Conceptualizations of ERI

The popularity of multiple ERI theories, measures, and methodologies have introduced nuance and equivocality to the literature. This study draws from the most widely employed developmental and social/personality approaches. Drawing from developmental science, we consider how *where adolescents are in the ERI development* is related to exposure, reactivity, and recovery from ERD stress. A meta-analyses of over 50 studies found moderating effects of ERI exploration and commitment on the association between ERD and outcomes (Yip, Wang, Mootoo, & Mirpuri, 2019). Individuals reporting high levels of ERI exploration exhibited stronger negative associations between ERD and mental health outcomes. On the other hand, higher levels of ERI commitment mitigated the impact of ERD on adjustment indices, especially for Latinx individuals.

Based on a collective self-esteem approach (CSE; Luhtanen & Crocker, 1992), Sellers and colleagues captured the significance and meaning of African American ethnic/racial identity in the Multidimensional Inventory of Black Identity (MIBI; Sellers et al., 1997). Because the MIBI is based on social/personality theories, it shares a theoretical framework with a stress and coping approach. Despite empirical support for ERI serving as a resource to alleviate the stressors of ERD (Neblett, Shelton, & Sellers, 2004; Noh et al., 1999; Noh & Kaspar, 2003; Utsey, Ponterotto, Reynolds, & Cancelli, 2000; Yoo & Lee, 2005), meta-analyses did not yield consistent patterns (Yip, Wang, et al., 2019). The current analysis focuses on the dimensions of centrality and private regard (Sellers et al., 2006). Applications of a stress and coping framework find that ERI buffers the negative impact of ERD on depressive symptoms among African Americans (Sellers et al., 2003; Sellers et al., 2006), and meta-analytic techniques observe positive benefits for private regard dimensions (Rivas-Drake et al., 2014). Drawing from social/personality psychology, we consider how *adolescents' feelings about the significance and affective foundations of ERI* are related to exposure, reactivity, and recovery from ERD stress.

Despite strong theoretical foundations and empirical support for how various dimensions of ERI are related to discrimination and adjustment indices, there is much less research focusing on the dynamic associations between these constructs at a daily level. How adolescents are exposed to, react to and recover from daily ERD stress, and how ERI is implicated in these dynamics, remains a question.

Conceptual Models

The three conceptual models adopt *exposure, reactivity*, and *recovery* from the stress and coping literature (Ong et al., 2009) to depict relationships between ERI, ERD, and adjustment. The first is the *exposure* model, exploring how ERI is associated with frequency of ERD exposure. Because ERI is measured at the individual level (level-2) while ERD

and outcomes are measured at the daily level (level-1), a two-level exposure model explores how ERI impacts daily ERD experiences (Model 1; Figure 1). The second model is the *reactivity* model where ERI moderates and the daily impact of ERD on adjustment (i.e., cross-level moderation; Model 2; Figure 2). The third, and final, model is the *recovery* model, exploring the carry-over impact of ERD from one day to the next (Model 3; Figure 3), and the potential impact of ERI on recovery. While a piecemeal analysis of each of these models exists, this study contributes a systematic evaluation to both theory and developmental science considering all three conceptual models in a sample of diverse adolescents. Conceptually and analytically, these models are not competing, nor mutually exclusive; rather, they provide a comprehensive overview of how ERI is implicated in the daily experiences of ERD stress.

Model 1: Differential Exposure to Discrimination by ERI.

The first model—the exposure model—posits that ERI has a direct impact on experiences of ERD; this model has both theoretical and empirical support. Consistent with self-categorization theory, ERI is a lens through which individuals see the world (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). There is robust evidence of racism and discrimination, independent of individual perception (Miles, 2004); however, ERI may condition the likelihood that individuals perceive existing inequities. Individuals for whom race is central or important may be more likely to perceive everyday interactions as race-related (Neblett et al., 2004; Sellers et al., 2006; Sellers & Shelton, 2003; Shelton & Sellers, 2000). These findings have been corroborated in daily diary research where African American young adults reporting higher levels of centrality were also more likely to report daily ERD (Burrow & Ong, 2010). For adolescents, the literature suggests that ERI exploration, commitment and centrality are associated with more frequent experiences of ERD (Cheon & Yip, 2019; French & Chavez, 2010; Gonzales-Backen et al., 2018; Seaton, 2009; Sellers et al., 2006; Sellers & Shelton, 2003); and the same pattern is expected in the current data. However, research on how private regard and commitment are related to ERD among adolescents is less clear (Cheon & Yip, 2019).

Model 2: Differential Reactivity to Discrimination by ERI.

The second model – the reactivity model – posits that individual differences in ERI moderate the association between daily ERD and adjustment. Relative to the other models, this model has had the most theoretical and empirical attention, and yet a recent meta-analysis shows that data patterns are largely dependent upon ERI dimensions (Yip, Wang, et al., 2019). The moderating impact of ERI is supported by social identity theory; once an individual adopts a social identity, they become invested in maintaining self-esteem via that social identity (Turner & Tajfel, 1986). Across ethnic/racial groups and ages, researchers have observed commitment and private regard to buffer individuals from the vulnerabilities associated with ERD (Bynum, Best, Barnes, & Burton, 2008; Lee, 2005; Neblett & Roberts, 2013; Rivas-Drake, Hughes, & Way, 2008). At the same time, experiencing ERD when one has unclear feelings about or identification with ethnic/racial group membership seems to be particularly detrimental; indeed, ERI exploration has been observed to exacerbate the negative stress effects of ERD (Burrow & Ong, 2010; Yip, Wang, et al. 2019).

One might also hypothesize that given the centrality of ERI, ERD may have particularly detrimental impact. Indeed, centrality seems to exacerbate the negative effects of ERD such that individuals who report a stronger attachment to their ethnic/racial group report stronger negative effects of ERD (Burrow & Ong, 2010; McCoy & Major, 2003; Noh et al., 1999; Yip, Gee, & Takeuchi, 2008). A daily diary study found that African American students who report high levels of centrality also report higher levels of negative affect and depression on days in which they report ERD (Burrow & Ong, 2010). A recent meta-analytic review found both buffering and exacerbating effects of identity (Pascoe & Richman, 2009; Yip, Wang, et al. 2019). The current analyses test differential reactivity to ERD; based on existing theoretical and empirical research, it is hypothesized that ERI private regard and commitment will buffer the negative impact of ERD, while exploration and centrality may exacerbate effects.

Model 3: Recovery from Discrimination.

The third model – the recovery model – explores recovery from ERD, and the role of ERI on this recovery. Adapting Bolger and colleagues' approaches (1989), recovery is modeled in two ways: (a) comparing adjustment on days with ERD to the following day, and (b) comparing the day after experiencing ERD to other ERD-free days. The difference between these two recovery models is that the first recovery models indicates whether there is any next-day improvement from initial responses to ERD (i.e., any recovery model), whereas the second recovery model indicates whether next-day improvement is distinguishable from any other day that does not immediately follow an ERD experience (i.e., full recovery model). Recovery models are important to investigate since ERD not only has same-day, but also next-day effects. Daily diary research finds that ERD experienced today is associated with .09 standard deviation increase in depressive feelings (Torres & Ong, 2010), .07 increase in negative affect, .02 increase in somatic symptoms (Ong et al., 2013), $d = .96$ increases in sleep disturbance and $d = .40$ increases in daytime dysfunction (Xie et al., 2021) the following day. As such, lingering adjustment effects of ERD may be implicated in the development and maintenance of chronic health disparities. According to a stress and coping framework, coping processes will be invoked in response to ERD stress, and negative health responses to ERD are expected to dissipate over time (indicating recovery from an acute ERD stressor). As such, it is hypothesized that while ERD will have same-day effects of adjustment, that the negative effects of discrimination will dissipate over time.

The Current Study

Adapting *exposure, reactivity*, and *recovery* from the stress and coping literature (Bolger & Zuckerman, 1995), the current study bridges theories of ethnic/racial minority youth development (Coll et al., 1996; Spencer et al., 1997) with developmental (Phinney, 1992a) and social psychological identity (Sellers, Smith, Shelton, Rowley, & Chavous, 1998) theories to test three conceptual models of ERI exploration, commitment, centrality, and private regard and the daily associations between ERD and adjustment. The current study uses data from a 14-day daily diary study of a diverse sample of African American, Asian American, and Latinx adolescents, complementing developmental literature that has employed daily diary methods to focus primarily on adult samples (Burrow & Ong, 2010)

or on one ethnic/racial group (Seaton & Iida, 2019; Zeiders et al., 2019). ERD and ERI are particularly salient in adolescence (Hughes et al., 2016; Umaña-Taylor et al., 2014), and ERD during adolescence may be especially influential for adult adjustment (Adam et al., 2015).

Methods

Participants

The data were drawn from the first year of a four-year longitudinal study on ERD, sleep, and psychological adjustment on the ninth-grade adolescents. The sample included 76 African American, 145 Asian American (74% identified as Chinese, 3% Indian, 8% Korean, and 15% other), and 129 Latinx (5% identified as Central American, 25% Dominican, 22% Mexican, 15% Puerto Rican, 24% South American, and 9% other) adolescents. Table 1 presents the descriptive statistics, significance tests, and effect sizes of the demographic variables (age, gender, nativity, mother's and father's education level) across African American, Asian American, and Latinx adolescents. The sample had mean age of 14.3 years old (SD = .6) and was 62% female. The three ethnic/racial groups were not significantly different across age, gender, mother's and father's education levels, however, while most African American (70%) and Latinx (80%) adolescents reporting being born in the United States, most Asian American adolescents (76%) did not report nativity status.

