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Perceived discrimination as a stressor for close relationships: identifying psychological and physiological pathways

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Abstract Approaching the inverse association between perceived discrimination and close relationship functioning from a stress and coping framework, we propose and test a novel model incorporating psychological (emotion dysregulation) and physiological (chronic inflammation) pathways. Analyses of data from a sample of African American participants ($N = 592$) enrolled in the Midlife in the United States (MIDUS) study revealed support for the proposed model. Specifically, results from structural equation modeling analyses showed that perceived discrimination was indirectly associated with increased emotion dysregulation (venting and denial) through stressor appraisals and directly associated with increased inflammation (interluekin-6, e-selectin and c-reactive protein). Furthermore, relationship strain with family, friends and spouses was associated with greater levels of emotion dysregulation and chronic inflammation. Overall, the proposed model fit the data well and provides support for new avenues of research on the social, psychological and physiological correlates of perceived discrimination and close relationship functioning. To conclude, evidence for the proposed biopsychosocial model is summarized and directions for future research on these topics are discussed.

Keywords Perceived discrimination · Close relationships · Stress and coping · Emotion dysregulation · Inflammation

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Researchers have begun to investigate the pernicious health consequences of prejudice and discrimination for members of devalued groups, yet little work has focused on social and interpersonal outcomes. However, there is evidence to suggest that members of devalued groups may experience impaired relationship outcomes relative to members of dominant groups (Doyle & Molix, 2014). For example, African American men and women are less likely to marry compared to White men and women (Elliott et al., 2012). Once married, African Americans also generally report greater dissatisfaction and are at greater risk for divorce (Bulanda & Brown, 2007). Moreover, some research has shown that African Americans tend to have relatively smaller social networks relative to Whites (e.g., Ajrouch et al., 2001; Barneset al., 2004; Reynolds et al., 1994) and are less likely to be centrally positioned within social networks (Mehra et al., 1998). Social disparities in relationship outcomes among African Americans are of critical relevance to diverse fields, from social and clinical psychology to public health and behavioral medicine, due to strong associations between close relationships and physical health outcomes, even mortality (Holt-Lunstad et al., 2010; House et al., 1988).

A number of factors certainly contribute to these disparities in relationship outcomes, including the incarceration of marriageable African American men (South & Lloyd, 1992), disproportionate rates of poverty and unemployment between African Americans and Whites (McLoyd, 1990) and the insidious legacy of slavery in America (Stevenson, 1995). Notably, each of these factors involves an objective outcome stemming, at least in part, from prejudice and discrimination. However, past research has shown that perceptions of discrimination, or subjective assessments of differential treatment based on one's devalued identity, are also damaging for health and well-

being (Williams & Mohammed, 2009). In fact, some recent studies suggest that in addition to the objective consequences of prejudice and discrimination, such as incarceration or unemployment, perceived discrimination might also negatively affect close relationships for members of devalued groups, including racial minorities (e.g., Doyle & Molix, 2014, in press; Lincoln & Chae, 2010; Murry et al., 2001; Trail et al., 2012). However, further research is necessary to empirically confirm the effects of perceived discrimination on relationship functioning. Moreover, in order to understand how these effects operate, researchers need to investigate specific mechanisms (Doyle & Molix, in press). The purpose of the current work was to test a stress and coping model including multiple mediated pathways, both psychological and physiological, by which perceived discrimination, as a social stressor, might impair close relationship functioning for African Americans.

Perceived discrimination as social stress

Much previous work has approached the effects of perceived discrimination on health from a stress and coping perspective (e.g., Clark et al., 1999; Williams et al., 2003). Within this framework, potential threats in one's environment, such as perceived discrimination, are appraised as either meeting or exceeding one's available coping resources (Lazarus & Folkman, 1984). When threats are appraised as exceeding one's coping resources, they are posited to lead to negative outcomes, including impaired health and well-being (Folkman et al., 1986a, b). However, other research has shown that stressors, including prejudice and discrimination, can negatively impact health even when not appraised as exceeding one's coping resources (Dohrenwend, 2006; Noh et al., 2007). Therefore, it is possible that stressors might affect health directly as well as indirectly through stressor appraisals. A goal of the current research was to explore both of these pathways.

