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Expectations of Racism and Carotid Intima Media Thickness in African-American Women

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Abstract

Objective: Several researchers have argued that racism-related stressors play an important role in adverse cardiovascular outcomes among African-American women. However, studies have primarily focused on experiences of racism; thus, the role of expectations of racism is insufficiently understood. The current proof-of-concept study was designed to examine associations among expectations of racism, self-reported experiences of racism, and carotid intima-media thickness (IMT), a marker of cardiovascular risk, in African-American women.

Methods: Participants were 52 healthy African-American women, aged 30-50 (Mean=40.8, sd=4.3). Expectations of racism were assessed with a modified version of the Race-Based Rejection Sensitivity Questionnaire, experiences of racism were assessed with the Schedule of Racist Events, and carotid IMT was measured using B-mode ultrasound.

Results: In linear regression analyses adjusted for age, expectations of racism were associated with higher levels of carotid IMT ($b=.04$, $s.e.=.014$, $p=.013$), after adjusting for experiences of racism. Findings remained significant after additional adjustments for cardiovascular risk factors ($b=.03$, $s.e.=.014$, $p=.032$). Associations were not confounded by additional stressors, hostility, or negative affect (depressive symptoms).

Conclusions: Independent of actual reports of racism, “expectations” of racism may be associated with increased cardiovascular risk in African-American women. Additionally, although experiences of discrimination were associated with depressive symptoms, expectations of racism were not, suggesting that other negative emotions likely play a role. Future studies are needed to replicate these results in larger samples, and to explore the psychological and physiological

pathways through which expectations of racism might affect CVD risk across a range of populations.

Keywords

Atherosclerosis; Cardiovascular Disease; Depression; Racism; Social Determinants of Health; Stress; Psychological; Vigilance

Introduction

Cardiovascular Disease (CVD) is the number one killer of adult women in the United States (1). Among women, African-American women are disproportionately burdened by CVD morbidity and mortality. Recent data suggest that African-American women aged 35–44 have rates of CVD that are higher than those of African-American men, White men and White women (2). Socioeconomic and traditional clinical risk factors do not completely explain this excess risk (2, 3); thus there is a pressing need to identify non-traditional risk factors that might affect early CVD in African-American women.

Racism-related stressors have been proposed as one potential pathway through which race heightens risk of CVD among African-American women. Reviews and meta-analytic findings have documented consistent associations between reports of racism (and other forms of discriminatory treatment) and markers of CVD risk across a range of populations (4–6). This research has been important in establishing empirical linkages between exposure to racism/discrimination and cardiovascular risk; however, it has largely focused on reports of interpersonal experiences of racism and discrimination, which, across cohorts, tend to be relatively low (7–12). Further, because reports of interpersonal experiences only capture a specific component of racism-related stress, focusing on these experiences alone may actually underestimate the impact of racism-related stressors on cardiovascular health.

In contrast to experiences of racism, *expectations* of racism exist even in the absence of an actual event. Researchers have argued that expectations of racism are largely fueled by an *awareness* of racism (13, 14). Prior studies suggest that African-Americans possess a more accurate knowledge of racism-related occurrences in United States history than Whites (15) and report an awareness of negative stereotypes about their group (14). Coupled with vicarious exposure to racism through family members, friends and media coverage (16), this knowledge about racism may increase expectations of racism among African-American women even when personal exposure is low. Consequently, the threat of potential racism is the psychological stressor in this instance, independent of the experience of racism itself.

In a qualitative study assessing racism-related exposures among African-American women, Nuru-Jeter and colleagues (17) observed that: “Many participants reported thinking about their race or racism at least daily...[in] the form of conscious efforts to prepare themselves—through heightened awareness and altered behaviors—for situations where they were likely to face racist attitudes or behaviors.” This is consistent with arguments presented by Williams in 1994 (18), and further emphasized by Myers and colleagues in 2003 (13), which posit that expectations of racism represent a form of chronic vigilance that may contribute to poor health among African-Americans. Tasks requiring vigilance, or “alert, watchful

observation of the external environment” (p383) (19) have been associated with increased cardiovascular reactivity; and concerns about general interpersonal mistreatment have also been linked to cardiovascular reactivity (20) as well as hypertension (21) and self-reported sleep (22). To date, however, there has been limited empirical research on vigilance around racial/ethnic discrimination *per se* and health, and almost no data in African-Americans.