Procedure

The project was approved by the Fordham University Institutional Review Board (#13–075, "Effects of stress and sleep disturbance on academics and well-being among minority youth"). Participants were recruited from five public high schools in a diverse and urban area in the northeastern the United States. Participating schools reflect the diversity of the larger context, average 31% African American (ranging from 4% to 63%), 15% Asian American (ranging from 3% to 57%), 46% Latinx (ranging from 21% to 50%), and 6% White (ranging from 2% to 16%) students. The average Simpson's (1949) diversity index for the participating schools was .47 (ranging from .29 to .62, with higher scores indicating higher ethnic/racial diversity), indicating that the probability of randomly selecting two students from different ethnic/racial groups was 47%. Based on online data from the Department of Education (2016–2017), students in the five schools were representative of the larger area according to mean SAT scores = 925 (SD = 101), attendance rates = 87% (SD = 6%; area average = 89%), and four-year graduation rates = 76% (ranging from 60% to 89%; area average = 74%). All African American, Asian American, and Latinx ninth-grade students at each school were invited to participate in the study. Invitation letters were mailed to parents; only students with parental consent participated. Due to the intensive nature of the data collection and the unique challenges of collecting data from a diverse urban sample, data were collected in four successive cohorts (cohort 1: n = 85, cohort 2: n = 90, cohort 3: n = 89, cohort 4: n = 86) from 2015 to 2018. The four cohorts did not differ by age (η^2 = .01), gender (W = .01), nativity (W = .01), mother's (W = .01) or father's education levels (W = .02), and all ninth-grade respondents were aggregated.

Participants met in groups of one to ten students after school dismissal, were assented to the study, and completed an online demographic questionnaire including questions about ERI. Participants were then given a data-enabled electronic tablet to access the five- to seven-minute daily web-based survey, which they completed each night before bed for 14 days. Because the daily diary survey was hosted online, the research team monitored compliance daily. Participants were compliant (M = 10.8 diaries completed, SD = 3.6, maximum = 14). After 14 days, participants returned the tablet, completed another online survey, and were compensated $20.

Measures

The data reported here draw from two data collection points. The first survey administration preceded the daily diaries (i.e., individual-level data), and the second data collection included the daily diaries (i.e., daily-level data). Measures are organized by their respective level of analysis. Descriptive and psychometric statistics are presented in Table 2.

Individual ERI.—ERI exploration and commitment were assessed using items adapted from the Multigroup Ethnic Identity Measure (MEIM; Phinney, 1992b). ERI centrality and private regard were assessed with items adapted from the Multidimensional Inventory of Black Identity (MIBI; Sellers et al., 1997). Detailed psychometric analyses are presented elsewhere (Cheon, Feng, Cham, & Yip, in preparation), and are summarized here as they relate to the current analyses. Participants rated all MEIM items on a four-point scale (1 = *strongly disagree* to 4 = *strongly agree*). Confirmatory factor analysis examined the dimensionality of MEIM exploration and commitment in two adolescent (including the current data) and one young adult sample (Cheon et al., in preparation). Consistent with existing psychometric studies with adolescents (Yancey et al., 2001), the two reverse-worded items (one exploration, one commitment item) had poor factor loadings (standardized factor loading < .4) in the adolescence samples. Adolescents generally have a difficult time responding to reverse-coded statements (e.g., Ebesutani et al., 2012; Marsh, 1996; Muris et al., 2001). Following Brown (2003) and Marsh's (1996) suggestions to exclude the reverse-coded items, results supported a correlated two-factor model, with five items for exploration and seven items for commitment. The revised factor model was invariant across ethnic/racial groups (i.e., African American, Asian American, Latinx American) and across time (Cheon et al., in preparation). The current study uses the revised factor structure to assess exploration and commitment and specific items are included as Supplemental Material (Table S1).

The psychometric properties of the adapted ERI centrality and private regard from the Multidimensional Inventory of Black Identity (MIBI; Sellers et al., 1997) were investigated using the same adolescent and young adult samples (Cheon et al., in preparation). While the MIBI was developed and normed for African American college samples, it has been adapted to be valid and reliable in diverse samples spanning adolescence to adulthood (Schwartz et al., 2014). Participants rated items on a seven-point scale (1 = *strongly disagree* to 7 = *strongly agree*). Similar to the MEIM, confirmatory factor analysis indicated that reverse-coded items had poor factor loadings (standardized factor loading < .4 in value) and were thus excluded (Brown, 2003; Marsh, 1996). An additional centrality item was

excluded due to a poor factor loading. Consistent with existing research, the centrality and private regard factors were highly correlated (*r*s > .99, e.g., *r* = .59 to .65 among Latinx youth in Cross et al., 2018; *r* = .72 among African American youth in Seaton & Iida, 2019), and young adult samples (r = .88 in Cheon et al., in preparation). Consistent with existing research (e.g., Simmons et al., 2008; Vandiver et al., 2009) the two factors were combined into a single centrality/private regard factor. The revised factor model with four centrality items and four private regard items fit the data well and was invariant across ethnic/racial groups (i.e., African American, Asian American, Latinx American) and across time (Cheon et al., in preparation; see Supplemental Materials Table S2).

Daily ERD.—Participants reported the extent to which they experienced discrimination using the Racial/Ethnic Discrimination Index (REDI; Feng, Cheon, Yip, & Cham, 2021). The measure has been published in other research (Yip, Cham, Wang, & El-Sheikh, 2019) and consists of six social interactions related to respondents' ethnicity/race (e.g., "I was treated unfairly because of my race/ethnicity"). Participants reported the extent to which each item was a problem using a three-point scale (0 = *did not happen/was not a problem today*, 1 = *somewhat of a problem today*, 2 = *very much a problem today*). This measure showed internal consistency at the daily level (α = .90) and adolescent level (α = .98; Geldhof, Preacher, & Zyphur, 2014). Consistent with other indicators of daily ERD, adolescents reported low frequencies of daily ERD (Hoggard et al., 2012; Torres & Ong, 2010). Across the six items, 71% of students reported that they did not experience ERD; therefore, the data were transformed into a dichotomous indicator (i.e., 0 = no daily ERD experience, 1 = at least one daily ERD experience; *M* = .09). The intraclass correlation supports variation in ERD across days across the adolescents (*ICC* = .47). To examine the validity of the REDI dichotomous indicator, correlations with a daily adaption of the Everyday Discrimination Scale (Williams et al., 1997) and adjustment indicators were estimated. As others have done (Goosby, Cheadle, & Mitchell, 2018), adolescents were queried about their experiences "today" (e.g. "Today, I received poorer service than others in restaurants or stores"). If participants indicated "yes", they were asked: "how sure are you that this happened because of your race/ethnicity?" (0 = not at all, 1 = not very sure, 2 = somewhat sure, 3 = very sure). The median daily-level correlation between the REDI and the Everyday Discrimination Scale (attributed to ethnicity/race) was .16 (range: −.02 to .43), supporting convergent validity. The REDI dichotomous indicator was also significantly correlated with negative mood (*r* = .07), anxious mood (*r* = .07), and angry mood (*r* = .09), supporting criterion-related validity.

Daily adjustment outcomes.—Participants reported daily mood, somatic symptoms, and stress response styles (problem solving coping, rumination). Daily mood was assessed with an abbreviated version of the Profile of Mood States (POMS; McNair et al., 1971) adapted for daily diary studies (Cranford et al., 2006). Ranging from 1 (*not at all*) to 5 (*extremely*), adolescents responded to three dimensions of the POMS: *anxious mood* (anxious, nervous, on edge, unable to concentrate), *negative mood* (sad, hopeless, discouraged, blue), and *angry mood* (angry, resentful, grouchy, annoyed). The POMS does not include a positive affect scale, therefore, adolescents rated additional items for *positive mood* (happy, calm, joyful, excited).

Somatic symptoms were assessed by the Index of Somatic Symptoms (Walker, Garber, Smith, Van Slyke, & Claar, 2001), derived from the six most commonly endorsed items from the Children's Somatization Inventory (CSI; Garber, Walker, & Zeman, 1991). On a scale from 1 (*not at all*) to 4 (*a whole lot*), adolescents rated somatic symptoms (headache, nausea, tiredness, sore muscles, stomachache, feeling weak), that have been found to be valid and reliable indicators of daily experiences (Bolger et al., 1989).

Adolescents' adjustment was also measured by two dimensions of daily stress responses associated with daily ERD reports (Hoggard, Byrd et al., 2012), including the *rumination* (i.e., passive coping by thinking repetitively about negative symptoms but not taking actions to change unfavorable situations) and *problem-solving coping strategies* (i.e., positive coping with active responses to resolve the problems) subscales of the Children's Response Styles Questionnaire (Abela, Vanderbilt, & Rochon, 2004). On a scale from 1 (*no, I did not do this today*) to 3 (*a lot of the time*), adolescents rated engagement in four *ruminative thoughts* (e.g., "I thought about all of my failures, faults, and mistakes") and three *problem-solving coping strategies* (e.g., "I tried to find something good in the situation or something I had learned"). Stress response approaches are reliable and valid predictors of children and adolescent health (J. R. Abela, Brozina, & Haigh, 2002).