Importantly for the current work, in addition to negative effects on psychological and physical health, stress has also been shown to predict impairments in relationship functioning with close others, including family, friends and romantic partners (McCubbin & Patterson, 1983; Randall & Bodenmann, 2009). Recognizing these links between perceived discrimination, stress and close relationships, some researchers have proposed that stress responses might be a mechanism driving the deleterious effects of perceived discrimination on close relationship functioning (e.g., Lincoln & Chae, 2010; Murry et al., 2001; Otis et al., 2006). Yet little previous research has explored downstream stress responses, either psychological or physiological, that could account for such effects (see Trail et al., 2012, for an exception).

The biopsychosocial model of racism, proposed by Clark et al. (1999), posits that chronic perceptions of discrimination result in exaggerated psychological and physiological stress responses, eventually leading to impaired health outcomes for African Americans. Within the biopsychosocial model, psychological and physiological stress responses play a mediating role, explaining the association between perceptions of discrimination and impaired health outcomes. Two key psychological and physiological stress responses are emotion dysregulation, or failure to adaptively regulate negative emotions, and chronic inflammation. In the current work, we hypothesized that these two downstream consequences of stress play important roles in explaining the association between perceived discrimination and impaired close relationship functioning.

Psychological stress response

Emotion regulation refers to the process by which individuals control when, where and how they experience and express their emotions (Gross, 1998). Emotion dysregulation can manifest in a number of ways, including through venting and denying negative emotions. Although venting is often assumed by laypersons to be a productive method for handling negative emotions (i.e., "letting off steam"), venting in fact does not reduce negative affect and can even result in prolongation of negative emotions by focusing attention on those feelings (Tice & Bratslavsky, 2000). Similarly, denial of negative emotions generally does not improve mood and has been shown to lead to increased physiological arousal (Mauss et al., 2007). Therefore, both venting and denial generally represent forms of emotion dysregulation.

Some past work has shown that emotion dysregulation can result from experiencing prejudice and discrimination (Miller & Kaiser, 2001); other work has found that such responses are capable of damaging close relationships (Gottman & Notarius, 2000). One study has examined whether emotion dysregulation, specifically verbal aggression, mediates the effects of perceived discrimination on marital quality, however support for this mechanism was only found among Latino husbands, not wives, who were low in ethnic group identification (Trail et al., 2012), These results suggest that verbal aggression may be a form of emotion dysregulation that is more relevant to men than women and perhaps most relevant to men who are least identified with their devalued groups. In the current model, we hypothesized that perceived discrimination would result in increased emotion dysregulation, manifested as venting and denying negative emotions, which would in turn predict greater close relationship strain among African American men and women.

Physiological stress response

In addition to creating a psychological burden, the stress of prejudice and discrimination can also instigate a physiological burden (Mays et al., 2007), or allostatic load (Ganzel et al., 2010). One manifestation of this burden is dysregulation of the immune system and resulting chronic non-specific inflammation. Three biomarkers of chronic inflammation that have been widely examined are interleukin-6 (IL-6), e-selectin and c-reactive protein (CRP). IL-6 is a proinflammatory cytokine secreted by leukocytes in order to stimulate the immune response; e-selectin is a cellular adhesion molecule expressed on the surface of endothelial cells that recruits leukocytes during inflammation; and CRP is an acute phase protein that binds to dead or dying cells to aid in necrosis and apoptosis. Importantly, previous research has demonstrated that chronic perceived discrimination is predictive of increased IL-6 (Ratner et al., 2013), increased e-selectin (Friedman et al., 2009) and increased CRP[1] (Lewis et al., 2010). Collectively, these previous studies indicate that chronic inflammation may be one consequence of experiencing prejudice and discrimination throughout the life span.

Chronic inflammation has also been found to be associated with social withdrawal and loneliness across several cross-sectional studies (e.g., Cole et al., 2007; Ford et al., 2006; Friedman et al., 2005). Although researchers have often suggested that social isolation leads to greater levels of inflammation, recent work has begun to reveal that inflammation also induces distancing from social connections among humans (Eisenberger et al., 2010; Inagaki et al., 2012) as well as non-human animals (see Dantzer et al., 2008, for a review). For example, participants in a recent study (Eisenberger et al., 2010) were administered an inflammatory challenge (injection with endotoxin or placebo) and afterward researchers measured levels of IL-6 and social withdrawal. Results showed that those in the endotoxin condition experienced greater withdrawal compared to those who received a placebo. Furthermore, for those in the endotoxin condition, greater increases in IL-6 were associated with greater social withdrawal. Individuals who experience chronic inflammation may strain their close relationships due to such withdrawal. Therefore, we hypothesized that perceived discrimination might be associated with impaired close relationship functioning via increased levels of IL-6, e-selectin and CRP.