Thus, the current “proof of concept” study was designed to examine the association between “expectations” of racism and carotid intima media thickness (IMT) in a small sample of healthy adult African-American women. Carotid IMT is a biomarker of CVD risk that has been linked to incident myocardial infarction and stroke in both clinic and community samples (23–25). Prior studies have documented associations between increased carotid IMT and psychosocial stressors (26–28), including self-reported experiences of racism (29) and overall unfair treatment (30). Across studies, carotid IMT is typically higher among African-Americans as compared to Whites (31, 32), and may therefore be an important target for prevention efforts to reduce black-white disparities in CVD.

We hypothesized that higher levels of expected racism would be associated with greater carotid IMT, and that this association would be independent of reports of actual racism. We also examined whether any observed associations were independent of potential confounders such as: 1) additional chronic stressors not directly due to race, and 2) known correlates of CVD risk such as hostility and negative emotions in the form of depressive symptoms. Finally, we explored the synergistic (interactive) effects of expectations of racism and experiences of racism on IMT, in order to determine whether the effects of expectations of racism on carotid atherosclerosis were most pronounced in women who reported higher levels of experienced racism.

Methods

Participants

Participants were 52 pre-menopausal African-American women aged 35–50, from a mid-sized city in the Northeastern United States. Women were recruited through community advertisements and flyers/pamphlets posted in area beauty supply shops, hair salons, restaurants, churches and community organizations. Interested participants were pre-screened by telephone to determine eligibility. In order to participate in the study, women had to self-identify as non-Hispanic African-American and be free of self-reported cardiovascular disease and most CVD equivalents, such as diabetes and clinical CVD (including a history of myocardial infarction, symptoms of angina, intermittent claudication, cerebral ischemia or revascularization). Additional exclusion criteria included: chronic illnesses known to influence atherosclerotic disease (e.g. Human Immuno-deficiency Virus, certain autoimmune diseases, renal disease and liver disease); treatment for psychiatric disorders (depression, anxiety); having received a mastectomy and/or hysterectomy; and current illicit drug use or alcohol abuse. Women who were pregnant, breastfeeding, postmenopausal, or taking oral contraceptives were also ineligible for participation.

Procedure

Based on self-reported menstrual cycle information obtained during the pre-screening interview, participants were scheduled for study visits during the post-ovulation luteal phase of their menstrual cycle (days 15–27 in a 28 day cycle), following a 12-hour fast. Women were asked to discontinue any vasoactive medication(s), caffeine ingestion and smoking for 24 hours prior to their visit. During their visit, participants completed a standard protocol that included measured height and weight, clinical tests (e.g. blood pressure) and B-mode ultrasound imaging of the carotid artery. Detailed information on demographic, psychosocial and behavioral characteristics was also collected, via interviewer-administered questionnaires. Participants were compensated \$150 for their time, effort and potential lost wages. Study procedures were approved by the Human Investigation Committee at Yale University. All participants provided written, informed consent. Assessments were conducted at the University's Hospital Research Unit between April 2009-May 2010.

Measures

Expectations of Racism were assessed with a modified version of the “expectations” subscale of the Race-Based-Rejection Sensitivity Questionnaire (14). The subscale inquires about expectations of racism across a variety of situations. As one example: *“Imagine you have just finished shopping for new clothes, and you are leaving the store carrying several bags. It’s closing time, and several people are filing out of the store at once. Suddenly, the alarm begins to sound, and a security guard comes over to investigate.”* Participants were then asked whether they *“would expect that the guard might stop me because of my race/ethnicity”*. Another item states: *“Imagine that you and your friends are in a restaurant, trying to get the attention of your waitress. A lot of other people are trying to get her attention as well,”* followed by a question asking participants if they: *“... would expect that she might not attend to me right away because of my race/ethnicity”*.

The subscale was originally designed to measure expectations of racism in African-American college students attending predominantly white universities (14) and consisted of 12 items, with good validity and test-retest reliability (14). Five items were dropped due to lack of applicability to a non-student population (e.g. items about grades and scholarships) or lack of current relevance (e.g. an item about using a payphone). Responses to the remaining 7 items were scored on a 6-point scale with higher scores indicative of greater expected racism. Responses were then averaged (total sum score divided by 7) to maintain the original distribution of the 1 to 6 point scale. The scale demonstrated good internal consistency in our sample (Cronbach's alpha=.87).