Analytic Strategies

Analyses were conducted in M*plus* 8.2 (Muthén & Muthén, 1998) using maximum likelihood estimation with robust standard errors (MLR). Nativity (0 = foreign born, 1 = U.S. born) was included to account for association with daily diary compliance (Enders, 2010); foreign-born adolescents (16% of the sample) had a higher completion rate than United States-born adolescents ($r = .21$, $p < .01$). Adolescents' ethnicity/race (i.e., African American, Asian American, Latinx American) was dummy coded using Latinx as the reference group. Multilevel modeling estimated the exposure, reactivity, and recovery models. As a test of sensitivity, the possibility of differences across the three ethnic/racial groups was investigated with multivariate Wald tests examining omnibus differences across the three groups (see Supplemental Materials).

Testing model 1: Differential exposure to discrimination by ERI.—The direct effect of ERI on ERD was estimated with two-level logistic regression models (i.e., 0 = no discrimination today, 1 = yes at least one instance of discrimination today):

$$log\left(\frac{\hat{p}_{ti}}{1-\hat{p}_{ti}}\right) = \gamma_{00} + \gamma_{01}(EXP)_i + \gamma_{02}(COM)_i + \mu_{0i}$$

$$log\left(\frac{\hat{p}_{ti}}{1-\hat{p}_{ti}}\right) = \gamma_{00} + \gamma_{03}(CEN/PRI)_i + \mu_{0i}$$

$log(\cdot)$ is the natural logarithmic function and $\hat{p}_{ti}$ is the predicted probability of an individual experiencing ERD i (level-2) at day t (level-1). $log(\hat{p}_{ti}/1-\hat{p}_{ti})$ is the logit function. μ_{0i} is an individual i's residual, which is assumed to be normally distributed. γ_{00} is the intercept.

γ_{01}, γ_{02}, and γ_{03} are the unstandardized exposure effects of: 1) ERI exploration (*EXP*) and commitment (*COM*), and 2) centrality/private regard (*CEN/PRI*) which were investigated in two separate models. To facilitate the interpretation, the odds ratios (and 95% confidence intervals) of ERI exploration, commitment, and centrality/private regard were reported and interpreted as the corresponding increase in odds of experiencing ERD when ERI increases by one *SD*. *R*-square estimates effect size and provide the percentage of the variance of logit accounted for by each predictor.

Testing model 2: Differential reactivity to discrimination by ERI.—Next, the moderating role of ERI on the association between daily ERD and adjustment using cross-level interactions was estimated. The first equation focuses on the moderating effects of exploration and commitment while the second focuses on centrality/private regard:

$$(OUT)_{ti} = \gamma_{00} + \gamma_{10}(ERD)_{ti} + \gamma_{01}(EXP)_i + \gamma_{02}(COM)_i + \gamma_{11}(ERD)_{ti}(EXP)_i + \gamma_{12}(ERD)_{ti}(COM)_i + \gamma_{20}(OUT)_{(t-1)i} + \mu_{0i} + \mu_{1i}(ERD)_{ti} + \epsilon_{ti}$$

$$(OUT)_{ti} = \gamma_{00} + \gamma_{10}(ERD)_{ti} + \gamma_{03}(CEN/PRI)_i + \gamma_{13}(ERD)_{ti}(CEN/PRI)_i + \gamma_{20}(OUT)_{(t-1)i} + \mu_{0i} + \mu_{1i}(ERD)_{ti} + \epsilon_{ti}$$

$(OUT)_{ti}$ is an individual *i*'s adjustment outcome (*OUT*) on day *t*. To adjust for carry-over effects, adjustment reported on the previous day $(OUT)_{(t-1)i}$ was included as a covariate. γ_{00} is the intercept, while μ_{0i} is individual *i*'s residual intercept. γ_{10} is the effect of ERD on the outcome at mean-levels of ERI exploration, commitment, and centrality/private regard, while μ_{1i} is individual *i*'s residual slope of ERD. μ_{0i} and μ_{1i} are assumed to be bivariate normally distributed. γ_{01}, γ_{02}, and γ_{03} are the effects of exploration, commitment, and centrality/private regard when no ERD was experienced. γ_{11}, γ_{12}, and γ_{13} quantify the moderation effects of ERD with exploration, commitment, and centrality/private regard, respectively. Level-2 pseudo *R*-squares of the moderation effects are reported as standardized measures of effect size, and are interpreted as the percentage of the random slope variance of ERD accounted for by ERI.

Testing model 3: Differential recovery from discrimination by ERI.—The recovery model explored potential carry-over effects of ERD on next-day outcomes, and how these effects might vary by ERI. Analyses proceeded in three steps. First, to quantify the magnitude of recovery, same-day effects were estimated (i.e., any recovery model):

$$(OUT)_{ti} = \gamma_{00} + \gamma_{10}(ERD)_{ti} + \gamma_{30}(OUT)_{(t-1)i} + \mu_{0i} + \mu_{1i}(ERD)_{ti} + \epsilon_{ti}$$

γ_{10} is the mean difference in the outcome between experiencing ERD versus not.

Next, a two-level regression compared adjustment on days immediately following ERD to all other ERD-free days (i.e., full recovery model):

$$(OUT)_{ti} = \gamma_{00} + \gamma_{10}(ERD)_{ti} + \gamma_{20}(ERD1)_{ti} + \gamma_{30}(OUT)_{(t-1)i} + \mu_{0i} + \mu_{1i}(ERD)_{ti} + \mu_{2i}(ERD1)_{ti} + \epsilon_{ti}$$

*ERD*1 is a daily-level dummy variable where 1 represents all other ERD-free days (except the first ERD-free day after experiencing ERD), and 0 represents all other days. *ERD* and *ERD*1 form a set of dummy variables in which the reference group is the first ERD-free day (i.e., *ERD* = 0 and *ERD*1 = 0). *ERD* = 1 and *ERD*1 = 0 represents days adolescents experience ERD. *ERD* = 0 and *ERD*1 = 1 represent all other ERD-free days not including the first day. Based on stress and coping frameworks (Bolger & Zuckerman, 1995), two types of recovery effects were explored. The first is recovery from a day in which an adolescent experiences ERD to the following day (γ_{10}), which captures the next-day effect of ERD (i.e., any recovery model). There is evidence of next-day recovery from ERD when γ_{10} is significant (and positive for negative adjustment outcomes, or negative for positive mood). The second type of recovery effect compares a day immediately following ERD ($t+1$) to all other ERD-free days ($-\gamma_{20}$), to determine if outcomes the day after experiencing ERD stress are distinguishable from other ERD-free days (i.e., full recovery model); that is, when $-\gamma_{20}$ is not significant. The two recovery models complement each other; the first provides evidence of any recovery from ERD and the second provides evidences of protracted recovery from ERD that make next-day outcomes indistinguishable from days that do not immediately follow ERD. Standardized effects are obtained by dividing the unstandardized effects by the level-1 *SD*s of the daily-level outcomes, recovery is interpreted as changes in *SD* units of the outcomes. *R*-squares are interpreted as the percentage of the residual variance of daily outcome accounted for by *ERD* (or *ERD*1).

We also tested how the next-day recovery effects were moderated by ERI:

$$(OUT)_{ti} = \gamma_{00} + \gamma_{10}(ERD)_{ti} + \gamma_{01}(EXP)_i + \gamma_{02}(COM)_i + \gamma_{11}(ERD)_{ti}(EXP)_i + \gamma_{12}(ERD)_{ti}(COM)_i + \gamma_{20}(ERD1)_{ti} + \gamma_{30}(OUT)_{(t-1)i} + \mu_{0i} + \mu_{1i}(ERD)_{ti} + \mu_{2i}(ERD1)_{ti} + \epsilon_{ti}$$

$$(OUT)_{ti} = \gamma_{00} + \gamma_{10}(ERD)_{ti} + \gamma_{03}(CEN/PRI)_i + \gamma_{13}(ERD)_{ti}(CEN/PRI)_i + \gamma_{20}(ERD1)_{ti} + \gamma_{30}(OUT)_{(t-1)i} + \mu_{0i} + \mu_{1i}(ERD)_{ti} + \mu_{2i}(ERD1)_{ti} + \epsilon_{ti}$$

γ_{01}, γ_{02}, and γ_{03} are the effects of exploration, commitment, and centrality/private regard when no ERD was experienced. γ_{11}, γ_{12}, and γ_{13} quantify the moderation effects of ERD with exploration, commitment, and centrality/private regard on the next-day recovery effects, respectively. Level-2 pseudo *R*-squares of the moderation effects are reported as standardized measures of effect size, and are interpreted as the percentage of the residual variance of adjustment outcomes accounted for by ERI.

This study was not preregistered and data and study materials are available by request from the first author.

Results

Table 2 presents Pearson's bivariate correlations. ERI exploration, commitment, and centrality/private regard were positively correlated. Exploration was also associated with higher levels of positive mood and problem-solving coping strategies. Commitment was negatively associated with ERD and all negative outcomes, and positively associated with positive mood and problem-solving coping strategies. Centrality/private regard was also negatively associated with ERD and negative outcomes with the exception of somatic symptoms and rumination, and associated with higher levels of positive mood and problem-solving coping strategies. ERD was associated with worse negative outcomes, lower levels of positive mood and higher levels of problem-solving coping. Positive mood had a negative association with all negative outcomes and a positive association with problem-solving coping; all negative adjustment outcomes were positively correlated. Finally, problem-solving coping strategies were correlated with higher levels of both positive mood and negative outcomes.