[1] With regards to CRP, while Lewis et al. (2010) found a linear association with perceived discrimination, other researchers have reported no statistically significant association (Albert et al. 2008) as well as a significant curvilinear association (Cunningham et al. 2012). Therefore, the relationship between perceived discrimination and the biomarker, CRP, remains somewhat ambiguous in the literature at this point.

The current study

Ultimately, in the current study we were interested in explaining the association between perceived discrimination and close relationship functioning previously reported in other work (e.g., Doyle and Molix in press; Lincoln & Chae, 2010; Murry et al., 2001). In specifying the current model, we drew primarily from stress response pathways outlined by Clark et al. (1999). Thus we positioned stressor appraisals and stress responses, both psychological and physiological, as intermediate steps between perceived discrimination and relationship functioning. To summarize the proposed model (displayed in Fig. 1), we hypothesized that perceived discrimination would predict increased relationship strain among African Americans. However, we also hypothesized that the effects of perceived discrimination on relationship strain would be mediated by emotion dysregulation and chronic inflammation, and that the direct effect of perceived discrimination on relationship strain would no longer be significant when accounting for these proposed mechanisms. Furthermore, due to mixed evidence for the importance of stressor appraisals, we also examined both direct effects of perceived discrimination on the proposed mechanisms as well as indirect effects through stressor appraisals.

Methods

For the current study, we analyzed secondary data from the Midlife in the United States II (MIDUS II): Milwaukee African American Sample (Ryff et al., 2006). This large probabilistic sample was recruited with the purpose of scrutinizing health issues among minority populations. Stratified sampling throughout Milwaukee County, Wisconsin based upon proportion of African Americans within each neighborhood was utilized to recruit a total of 592 participants. Participants completed self-administered questionnaires on a number of topics. In addition to participating in MIDUS II, a subset of these participants ($n = 201$) also participated in the MIDUS II: Biomarker Project, which involved an overnight session at a General Clinical Research Center (GCRC) at the University of Wisconsin and collection of various biological specimens, including blood samples. Further details regarding this study and all procedures are available elsewhere (Love et al., 2010). Due to differential participation in these two portions of MIDUS II, limitations in the number of participants involved in all types of relationships assessed (i.e., families, friendships, marriages) and measure completion rates, the number of data points for each measure in the current study varies (see note accompanying Table 1). Since these data points are missing at random, full-information maximum likelihood (FIML) methods were used to estimate parameters including all available data (Arbuckle,

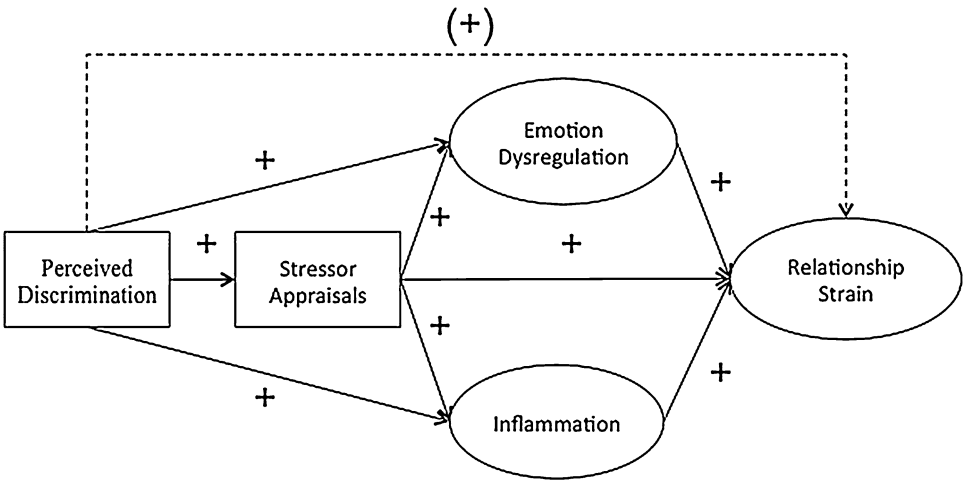

Fig. 1 Proposed structural model of pathways from discrimination to close relationship functioning