The original Race-Based Rejection Sensitivity Questionnaire also included an “anxious/concerned” probe prior to asking about “expectations.” Thus, participants were asked how “anxious/concerned” they would be about experiencing racism in a specific instance (e.g. trying to get the attention of a waitress), followed immediately by a query of how much they would “expect” to experience racism in that setting. Our community-based sample of women found the two back-to-back probes with similar wording counterintuitive and confusing. Thus we dropped the anxious/concerned queries (these generated the most pushback), from the questionnaire in the initial stages of the study.

Experiences of Racism within the past 12 months were assessed by the 17-item Schedule of Racist Events (SRE) Recent (33). We used the “recent” scale in keeping with standard psychosocial stress paradigms, which capture negative life events that are fairly proximal to the outcome. Sample items include: “*How many times have you been treated unfairly by people in service jobs (store clerks, waiters...) because you are Black?*”, and “*How many times have you been unfairly accused or suspected of doing something wrong (stealing, cheating) because you are Black?*” Possible responses range from 1 to 5, with higher scores indicating greater exposure to racism. Scores were averaged (total sum score divided by 17) to retain the original 1 to 5 point scale. The SRE Recent demonstrated good internal consistency in the current sample (Cronbach’s $\alpha=.89$).

Carotid Intima Media Thickness (IMT) was assessed non-invasively by a single ultrasonographer using a duplex ultrasound vascular imaging system connected to a 7 MHz linear array probe (Acuson Cypress™, Mountain View CA) with an imaging protocol adapted from guideline recommendations (34). Participants were studied in the supine position with the head laterally rotated 45 degrees to the left. B-mode ultrasound images of the far wall of the right common carotid artery were obtained 1 cm proximal to the carotid bulb for 3–5 cardiac cycles at anterior, posterior, and lateral angles and stored in Digital Imaging and Communication in Medicine (DICOM) format. IMT measurements (mm) were made at end-diastole with a previously validated computer-assisted edge detection image analysis system (Artery Measurement Systems, Gothenburg, Sweden) (35) by a single investigator blinded to clinical information. This software reports the mean value of 100 measurements along a 1 cm segment of the vessel. Using this software, the intraclass correlation coefficient for a single investigator is 0.97 with coefficient of variance of 3%. The average of the mean measurements across the different carotid artery imaging angles comprise the reported average IMT.

Demographics.—Age (in years), education (in years) and marital status were assessed for descriptive purposes via self-report.

Cardiovascular Risk Factors.—Blood Pressure measurements were obtained by a trained nurse and standardized for cuff size, position and rest period. Two blood pressure readings in the seated position were taken from the right arm of each participant and averaged for use in all analyses. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared. BMI was categorized as normal, overweight and obese (36) for descriptive purposes, but was modeled continuously in all analyses.

Contextual Psychosocial Variables.—Measures of additional stressors, hostility, and depressive symptoms were also included as potential confounders (stressors, hostility) and/or mediators (depressive symptoms). Additional Stressors were assessed with the five-item chronic burden scale (37) designed to measure stressors that have a duration of six months or more such as: relationship difficulties; ongoing financial problems; or difficulties with a job/ability to work. Responses were scored as present/absent and summed across items, with higher scores indicating more chronic stressors. Hostility was assessed with the 27-item CHOST, derived from the Cook-Medley hostility scale (38). Items are asked in a True/False format, with one point assigned for each true response. Scores range from 0–27

with higher scores indicating greater hostility. Depressive Symptoms were assessed with the 21-item Beck Depression Inventory (BDI) (39). Scores range from 0–63, with higher total scores indicating more severe depression. All three scales have been widely used across community samples and have demonstrated good reliability and validity (29, 37).

Statistical Analyses

Descriptive statistics were used to characterize the study sample on demographics, racism variables, cardiovascular risk factors, IMT and additional psychological covariates. Five participants (9%) were missing data on the SRE (our measure of experiences of racism) due to a programming error. Although there are a number of highly sophisticated methods to account for missing data (40), because SRE scores were missing completely at random (MCAR), we ran all of our analyses without these women (which is considered appropriate under MCAR criteria but could result in too large of a standard error), and using mean substitution on the SRE (which could result in too small of a standard error) (41, 42). Our findings were almost identical using both methods; thus we chose the latter approach to allow for the inclusion of the most participants.

Correlation coefficients were used to examine associations between expectations of racism, experiences of racism, contextual psychosocial variables and IMT. Due to our relatively small sample size, in order to avoid over fitting our models we took a conservative approach to adding the contextual psychosocial variables; they were only considered to be potential confounders (i.e. third variables) or mediators and included in final models if they were associated with both the predictor and the outcome at $p < .05$.