Model 1: Differential Exposure to ERD by ERI

Investigating the direct effects of ERI on ERD, results were consistent with hypotheses and existing research, adolescents who reported higher levels of ERI commitment reported a decreased likelihood of experiencing ERD ($b = -1.24$, standardized $b = -.28$, *S.E.* = .50, [95%CI −2.22, −.25], $p = .01$). One standard deviation increase in commitment was associated with a 28% decreased likelihood of experiencing ERD, and the *R*-square indicates that 3.6% of the variance in ERD was accounted for by individual differences in ERI commitment. Contrary to hypotheses, no significant exposure effects were found for ERI exploration ($b = .54$, standardized $b = .13$, *S.E.* = .46, [95%CI −.36, 1.44], $p = .24$) or centrality/private regard ($b = -.35$, standardized $b = -.16$, *S.E.* = .19, [95%CI −.72, .02], $p = .07$).

Model 2: Differential Reactivity to ERD by ERI

Next, the moderating role of ERI on the association between ERD and adjustment was investigated. Consistent with hypotheses, ERI exploration exacerbated the association between ERD and anxious mood (Table 3, Figure 4), such that higher levels of exploration increased the association between ERD and anxious mood. Also consistent with hypotheses, ERI commitment attenuated the association between ERD and problem-solving coping strategies (Table 3; Figure 5). At higher levels of commitment (1 *SD* above the mean), there was no significant association between ERD and coping, while at lower levels of commitment (1 *SD* below the mean), ERD resulted in higher levels of problem-solving coping. ERI centrality/private regard also attenuated the association between ERD and problem-solving coping strategies (Table 3) such that at lower levels of centrality/private regard (1 *SD* below the mean), ERD was associated with higher levels of problem-solving coping. However, at higher levels of centrality/private regard (1 *SD* above the mean), ERD was not associated with problem-solving coping strategies.

Model 3: Differential Recovery from ERD by ERI

The final set of analyses included three related steps to examine how the potential carry-over effects of ERD on next-day adjustment might vary by ERI. First, the same-day effects of ERD on adjustment were estimated. ERD was negatively associated with positive mood (Table 4; $p = .03$). The standardized effects (dividing the unstandardized effects by the *SD*s of the outcomes at daily level) showed that ERD was associated with a .12 *SDs* decrease in positive mood, R-square = 0.1%. ERD was also associated with higher levels of all negative outcomes (ps < .001) by a mean of .42 *SDs* (range = .29 to .49 *SD*), mean *R*-square = .9% (range = .1% to 2.0%). In order to provide conceptual support for the direction of the association between ERD and adjustment in the recovery models, sensitivity analyses were conducted with alternative models in which adjustment indices (e.g., positive mood, anxiety, etc.) were modeled to predict ERD as an outcome. These models did not converge due to uncorrelated paths, suggesting the data were a poor fit for these alternative models. As such, subsequent models included ERD as a predictor of adjustment indices.

Having established that ERD has an effect on daily adjustment indices, the next step was to test empirical support for the two recovery models (i.e., the carry-over effects of ERD on next-day adjustment). The first, any recovery, model compared adjustment on days when adolescents experience ERD (t) to the following day ($t + 1$; γ_{10}). Significant results are interpreted to evidence recovery suggesting better adjustment on the day following adolescents' experience of ERD (e.g., when γ_{10} was significantly positive for negative mood) and the negative same-day effects reported above (Table 4) showed recovery the following day. Results (Table 5) showed that there was no significant difference in positive mood or anxiety between the day adolescents reported ERD and the following day. In contrast, adolescents reported significantly more negative mood, angry mood, somatic symptoms, rumination, and problem-solving coping on a day when they reported ERD compared to the following day. With the exception of the negative effects of ERD on next-day positive mood and anxiety, the recovery model offered partial support for the next-day recovery of ERD stress.

Next, the second, full recovery, model compared the first ERD-free day to all other ERD-free days ($-\gamma_{20}$) and did not result in any significant differences (Table 5, ps > .05). These results complement and lend further support to the first recovery model, suggesting that although ERD had strong same-day effects (Table 4), outcomes were indistinguishable the day after ERD compared to all other days adolescents did not experience ERD. By the next day, adolescents returned to their typical levels on each outcome despite reporting ERD the previous day.

The final step examined whether recovery varied by ERI. This was done by estimating the moderating role of ERI for the association between the two dummy variables *ERD* and *ERD*1 (i.e., the two approaches to modeling recovery, γ_{10} and $-\gamma_{20}$). The next-day recovery effect (i.e., γ_{10}) of ERD on daily problem-solving coping strategies was moderated by ERI commitment ($b = -.22$, standardized $b = -.39$, *S.E.* = .10, $p = .03$; Supplemental Figure S3) and centrality/private regard ($b = -.08$, standardized $b = -.14$, *S.E.* = .03, $p = .01$; Supplemental Figure S4) in the form of a buffering pattern for the association between ERD and daily problem-solving coping. At lower levels of commitment or centrality/private

regard (1 *SD* below the mean), ERD resulted in higher levels of problem-solving coping indicating weaker recovery effects; however, at higher levels of commitment or centrality/private regard (1 *SD* above the mean), ERD was not associated with problem-solving coping, indicating stronger recovery effects. An additional set of sensitivity analyses removed the seven participants (2%) who reported daily ERD experiences on every day of the study and the results were consistent with those presented here.

Discussion

Recognizing that ERD and ERI are developmentally intertwined (Garcia Coll et al., 1996; Spencer, 2007), the current study contributes to the investigation of how ERI, ERD, and adjustment are related on a daily basis for ethnic/racial minority youth. Supported by meta-analyses and systematic reviews, the study builds off of data linking ERD with poor outcomes (Benner et al., 2018; Pascoe & Richman, 2009; Priest et al., 2013; Schimitt, Branscombe, Postmes, & Garcia, 2014), and contributes an integrated investigation of the developmental impact of ERD employing stress and coping frameworks. This study offers and tests three stress and coping models (i.e., exposure, reactivity, recovery) that lays foundational groundwork for future exploration and theory.

Model 1: Differential Exposure to Discrimination by ERI

The first, exposure model, explores whether and how ERI dimensions predict the probability of adolescents reporting ERD stress on a daily basis. While research with African American adults has found that ERI centrality is associated with increased reports of ERD (Burrow & Ong, 2010; Sellers & Shelton, 2003; Shelton & Sellers, 2000), the same pattern was not observed in these data. Instead, the current study observed ERI commitment to confer positive benefits related to a 28% decrease in the likelihood of reporting ERD on a daily basis. One point of departure from existing research is that psychometric analysis of the MIBI in the current adolescent sample supported the treatment of a single, combined indicator of centrality/private regard rather than separate dimensions. This psychometrically-informed decision may reflect the developmental nature of ERI; adolescents (mean age 14.3 years old) may not yet distinguish how they feel about their ethnic/racial group membership and how that differs from how important it is to them ($r = .99$). As such, some of the distinguishing patterns for ERI centrality and private regard that have been observed for adults, may be obscured in the current data. Adolescence, and the beginning of high school, is associated with increased cognitive capacities that inform a more nuanced appreciation and understanding of how others hold negative views of one's ethnic/racial group (Quintana, 1999). Indeed, research has found that public regard (i.e., how positively one feels that others view their group) declines from adolescence to young adulthood (Yip, Seaton, & Sellers, 2006) and that ERI exploration continues into young adulthood (Syed & Azmitia, 2010). Taken together, the literature seems to suggest that as cognitive capacities increase during adolescence, ERI centrality may become increasingly distinguished from private regard. Since the current study does not distinguish affective evaluations from overall importance, ERI centrality/private regard should be interpreted as a broader indicator of ERI. For this reason, it is possible that lack of clarity around various dimensions of ERI resulted in null effects for the exposure analyses. Similarly, ERI exploration was not related to

ERD, which may be due to its strong correlation with both ERI commitment and centrality/private regard, possibly another indicator of how adolescents do not yet consider ERI as a dimensional sense of self.

In the current sample, high levels of ERI commitment, or the assertion that an adolescent has a strong sense of the meaning of ethnicity/race and the role that it plays in self-construal, seemed to confer protection against daily experiences of ERD. This observation is consistent with other research which finds that ERI commitment is associated with lower levels of ERD among immigrant adolescents (Gonzales-Backen et al., 2018). At the same, ERI commitment is associated with a host of mental health benefits (Phinney, 1991; Syed & Azmitia, 2008; Ying, 1999); and the current analyses suggest that one possible reason may be less frequent reports of daily ERD experiences. Since the current analyses only present ERI commitment measured at a single point in time, it is unclear whether commitment is preceded by high levels of exploration, or if some adolescents are able to commit to their ERI without prolong periods of exploration (Cross & Fhagen-Smith, 2001). Longitudinal data suggest that one pathway through which adolescents arrive at a high level of commitment is through periods of ERI exploration (Syed & Azmitia, 2009; Syed et al., 2013) and prior ERD experiences (Cheon & Yip, 2019). As such, the literature support developmental processes where high levels of ERI commitment are preceded by ERD and ERI exploration processes that likely equip adolescents with strategies for coping with ethnic/racial minority stress.