Table 1 Correlation matrix, means and standard deviations for observed variables

Measure	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. Perceived discrimination	1.50	.64	–									
2. Stressor appraisals	2.52	.65	.14*	–								
3. Venting	2.36	.73	.09†	.36***	–							
4. Denial	1.86	.71	.02	.29***	.47***	–						
5. IL-6	4.38	3.88	.21**	−.09	.06	.18*	–					
6. E-selectin	52.30	28.72	.26***	−.08	−.04	−.09	.79***	–				
7. CRP	4.74	6.60	.03	−.04	.09	.06	.58***	.43***	–			
8. Familial strain	2.23	.80	.16***	.35***	.21***	.17**	.14*	.17*	.10	–		
9. Friendship strain	1.93	.73	.14**	.30***	.14**	.12*	.24**	.26***	.12†	.39***	–	
10. Spousal strain	2.08	.72	.20**	.15	.09	.04	.16	−.01	.07	.26***	.24***	–

Perceived discrimination ($n = 584$), stressor appraisals ($n = 198$), venting ($n = 394$), denial ($n = 394$), IL-6 ($n = 201$), e-selectin ($n = 201$), CRP ($n = 201$), family strain ($n = 586$), friend strain ($n = 579$), spousal strain ($n = 222$)

† $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

1996). Importantly, the Biomarker Project subsample is comparable to the overall MIDUS sample in terms of both demographics and overall health (Love et al., 2010).

Participants

All participants in the current sample self-identified as African American. In the total sample, 370 participants were female (62.5 %) and 222 participants were male (37.5 %). Participants, recruited for a study focused on the experiences of midlife individuals, ranged in age from 34 to 85, with a mean age of 51.64 ($SD = 11.90$).

Measures

Perceived discrimination

Perceived discrimination was measured through nine items. Participants were instructed to think of their day-to-day experiences, then rate how often each form of mistreatment occurred on a scale ranging from 1 (*never*) to 5 (*very often*). Examples of everyday discriminatory hassles from this scale include, "Do people act as if they think you are not smart?" and, "Are you treated with less respect than other people?" This measure evidenced good internal reliability in the current sample, $\alpha = .87$. Previous research focusing on the consequences of perceived discrimination for health has utilized this measure (e.g., Friedman et al., 2009; Lewis et al., 2010) and has found evidence of good internal consistency, split-half reliability and convergent and divergent validity for this measure across diverse samples (e.g., Clark et al., 2004; Kessler et al., 1999; Lewis et al., 2012; Taylor et al., 2004; Williams et al., 1997).

Stressor appraisals

Participants completed the Perceived Stress Scale (Cohen et al., 1983), a widely used self-report measure of general

stressor appraisals within the past month. Participants responded to 10 items on a scale from 0 (*never*) to 4 (*very often*), indicating how often they felt or thought in a certain way. Example items from this scale include, "In the last month, how often have you been able to control irritations in your life?" and, "In the last month, how often have you found that you could not cope with all the things that you had to do?" Greater scores on this measure indicate greater appraisal of current life stressors as exceeding one's available coping resources. This measure also evidenced good internal reliability in the current sample, $\alpha = .84$.

Emotion dysregulation

Emotion dysregulation was assessed by two subscales, venting and denial, from the COPE Inventory (Carver et al., 1989). Both subscales were composed of four items. Example items include, "I get upset and let my emotions out," from the venting subscale, and "I refuse to believe that it has happened," from the denial subscale. Responses to each item were made on a scale ranging from 1 (*not at all*) to 4 (*a lot*). Both subscales evidenced adequate internal reliability in the current sample (venting, $\alpha = .73$; denial, $\alpha = .72$) and have previously been used to assess emotion dysregulation (e.g., Westen, 1994).