A series of multivariable linear regression models were conducted to examine the associations among expectations of racism, experiences of racism, and IMT. The initial, minimally adjusted model examined the main effect of expectations of racism on levels of IMT, after controlling for age and reports of racism. The second model added SBP and BMI as cardiovascular risk covariates, given their association with IMT in prior studies (43–45). A third model added any additional psychosocial covariates (potential confounders/mediators) meeting criteria for inclusion in the models. Following this first set of models, we then conducted a series of exploratory analyses in order to examine the expectations of racism by experiences of racism interaction, in both minimally and fully adjusted models.

Following this, we conducted a series of sensitivity analyses adjusting for education as a marker of socioeconomic status (SES). None of our primary models included this term, because several studies have found that African-Americans receive fairly limited health returns on education and other SES indicators (46, 47). Analyses with and without education produced similar results, thus this variable was not retained in final models. All analyses were conducted using SPSS.

Results

Participant Characteristics

Descriptive statistics for participant demographic, psychosocial and cardiovascular risk factor characteristics are presented in Table 1. Women ranged in age from 30–50, and were

skewed toward the younger end of the distribution, with an average age of 41 (SD=4.31). Approximately 53 percent were married or living as married, 24.5 percent were never married and 20.8 percent were either separated or divorced. Participants were well educated, reporting a mean 15.7 years (SD=2.39) of education. On average, women had SBP and DBP levels in the normal range, although 15.1% (N=8) met criteria for hypertension based on the Seventh Joint National Committee (JNC7) guidelines (48). Participants were predominantly obese, with an average BMI of 30.64 (SD=5.98). Reports of expected racism were intermediate, with a mean score of 3.54 on a 6-point scale; however, reports of *experiences* of racism were skewed towards the lower end, with an average score of 1.68 on a 5-point scale (Table 1). Scores on the BDI were also skewed towards the low end of the distribution.

Correlations Among Variables of Interest

As shown in Table 2, expectations of racism were significantly correlated with experiences of racism ($r=.63$, $p<.001$) and hostility ($r=.43$, $p<.001$), but were not significantly correlated with additional stressors ($r=.23$, $p=.104$) or depressive symptoms ($r=.19$, $p=.178$). Self-reported experiences of racism however, were significantly correlated with both additional stressors and depressive symptoms (both p -values $<.001$), as well as hostility. Other than expectations of racism, none of the psychological variables were significantly correlated with IMT (Table 2); thus none were considered to be potential confounders/mediators.

Associations Between Expectations of Racism and IMT

The crude association between expectations of racism and IMT is presented in a scatterplot in Figure 1. In linear regression analyses adjusting for age and self-reported racism, higher levels of expected racism were associated with a greater amount of carotid atherosclerosis ($b=.04$, $s.e.=.014$, $p=.013$). As shown in Figure 2 (with expectations of racism categorized for descriptive purposes), the relationship between expectations of racism and IMT was dose-response in nature, with each higher level of expected racism associated with a greater amount of carotid IMT, resulting in a 0.1mm difference between the lowest and highest tertiles. This association remained significant after further adjustment for BMI and SBP ($b=.03$, $s.e.=.014$, $p=.032$).

Exploratory Analyses

We ran exploratory analyses to examine the synergistic effects of expectations of racism and experiences of racism on IMT. In linear regression analyses adjusted for age, experiences of racism and expectations of racism, the experiences of racism X expectations of racism interaction term was non-significant ($p>.78$), indicating that the effect of expectations of racism on IMT did not differ by level of reported racism.

Additionally, although hostility was not associated with IMT in bivariate analyses, due to its significant association with expectations of racism in our sample and linkages to CVD risk in prior studies (32, 49, 50), we also ran exploratory models adjusting for hostility. In linear regression models adjusting for age, experiences of racism and hostility, expectations of racism was significantly associated with carotid IMT ($b=.04$, $p=.021$). Fully adjusted models (data not shown), revealed similar results.