Model 2: Differential Reactivity to Discrimination by ERI

Next, the reactivity model tested various dimensions of ERI as moderators of the association between ERD and adjustment. For all three ERI dimensions (i.e., exploration, commitment, and centrality/private regard), ERI moderated the daily associations between ERD and adjustment. Consistent with hypotheses and meta-analytic results (Yip, Wang, et al. 2019), ERI commitment and centrality/private regard attenuated associations while ERI exploration exacerbated negative outcomes.

Both ERI commitment and centrality/private regard dampened the effect of ERD on problem-solving coping strategies; such that adolescents who reported high levels of ERI engaged in fewer coping strategies on days in which they reported ERD stress. Coupled with results from the exposure model, ERI commitment seems to be associated with being less likely to perceive ERD; however, when adolescents do report ERD, they are less likely to seek information and comfort from trusted others and focus on the positives of the situation. The ability to draw positive esteem from membership in a sociohistorically marginalized group in which adolescents are not only experiencing ERD, but also witness to ERD in their local communities and in the larger national landscape, represents resilience against oppression and racism. This resilience and esteem are likely accompanied by coping strategies and approaches for dealing with race-related stressors such as ERD. As tests of sensitivity, the study also investigated the possibility of ethnic/racial differences in the moderating capacity of ERI centrality/private regard (Supplemental Analyses). The buffering effect of centrality/private regard for problem-solving coping was only significant for African American youth (the slopes were in the same direction for Asian and Latinx

youth). Since African American stereotypes are typically more negatively valanced (e.g., model minority stereotype among Asian Americans; Hughes et al., 2016; Kiang et al., 2016), a strong sense of connection and positive regard for being African American may be especially promotive of positive coping strategies in the face of discrimination. We did not observe significant differential reactivity to ERD based on adjustment indicators other than problem-solving coping. Future research should explore the possibility of a moderated mediation process where ERI conditions adolescents' adaptive stress responses to ERD to influence adjustment in other domains (e.g., mood, somatic symptoms).

On the other hand, adolescents reporting high levels of ERI exploration reported higher levels of anxious mood on day in which they reported ERD stress. This observation is consistent with theory and empirical work that adolescents who are still unclear about the role of ethnicity/race in their identity are especially vulnerable to ERD stress (Burrow & Ong, 2010; Yip, Wang, et al. 2019). As tests of sensitivity, there were ethnic/racial differences in how ERI exploration moderated the association between daily ERD stress and rumination (Supplemental Analyses). For Latinx youth, ERI exploration was associated with *lower levels* of rumination on days when adolescents also reported ERD stress, while for African and Asian American youth, this association was positive (albeit not statistically significant). Previous research on Latinx youth suggests that the developmental processes of ERI (i.e., exploration, commitment) may be closely tied to family ethnic socialization (Douglass & Umaña-Taylor, 2015). Therefore, Latinx youth's ERI exploration may be grounded in supportive family practices that celebrate one's ethnic/racial heritage, providing some protective benefits to Latinx youth. These findings also provide support for the stress and coping framework by elucidating ERI as an individual difference, domain-specific coping resource for youths of color (Sellers et al., 2006). Whereas Latinx adolescents' ruminative coping (i.e., maladaptive coping with passive and repetitive reflection on stressful situations, which typically aggravates negative symptoms; Abela et al., 2004) to ERD stress was buffered by ERI exploration, African American adolescents' problem-solving coping (i.e., positive coping with active, direct responses such as information seeking; Abela et al., 2002) was moderated by ERI centrality/private. The current data provide preliminary evidence that the moderating impact of ERI dimensions on coping with ERD varies across ethnic/racial groups, similar to meta-analytic patterns (Yip, Wang, et al. 2019).

The data are also consistent with meta-analytic conclusions related to the different ways in which commitment and exploration are implicated between ERD and outcomes (Yip, Wang et. al, 2019). Adolescents who report high levels of ERI exploration, have above-average levels of searching about their ethnic/racial group membership. ERD experiences in this time of uncertainty and questioning is especially deleterious for psychological adjustment (Yoo & Lee, 2008). It is possible that without a clear sense of one's ethnic/racial group membership, adolescents are also not able to access successful ERD coping strategies. The data highlight the benefits of having a strong sense of ERI commitment for mitigating the negative effects of ERD. Paralleling how exploration may put adolescents at risk for the negative effects of ERD, commitment may confer emotional support and a sense of belonging buffering ERD.

Model 3: Recovery from Discrimination

The third conceptual model included two sub-models for estimating recovery (any and full recovery), to investigate the carry-over impact of ERD on next-day outcomes. Recovery models inform discussions that link ERD and chronic health disparities (Gee, Walsemann, & Brondolo, 2012; Krieger, 1999). Consistent with existing literature, the *same-day effects* of ERD on adjustment outcomes were detrimental across all negative adjustment indicators (Burrow & Ong, 2010; Ong et al., 2013; Torres & Ong, 2010). To determine *longer-term effects* of ERD, recovery from same-day effects was explored in two ways. The first approach compared days on which adolescents experienced ERD to the following day (i.e., any next-day recovery). A significant effect of the dummy variable indicated a difference in outcomes between a day in which adolescents experience ERD to the following day. For negative adjustment indicators, a positive coefficient indicated recovery. Non-significant dummy variables suggest a lasting impact of ERD from one day to the next. On the other hand, statistically significant effects support recovery from ERD. For the first recovery model, with the exception of lower positive mood and higher levels of anxiety, adolescents showed no additional negative effects of ERD the day after experiencing discrimination. In other words, adolescents continued to report compromised levels of next-day positive mood and anxiety, with recovery for all other outcomes. These data point to possible affective pathways (positive mood, anxiety) through which daily experiences of ERD may be implicated in the development of longer term, sustained health disparities (Gee, Hing, Mohammed, Tabor, & Williams, 2019; Gee et al., 2012).

Lending further support, the second recovery model compared a day following ERD to all other ERD-free days (i.e., full recovery model) to investigate whether adolescents were able to recover to their typical level of each outcome. Non-significant results suggested that days following ERD were indistinguishable from other ERD-free days. While the effects of ERD might be confined to same-day effects, the non-significant differences between these two types of days suggest that adolescents were able to "shake off" daily ERD experiences. However, adolescents who are subjected to repeated ERD exposures may accumulate risk (Gee et al., 2019) and develop chronic health disparities. Alternatively, ERD effects may be more apparent for adjustment indices such as psychophysiological effects, which may have a stronger impact on adjustment (Adam et al., 2015; Levy et al., 2016; Neblett & Roberts, 2013; Zeiders, Hoyt, & Adam, 2014). Indeed, ERD is associated with cardiovascular responses, nocturnal blood pressure dipping, and sleep disturbances (Brondolo et al., 2008; Goosby, Cheadle, Strong-Bak, Roth, & Nelson, 2018; Slopen, Lewis, & Williams, 2016; Zeiders et al., 2014).

For the recovery models, ERI commitment and centrality/private regard had similar buffering effects for the daily association between ERD and problem-solving coping. While each ERI dimension was tested in separate models, ERI commitment and centrality/private regard were highly correlated ($r = .73$, $p < .01$), suggesting overlapping constructs. Conceptually, how committed an adolescent is to an ethnic/racial group identity likely shares variability with how important that identity is and how positively the adolescent feels about the group membership. However, while ERI commitment and exploration shared a similarly high correlation ($r = .74$, $p < .01$), distinguishing patterns were observed between the two

dimensions, particularly for the reactivity models. Although ERI exploration was associated with ERD, it did not moderate outcomes. This may be a limitation of a variable-centered approach operationalizing ERI as separate subdimensions. Although ERI exploration and centrality/private regard were positively correlated (r=.58), variability in the extent to which exploration is associated with positive ethnic/racial group affect, may have resulted in an overall null association for the moderating effects of ERI exploration. Adolescents who report higher ERI commitment and centrality/private regard showed stronger recovery effects following ERD. This shows the importance of investigating the overlapping and unique contributions of ERI dimensions.

Conclusions and Limitations

As a collective, the three stress and coping models synthesize research on ERI, ERD, and psychological adjustment for ethnic/racial minority adolescents. Adolescents who have a clearer sense of their ethnic/racial identity (i.e., high commitment) are 28% less likely to report daily experiences of ERD. In addition, these same adolescents were less likely to engage in problem-solving coping strategies when they did experience discrimination, suggesting weaker reactivity to ERD, without notable ethnic/racial group differences. While reporting high levels of ERI exploration was not associated ERD, when these adolescents did experience ERD, they were also more anxious. ERI commitment and centrality/private regard buffered the impact of ERD on problem-solving coping. Finally, the recovery models offer important insights. First, not only do the data corroborate existing research linking ERD to compromised adjustment, sensitivity analyses suggest that ERD predicts adjustment and not vice versa. Second, while adolescents evidence recovery on negative mood, angry mood, somatic symptoms, rumination and problem-solving coping, the negative effects of ERD on positive mood and anxiety persisted to the next day. However, even for positive mood and anxiety, there was evidence of longer-term recovery. In sum, adolescents who have a strong sense of ERI commitment had the best adjustment outcomes; they were less likely to report ERD, showed less reactivity to ERD, and also recovered more quickly from ERD. The three models investigated here suggest focusing on promoting and building adolescents' sense of ERI commitment (i.e., having a clear sense of one's ethnic background, a strong sense of belonging, strong attachment to one's ethnic group) may be an important lever for mitigating the impact of ERD.