Chronic inflammation

Three biomarkers were evaluated to gauge chronic inflammation: IL-6, E-Selectin and CRP. Fasting blood samples were collected from participants in the morning of the second day of their sessions at the GCRC for the MIDUS II: Biomarker Project. Samples were assayed for IL-6, e-selectin and CRP according to manufacturer guidelines (R&D Systems, Minneapolis, MN for IL-6 and E-Selectin; Dade Behring Inc., Deerfield, IL for CRP). Specifically, IL-6 was measured at the University of Wisconsin using high-sensitivity enzyme-linked immunosorbent assay (ELISA) while e-selectin and CRP were measured at the University of Vermont using high-sensitivity ELISA and particle enhanced immunonepholometric assay, respectively. Laboratory intra- and inter-assay coefficients of variance (CVs) were in acceptable ranges for all biomarkers, <10 %, except the inter-assay CV for IL-6, 12.31 %, which is slightly higher than is generally recommended (Schultheiss et al., 2012).

Relationship strain

Because we were interested in many different types of close relationships, we utilized measures of relationship strain with friends, family and spouses for the current study. Each of these parallel measures consisted of 4 items which participants rated from 1 (*not at all*) to 4 (*a lot*). The family measure specifically instructed participants to consider members of their family, not including their spouse or partner, thus avoiding redundancy. Example items from these measures include, "How often do they criticize you?" and, "How often do they let you down when you are counting on them?" Internal consistency for these measures was adequate for each type of relationship assessed (family, $\alpha = .78$; friends, $\alpha = .80$; spouse, $\alpha = .72$).

Results

Data were analyzed in structural equation models via AMOS software (Arbuckle, 1997) with maximum likelihood estimation using FIML methods for handling missing data (Arbuckle, 1996). Based upon recommendations by Sharma et al. (2005), in all models we examined fit using one absolute fit index, the root mean square error of approximation (RMSEA), as well as one incremental fit index, the non-normed fit index (NNFI; also referred to as the Tucker-Lewis index). RMSEA values below .05 and NNFI values above .95 are generally accepted as indicative of good model fit. We also report Chi square and corresponding degrees of freedom for each model. Non-significant Chi square values indicate that the reproduced covariance matrix does not significantly differ from the observed covariance matrix, indicating good model fit. For model comparisons, we tested Chi square change in order to assess whether parameter constraints significantly affected fit, with non-significant results suggesting preference for the more parsimonious model (i.e., the model with constrained parameters). Finally, for each latent factor in the model (i.e., emotion dysregulation, chronic inflammation and relationship strain) we chose one indicator based on theoretical primacy and fixed its loading at one to set the metric for that factor. These fixed indicators were venting, IL-6 and familial strain, respectively.

Descriptive statistics and inter-correlations among all observed variables are presented in Table 1. Notably, each of the indicator variables for the three latent factors (emotion dysregulation, inflammation and relationship strain) correlated significantly with all other indicators from the same factor. The first model we examined was a simple model with only one direct path from perceived discrimination to relationship strain. The purpose of this model was to establish that perceived discrimination had an overall effect on relationship strain before incorporating any of the hypothesized mechanisms into the model. This model fit the data well, $\chi^2(2) = 2.32$, $p = .31$, RMSEA = .02 (90 % CI .00, .09), NNFI = .99, and revealed a significant effect of perceived discrimination on the latent construct, relationship strain, $\beta = .25$, $p < .001$,

as hypothesized. Having established that perceived discrimination predicts increased relationship strain, we turned to the complete hypothesized model with all direct and indirect paths included.

This model also evidenced good fit, $\chi^2(28) = 26.20$, $p = .56$, RMSEA <.001 (90 % CI .00, .03), NNFI = 1.00, however two paths were not statistically significant. The first non-significant path was the direct path from perceived discrimination to relationship strain, consistent with our hypotheses. Specifically, it was hypothesized that this path would drop out of the model once all of the mechanisms were included, suggesting that the effects of perceived discrimination on relationship strain are explained or mediated by the psychological and physiological mechanisms included in the complete model. The second non-significant path was the direct path from perceived discrimination to emotion dysregulation. In order to confirm that these paths need not be included in the final model, we tested a nested model comparison in which we fixed these parameters at zero. Results from the Chi square change test indicated that fixing these paths did not significantly impair model fit, $\Delta\chi^2(2) = 1.80$, $p = .41$, thus the reduced model was retained.

This final model (displayed in Fig. 2) with both of the previous paths dropped fit the data well, $\chi^2(30) = 28.00$, $p = .57$, RMSEA <.001 (90 % CI .00, .03), NNFI = 1.00. For the measurement model, all indicators significantly loaded on the proposed latent factors (all loadings >.42). Furthermore, for the structural model, all paths were statistically significant (except the path from emotion dysregulation to relationship strain, which was marginal) and in the hypothesized directions (except the path from stressor appraisals to inflammation). Next, we describe results from the final structural model in greater detail and examine direct and indirect effects.

Interestingly, while perceived discrimination was directly associated with increased levels of the proposed physiological mechanism, inflammation, $\beta = .26$, $p < .001$, perceived discrimination was indirectly associated with increased levels of the proposed psychological mechanism, emotion dysregulation, through stressor appraisals, $\beta = .08$, Sobel's $z = 2.50$, $p = .01$. In other words, the effects of perceived discrimination on the two proposed mechanisms operated differently. Also of note, while inflammation was significantly predictive of increased relationship strain, $\beta = .41$, $p < .001$, the effect of emotion dysregulation on relationship strain was smaller in magnitude and only marginally significant, $\beta = .17$, $p = .08$. Furthermore, we tested whether inflammation mediated the effect of perceived discrimination on relationship strain and found evidence for a significant indirect effect, $\beta = .11$, Sobel's $z = 3.82$, $p < .001$. We did not, however, examine a parallel indirect effect through emotion dysregulation because there was no direct path from perceived discrimination to emotion dysregulation. In addition to these effects, we also found that stressor appraisals directly predicted increased relationship strain, $\beta = .48$, $p < .001$, and significantly mediated an indirect effect of perceived discrimination on relationship strain, $\beta = .09$, Sobel's $z = 2.67$, $p < .01$.

Finally, contrary to our hypotheses, stressor appraisals appeared to be associated with decreased rather than increased inflammation, $\beta = -.14$, $p < .05$. In other words, participants who reported greater appraisals of life stress exceeding coping resources within the past month also evidenced lesser chronic inflammation. In order to further explore this unexpected finding, we examined whether perceived discrimination might have an indirect effect through stressor appraisals that was in the opposite direction as its direct effect on inflammation. Results from this test revealed that the indirect path was not significant, $\beta = -.03$, Sobel's $z = -1.67$, $p = .10$. Therefore, although stressor appraisals appeared to decrease chronic inflammation, perceived discrimination was consistently associated with higher levels of inflammation.

Discussion

In the current study we found relatively strong support for the proposed model. In line with previous research (e.g., Doyle & Molix, 2014, in press; Lincoln & Chae, 2010; Murry et al., 2001), we found that among African Americans, perceived discrimination was related to greater relationship strain with family, friends and spouses. However, in a model including the proposed psychological and physiological mechanisms, emotion dysregulation (operationalized as venting and denial of negative emotions) and chronic inflammation (operationalized via three biomarkers: IL-6, e-selectin and CRP), the direct effect of perceived discrimination on relationship strain was no longer significant. These results suggest that emotion dysregulation and chronic inflammation are two important ways in which prejudice and discrimination may contaminate close relationships for members of devalued groups.

It is noteworthy, however, that the evidence for chronic inflammation was somewhat more clear-cut in the current study compared to the evidence for emotion dysregulation. Perceived discrimination directly predicted increased chronic inflammation and, in turn, chronic inflammation directly predicted increased close relationship strain. In contrast, perceived discrimination indirectly predicted increased emotion dysregulation through increased stressor appraisals and, in turn, emotion dysregulation only marginally predicted increased close relationship strain. Although both of these pathways warrant further investigation, it is plausible that the subtler effects of prejudice