Despite its contributions, this study has limitations; limitations that provide avenues for future research. First, the sample was drawn from a large, diverse, urban area shaping experiences of ERD and ERI. Context influences exposure to ERD, with some research suggesting that diversity exacerbates ERD (Seaton & Yip, 2009) while others find protective effects (Juvonen, Nishina, & Graham, 2006). However, the frequency of ERD reported in this sample was comparable to other samples (Burrow & Ong, 2010; Huynh & Fuligni, 2010). Second, the sample included adolescents, yet drew upon social identity theories and existing research focused on young adults; which may limit generalizability and raise the possibility of developmental differences in the three models across the lifespan. The current sample precluded analyses investigating intersections of race and gender. Although the current study assesses ERD at the daily level, experiences were treated as discrete events and is limited in its ability to detect possible differential impact of specific experiences

(e.g., being the target of a racial slur, versus being physically attacked). While the study employs intensive longitudinal methods that elucidate temporal processes over a two-week period, it represents only a snapshot of adolescent development, and additional longer-term studies are necessary to consider how these processes are related over time. Evidence of the developmental nature of ERI was found in the psychometrically indistinguishable centrality and private regard dimensions. These data were unable to distinguish how centrality paired with high versus low levels of private regard may differentially moderate the associations between discrimination and outcomes. Prior research employing person-centered approaches are better equipped to address these nuances (Chavous et al., 2003; Seaton, 2009). Finally, ERI fluctuates daily (Yip & Fuligni, 2002; Seaton & Iida, 2019; Wang et al., 2019) and changes throughout adolescence (Douglass & Umaña-Taylor, 2015) and into adulthood (Umaña-Taylor et al., 2014; Yip et al., 2006). ERI and ERD are reciprocally associated (Cheon & Yip, 2019; Seaton, Yip, & Sellers, 2009); and future research should explore these conceptual models at the daily level and longer term in older samples.

The study adds a systemic investigation of how ERD stress is implicated in the everyday functioning of ethnic/racial minority adolescents, in terms of its same- and next-day impact. Applying stress and coping frameworks, the study investigated how ERD is a unique form of stress related to the daily adjustment of diverse adolescents. The study also includes multiple dimensions of ERI and its moderating influence on the impact of daily ERD on adolescent outcomes. While not particularly frequent, ERD is a normative developmental context for ethnic/racial minority youth and developmental science should continue to unpack its impact, and corresponding processes to interrupt this impact. The manuscript also highlights the importance of ERI commitment has a focal lever for mitigating the frequency and impact of ERD on developmental outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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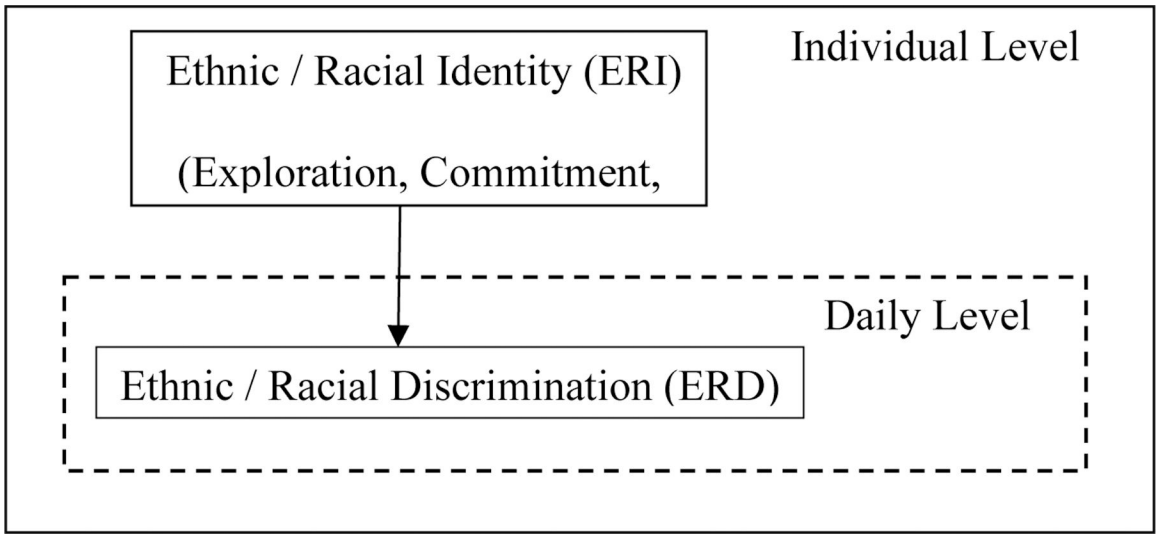

Figure 1.
Model 1: Conceptual path diagram of exposure model.

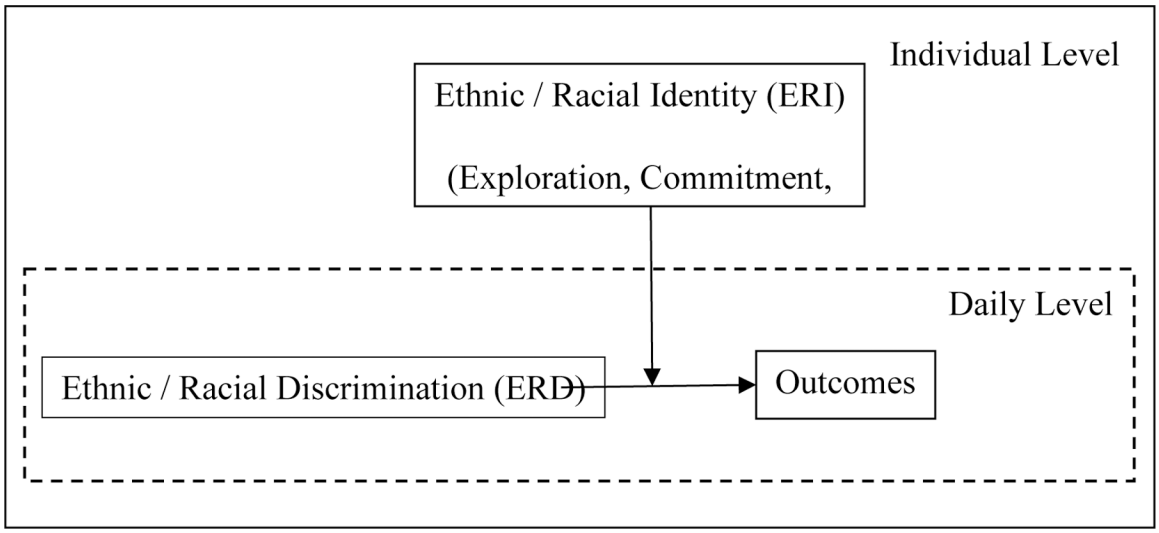

Figure 2.
Model 2: Conceptual path diagram of reactivity model.

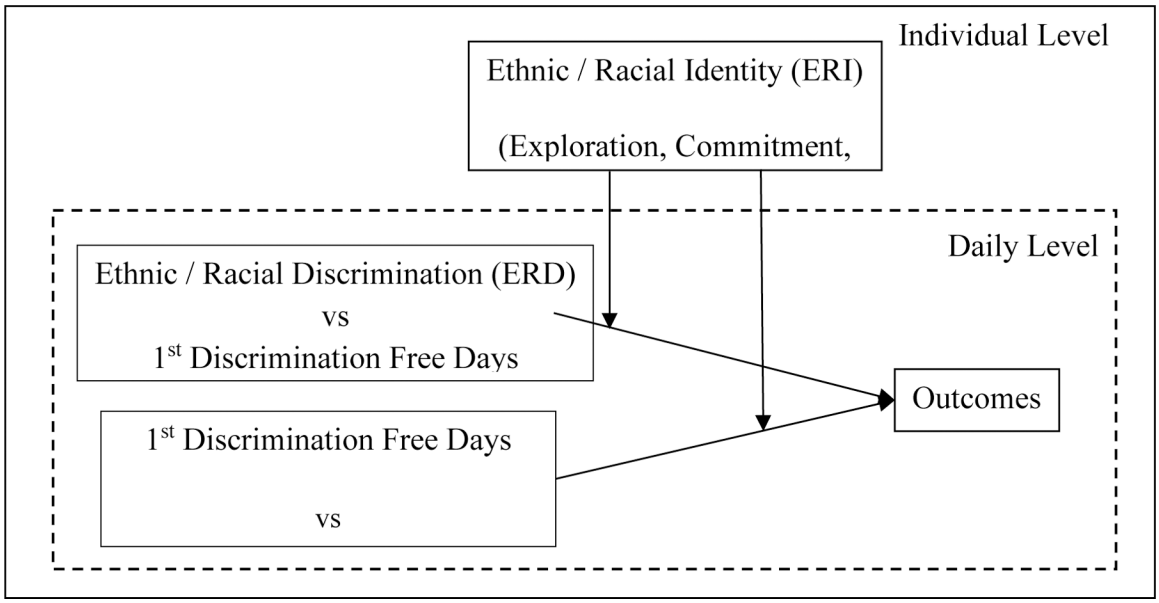

Figure 3.
Model 3: Conceptual path diagram of recovery model.