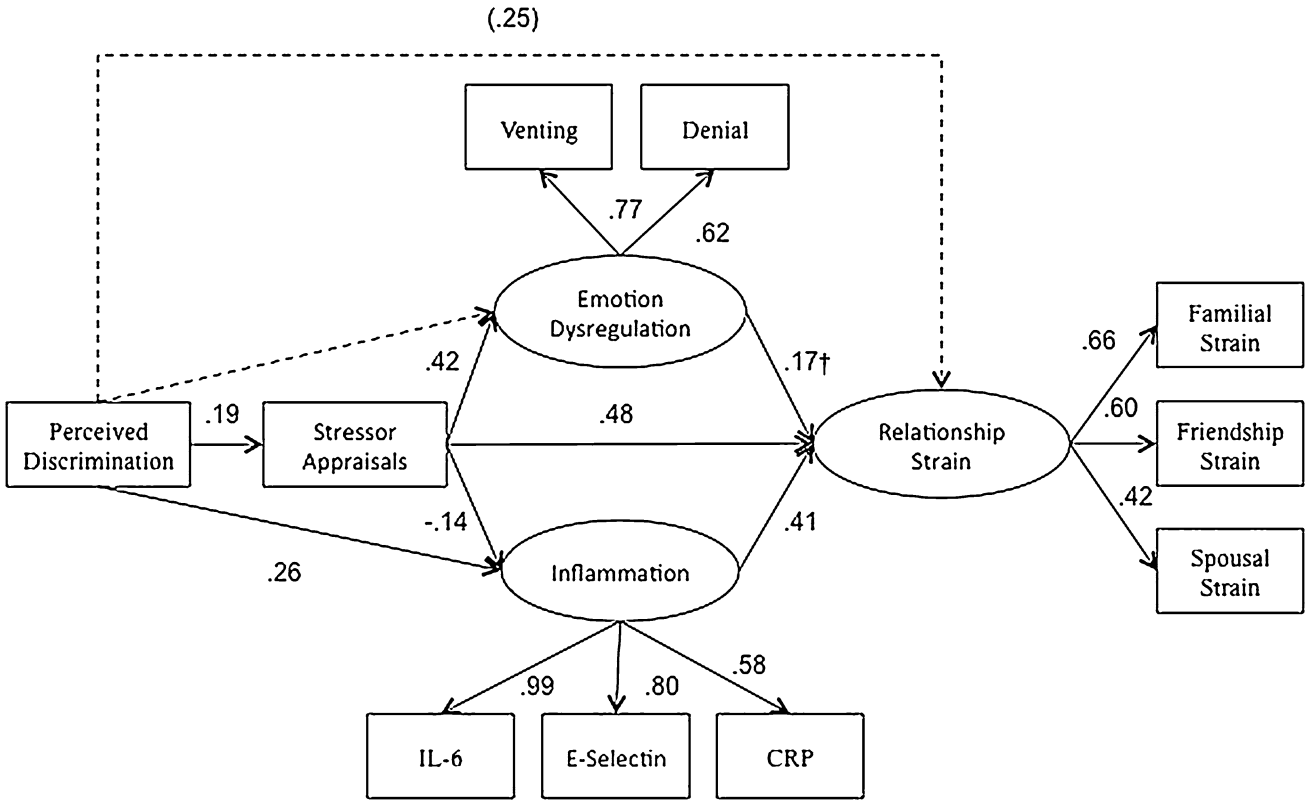

Fig. 2 Model of pathways from discrimination to close relationship functioning. *Note* All coefficients presented are standardized and significant at $p < .05$ (except $^{\dagger}p < .10$, as noted). *Dashed lines* represent non-significant paths that were removed from the final model. The coefficient in *parentheses* represents the effect of perceived discrimination on relationship strain in the initial model with only these two variables. Fit statistics for the final model are as follows: $\chi^2(30) = 28.00$, $p = .57$, RMSEA <.001 (90 % CI .00, .03), NNFI = 1.00

and discrimination that manifest themselves in biological systems are even more pernicious and damaging for close relationships.

Interestingly, a counterintuitive finding to emerge in the current research was that stressor appraisals had a significant inverse association with chronic inflammation. Individuals who appraised stressors as taxing their available coping resources generally experienced lower levels of inflammation. This finding may be related to the measure of stressor appraisals utilized in the current study, the Perceived Stress Scale. Other studies utilizing the Perceived Stress Scale have found non-significant associations with inflammatory markers (e.g., Christian et al., 2009; Kiecolt-Glaser et al., 2003) and despite the significant path found in our final model, results from the correlation matrix (Table 1) show that stressor appraisals do not have significant bivariate associations with IL-6, e-selectin or CRP. Therefore, it is possible that there is no true effect of stressor appraisals on chronic inflammation and that this pattern of data created a spurious effect. However, this finding certainly warrants greater scrutiny and more research is needed to clarify the relation between stressor appraisals and inflammation.