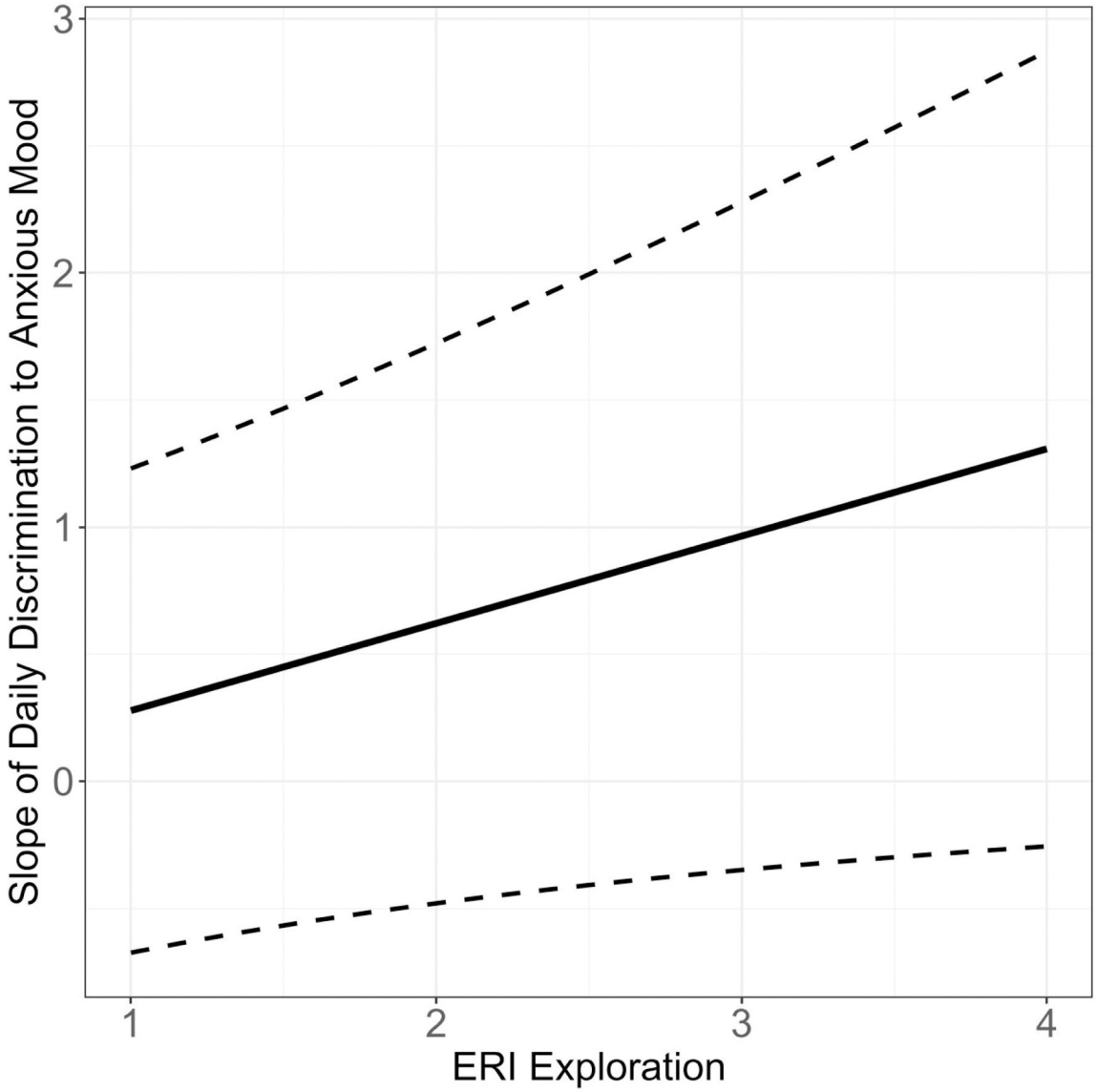

Figure 4.

A Johnson-Neyman plot for differential reactivity to discrimination on anxious mood by exploration. $b = -1.24$, *S.E.* = .50, [95%CI −2.22, −.25], $p = .01$. Gray lines: 95% confidence band.

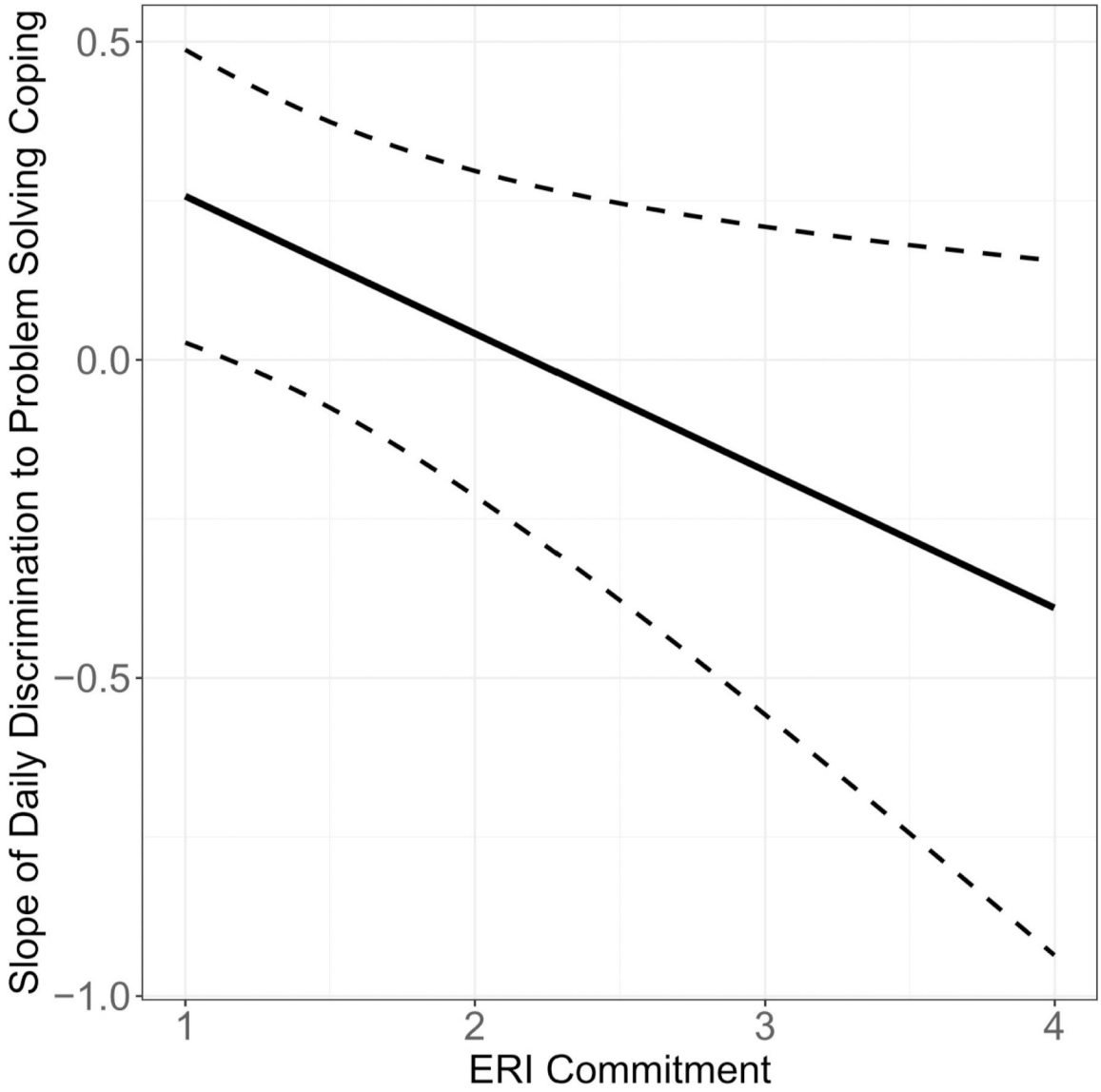

Figure 5.

A Johnson-Neyman plot for differential reactivity to discrimination on problem solving coping by commitment. $b = -.22$, *S.E.* = .10, $p = .02$. Gray lines: 95% confidence band.

Table 1

Demographics of African American, Asian American, and Latinx Adolescents

Variable	African American (*n* = 76)	Asian American (*n* = 145)	Latinx (*n* = 129)	Test	Effect Size
Age (Years)	14.3 (0.7)	14.4 (0.6)	14.3 (0.6)	$F(1, 348) = .31$ $p = .58$	$\eta^2 = .00$
Gender					
Female	53 (70%)	94 (65%)	95 (74%)	$\chi^2(2) = 2.50$	$W = .01$
Male	23 (30%)	51 (35%)	34 (26%)	$p = .29$	
Nativity					
United States	53 (70%)	25 (17%)	103 (80%)	$\chi^2(4) = 214.14$	$W = .62$
Other	20 (26%)	10 (7%)	25 (19%)	$p < .001$	
Missing	3 (4%)	110 (76%)	1 (1%)		
Mother's Education					
High School or Below	21 (28%)	47 (32%)	57 (44%)	$\chi^2(4) = 7.41$	$W = .02$
High School Above	31 (41%)	50 (36%)	37 (29%)	$p = .12$	
Not Known	23 (31%)	47 (32%)	34 (27%)		
Father's Education					
High School or Below	25 (33%)	44 (31%)	56 (43%)	$\chi^2(4) = 6.49$	$W = .02$
High School Above	21 (28%)	38 (26%)	23 (18%)	$p = .17$	
Not Known	29 (39%)	61 (43%)	50 (39%)		

Note. Means and *SD*s (in parentheses), one-way analysis of variance and the effect size η^2 were reported for adolescent's age. Frequencies and percentages (in parentheses), χ^2 test of independence and the effect size W were reported for all other variables.

Table 2

Zero-order Correlations among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. ERD	1										
2. EXP	−0.01	1									
3. COM	−0.06**	0.74**	1								
4. CEN/PRI	−0.04*	0.58**	0.73**	1							
5. POS	−0.05**	0.14**	0.19**	0.19**	1						
6. ANX	0.22**	0.02	−0.06**	−0.06**	−0.06**	1					
7. ANG	0.25**	0.03	−0.07**	−0.09**	−0.16**	0.70**	1				
8. NEG	0.25**	0.03	−0.06**	−0.08**	−0.15**	0.74**	0.80**	1			
9. SOM	0.24**	0.01	−0.04*	−0.03	−0.16**	0.47**	0.48**	0.47**	1		
10. RUM	0.27**	0.02	−0.04*	−0.03	−0.10**	0.52**	0.53**	0.63**	0.47**	1	
11. COP	0.21**	0.11**	0.04*	0.06**	0.08**	0.35**	0.33**	0.36**	0.25**	0.59**	1
Mean	0.09	2.67	3.06	5.00	3.10	1.75	1.64	1.55	1.43	1.32	1.39
SD	0.28	0.63	0.60	1.17	1.10	0.89	0.89	0.89	0.56	0.53	0.56
Internal Consistency	n/a	0.77	0.92	0.89	0.89	0.83	0.85	0.90	0.81	0.91	0.87

Note.

*$p < .05$,

**$p < .01$.

ERD = discrimination; EXP = ERI exploration; COM = ERI commitment; CEN/PRI = ERI centrality/private regard; POS = positive mood; ANX = anxious mood; ANG = angry mood; NEG = negative mood; SOM = somatic symptoms; RUM = rumination; COP = problem solving coping strategies. ERI exploration, commitment, and centrality/private regard were measured at individual level, and all other variables were measured at daily level. For ERI exploration, commitment, and centrality/private regard, McDonald's ω was used as the measure of internal consistency. For all other measures, Cronbach's α was used as the measure of internal consistency.

Table 3

Results of Reactivity Model (Model 2)

Outcome	Unstd. Coef.	*S.E.*	*z*	*p*	95% CI	Std. Coef.	*R-Square*
ERD × ERI Centrality/Private Regard (γ_{11})							
Positive Mood	0.01	0.07	0.14	0.89	[−0.13, 0.15]	0.01	1.5%
Negative Mood	−0.10	0.10	−0.97	0.33	[−0.30, 0.10]	−0.12	0.1%
Anxious Mood	0.01	0.08	0.12	0.90	[−0.14, 0.16]	0.01	0.0%
Angry Mood	−0.08	0.07	−1.03	0.31	[−0.22, 0.07]	−0.09	0.1%
Somatic Symptoms	−0.05	0.05	−0.99	0.32	[−0.13, 0.04]	−0.08	0.1%
Rumination	−0.02	0.04	−0.56	0.58	[−0.09, 0.05]	−0.04	0.0%
Prob Sol Coping	−0.08*	0.03	−2.87	0.01	[−0.13, −0.03]	−0.14	0.2%
ERD × ERI Exploration (γ_{12})							
Positive Mood	−0.01	0.17	−0.06	0.95	[−0.33, 0.31]	−0.01	0.5%
Negative Mood	−0.05	0.22	−0.22	0.82	[−0.48, 0.38]	−0.06	0.0%
Anxious Mood	0.34*	0.16	2.09	0.04	[0.02, 0.67]	0.40	0.0%+
Angry Mood	−0.15	0.21	−0.73	0.47	[−0.56, 0.26]	−0.18	0.1%
Somatic Symptoms	0.06	0.12	0.52	0.61	[−0.17, 0.29]	0.11	0.0%
Rumination	−0.08	0.10	−0.82	0.41	[−0.27, 0.11]	−0.16	0.1%
Prob Sol Coping	0.13	0.08	1.67	0.10	[−0.02, 0.27]	0.23	0.1%
ERD × ERI Commitment (γ_{13})							
Positive Mood	−0.11	0.17	−0.67	0.50	[−0.44, 0.22]	−0.10	1.1%
Negative Mood	0.01	0.26	0.04	0.97	[−0.50, 0.52]	0.01	0.0%
Anxious Mood	−0.21	0.21	−1.00	0.32	[−0.62, 0.20]	−0.24	0.0%
Angry Mood	0.17	0.24	0.72	0.47	[−0.30, 0.63]	0.20	0.0%
Somatic Symptoms	−0.12	0.12	−0.98	0.33	[−0.35, 0.12]	−0.22	0.1%
Rumination	0.03	0.11	0.23	0.82	[−0.19, 0.24]	0.05	0.0%
Prob Sol Coping	−0.22*	0.10	−2.27	0.02	[−0.40, −0.03]	−0.39	0.1%

Note.

*$p < .05$.

Unstd. Coef. = unstandardized regression coefficient. Std. Coef. = standardized regression coefficient, dividing the unstandardized coefficient by the *SD* of the daily level outcome. *S.E.* = estimated standard error. 95% CI = 95% confidence interval.

+indicates the calculated *R*-square was rounded up to zero. ERD = ethnic/racial discrimination. ERI = ethnic/racial identity. Prob Sol Coping = problem solving coping strategies.

Table 4

Effects of Ethnic/Racial Discrimination on Same-Day Outcomes (Model 3, Step 1)

Outcome	Unstd. Coef. (γ_{10})	*S.E.*	*z*	*p*	95% CI	Std. Coef.	*R-Square*
Positive Mood	−0.13*	0.06	−2.20	0.03	[−0.25, −0.02]	−0.12	0.1%
Negative Mood	0.42***	0.10	4.30	0.00	[0.23, 0.61]	0.49	2.0%
Anxious Mood	0.25***	0.07	3.81	0.00	[0.12, 0.37]	0.29	0.7%
Angry Mood	0.40***	0.08	4.97	0.00	[0.24, 0.55]	0.46	1.4%
Somatic Symptoms	0.25***	0.05	5.10	0.00	[0.16, 0.35]	0.47	0.5%
Rumination	0.25***	0.05	5.06	0.00	[0.15, 0.34]	0.48	0.4%
Prob Sol Coping	0.17***	0.04	4.03	0.00	[0.09, 0.26]	0.31	0.1%

Note.

** $p < .01$,

*** $p < .001$.

Unstd. Coef. = unstandardized regression coefficient. Std. Coef. = standardized regression coefficient, dividing the unstandardized coefficient by the *SD* of the daily level outcome. *S.E.* = estimated standard error. 95% CI = 95% confidence interval. Prob Sol Coping = problem solving coping strategies.

Table 5

Results of Recovery Models (Model 3)

Outcome	Unstd. Coef.	*S.E.*	*z*	*p*	95% CI	Std. Coef.	*R-Square*
γ_{10}: ERD Day (t) compared to Following ERD-Free Day (t+1)							
Positive Mood	−0.09	0.08	−1.10	0.27	[−0.24, 0.07]	−0.08	0.0%
Negative Mood	0.33**	0.10	3.25	0.00	[0.13, 0.53]	0.39	1.2%
Anxious Mood	0.15	0.08	1.82	0.07	[−0.01, 0.30]	0.17	0.4%
Angry Mood	0.35***	0.09	3.70	0.00	[0.16, 0.53]	0.40	1.0%
Somatic Symptoms	0.24***	0.07	3.64	0.00	[0.11, 0.37]	0.45	0.4%
Rumination	0.21***	0.05	3.93	0.00	[0.11, 0.32]	0.42	0.2%
Prob Sol Coping	0.14*	0.05	2.69	0.01	[0.04, 0.24]	0.25	0.0%+
$-\gamma_{20}$: First ERD-Free Day compared to All Other ERD-Free Days							
Positive Mood	−0.05	0.08	−0.69	0.49	[−0.21, 0.10]	−0.05	0.5%
Negative Mood	0.11	0.07	1.65	0.10	[−0.02, 0.24]	0.13	0.3%
Anxious Mood	0.14	0.08	1.74	0.08	[−0.02, 0.30]	0.17	0.5%
Angry Mood	0.06	0.07	0.89	0.37	[−0.08, 0.20]	0.07	0.2%
Somatic Symptoms	0.01	0.05	0.31	0.76	[−0.08, 0.10]	0.03	0.0%
Rumination	0.07	0.05	1.47	0.14	[−0.2, 0.16]	0.14	0.2%
Prob Sol Coping	0.05	0.04	1.28	0.20	[−0.03, 0.13]	0.09	0.0%

Note.

** $p < .01$,

*** $p < .001$.

Unstd. Coef. = unstandardized regression coefficient. Std. Coef. = standardized regression coefficient, dividing the unstandardized coefficient by the *SD* of the daily level outcome. *S.E.* = estimated standard error. 95% CI = 95% confidence interval.

+ indicates the calculated R-square was rounded up to zero. ERD = ethnic/racial discrimination. Prob Sol Coping = problem solving coping strategies.