The current study was also limited by the use of secondary data. Particularly, the measure of stressor appraisals utilized in the current study was not specific to appraisals of prejudice and discrimination, but rather life stressors more generally. Although we did find evidence that increased levels of perceived discrimination led to greater appraisals of stress as taxing beyond available coping resources, it is unclear what other types of life stressors may have been captured within this construct. Consistent with other researchers (e.g., Williams et al., 2003), we view prejudice and discrimination as one type of stress that creates an additional burden on top of other general life stressors (e.g., unemployment) for members of devalued groups. Research examining nuances in the effects of qualitatively distinct types of stressors would be valuable. Furthermore, the measure of perceived discrimination utilized in the current study did not refer to a particular social identity. Therefore, it is unclear to what social identity participants may have been attributing the mistreatment that they reported (e.g., race, gender, sexual orientation). Future work on this topic should include measures that refer to a specific social identity or allow participants to

attribute their experiences to whichever identity was salient at the time. This would be especially important for research among members of other racial groups, including Whites. We posit that similar results would be found with a sample of White participants if they were asked to report on discrimination related to other devalued social identities (e.g., sexism, heterosexism, weight-based discrimination).

Another potential limitation of the current study is the possibility that other unmeasured personality factors correlated with perceptions of discrimination (e.g., neuroticism, hostility) may actually be responsible for the observed effects. However, past research has shown that perceptions of discrimination remain consistent predictors of health and well-being outcomes after controlling for these confounding variables (e.g., Brondolo et al., 2005; Broudy et al., 2007; Huebner et al., 2005; also see Williams & Mohammed, 2009, for a discussion). In line with Clark et al. (1999), we posit that these other factors, collectively, modify African American's perceptions of and responses to prejudice and discrimination. Therefore, research examining differential responses to objective discriminatory events and effects on close relationship functioning would be useful.

Although we found strong support for the model as specified in the current study, it is also possible that the causal ordering of some variables within the model could potentially be more complex. For example, in the current model we propose that chronic inflammation, a mechanism driven by prejudice and discrimination, leads to poorer relationship functioning. But this association may be bidirectional: inflammation may lead to poorer relationship functioning and poorer relationship functioning may lead to inflammation (Jaremka et al., 2013). While the symptoms associated with chronic inflammation may lead to social withdrawal, being in a maladaptive relationship fraught with conflict may also lead to greater chronic stress and therefore greater inflammation. If, as previous research has shown (Doyle & Molix, 2014), prejudice and discrimination are capable of directly impairing relationship functioning, it may be that close relationship strain resulting from perceived discrimination eventually damages overall health through an indirect effect on chronic inflammation, a culprit in many of the most serious diseases of aging (Miller et al., 2011). In this way, close relationship strain may serve as a mediator in the well-established association between perceived discrimination and impaired physical health (Williams & Mohammed, 2009). Future research utilizing a longitudinal design might be able to address causation by testing a non-recursive model including bidirectional effects.

However, based upon results from the current study as well as experimental work on inflammation and social withdrawal (Dantzer et al., 2008; Eisenberger et al., 2010; Inagaki et al., 2012), we propose that there is accumulating evidence to suggest that chronic inflammation may be an important mechanism responsible for impaired relationship functioning. In the current research we were primarily interested in explaining how perceived discrimination contaminates close relationships, and we suggest that attention to chronic inflammation as a mediator in this association is warranted. Yet these associations may also be further complicated by a variable not accounted for in the current model—depression. Because depressive symptoms are closely associated with social stress, chronic inflammation, emotion dysregulation and relationship strain (Jaremka et al., 2013; Slavich & Irwin, in press), it is possible that depression may represent a common mechanism. It would be valuable for future research to examine the contribution of depressive symptoms to the model tested here.

Conclusion

Interdisciplinary models incorporating social, psychological and biological elements have been critical in stimulating research on the sequelae of stressors, including prejudice and discrimination (e.g., Clark et al., 1999). In the current work, we tested a model incorporating these pathways in order to examine how perceived discrimination strains close relationship functioning for members of devalued groups. This model fit the data well, suggesting psychological and physiological mechanisms that may contribute to impairments in relationship functioning among African Americans. Such work is critical in order to address disparities in relationship functioning between members of dominant and devalued groups (Doyle & Molix, 2014). Moreover, researchers should be encouraged to work with practitioners and policy-makers alike to ensure that effective interventions and programs targeting psychological and physiological mechanisms are implemented at multiple levels (e.g., individual, relational, structural) in order to help eliminate relationship disparities.

Conflict of interest David Matthew Doyle and Lisa Molix declare that they have no conflict of interest.

Informed consent All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

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