Discussion

To our knowledge, the current proof-of-concept study is the first to document an association between “expectations” of racism and a biomarker of cardiovascular risk in African-Americans. We examined associations among expectations of racism, self-reported experiences of racism, and carotid atherosclerosis in a community sample of healthy, premenopausal African-American women. As anticipated, expectations of racism were more commonly reported than experiences of racism, and findings revealed a significant, dose-response association between expectations of racism and carotid IMT that was independent of self-reported experiences of racism, and three major risk factors for atherosclerotic disease –age, SBP and BMI. We explored whether the effect of expectations of racism on IMT differed by reports of experiences of racism, but did not observe a significant expectations by experiences interaction. Thus, findings indicate that regardless of whether (or how often) an actual racist event occurs, an awareness about or expectation of racism may increase cardiovascular risk in African-American women. Additionally, our observed difference in carotid IMT between African-American women in the highest versus lowest tertile of expected racism (detailed in Figure 2) is of potential clinical significance, as a meta-analysis of past population based studies indicate a 10% increased risk of myocardial infarction and 13% increased risk of stroke for every 0.1 mm difference in carotid IMT, when adjusting for age, sex, and other vascular risk factors (25).

Results from the current study are consistent with a laboratory study that found that expectations of racism also affect physiological pathways that might ultimately lead to increased IMT (51). Sawyer and colleagues (51) randomized 54 Latina college students to one of two conditions: 1) evaluation by a white female colleague who endorsed prejudiced beliefs or 2) evaluation by a white female colleague who endorsed non-prejudiced beliefs. Physiological parameters were assessed as the participants awaited their interactions. Findings revealed that Latinas anticipating an encounter with prejudiced evaluators had significantly higher SBP, DBP and heart rates than Latina participants anticipating an interaction with a non-prejudiced evaluator (51). Thus, in keeping with our findings, Sawyer et al observed that expectations of discrimination alone were associated with physiological arousal, even in the absence of actual exposure to discrimination.

Our findings are also in line with those from other studies examining expectations of mistreatment for reasons not directly attributed to race (or other protected classes (52)). Hicken et al (21, 22) and Clark and colleagues (20) have found significant associations between a measure entitled “racism-related vigilance” and indices of CVD, such as sleep (22), hypertension (21) and large arterial elasticity (20). Yet despite the title, the measure used in those studies does not actually inquire about expectations of mistreatment due to “race” (sample item: “how often do you...try to prepare for possible insults from other people before leaving home?”); thus it is not directly comparable to the measure used in our study. This is an important distinction, because measures that assess mistreatment overall typically include exposure to non-racial discriminatory experiences (e.g. ageism, sexism, classism, weight discrimination), as well as unfair treatment more broadly. Given the salience around race in the United States, and the prominence of racism compared to other forms of interpersonal mistreatment for African-American women (53, 54), examining

expectations about *racism* specifically may be particularly important for this group. However, without a direct test, it is difficult to fully determine the uniqueness of racism-related expectations versus anticipated threat about discrimination due to other factors. Nonetheless, taken together, results from prior studies on vigilance more broadly combined with the current findings provide additional support for the notion that “expectations” may have a significant impact on cardiovascular health.

The mechanisms underlying the observed association between expectations of racism and IMT require further exploration. It is noteworthy that while depressive symptoms (and additional chronic stressors) were associated with self-reported experiences of racism, they were not associated with expectations of racism. This further supports the argument that “expectations” of racism may be a conceptually distinct form of racism-related stress. Consequently, the psychological pathways through which expectations exert their impact on cardiovascular health may also differ. For example, experiences of racism have been strongly linked to depression and depressive symptoms (4, 55, 56), which may be one pathway through which these experiences “get under the skin” to affect CVD risk. Expectations on the other hand, may be more strongly associated with anxiety, and a prolonged state of cognitive activation and threat-related attentional bias (57) that is unrelated to depressive symptoms (58); which would represent a slightly different pathway.

Thus, in contrast to the active cognitive appraisal process proposed by some that might link experiences of discrimination to depression and/or depressive symptoms (59), expectations of racism may operate either consciously, as proposed by Nuru-Jeter et al (17), or unconsciously, via a preattentive system that automatically screens the environment for cues about threat and safety (60, 61). In the latter instance, the absence of specific indicators of safety would co-occur with feelings of threat, leading to anxiety and heightened vigilance. This is consistent with Brosschot and colleagues’ generalized unsafety theory of stress, which posits that chronic stress responses in daily life are largely automatic (i.e. unconscious), resulting from feelings of unsafety that are independent of cognitive representations of, or actual exposure to, stressors (62, 63).

Threat and vigilance -- key components in the conceptualization of expectations of racism -- are also defining characteristics of post-traumatic stress disorder (PTSD), which has also been linked to physiological arousal and IMT (64, 65). However, PTSD and other anxiety disorders are characterized as maladaptive fear responses (66); whereas expectations of racism may be an adaptive response to living in a society where racism-related events (e.g. police shootings (67), comments by political leaders (68), increasing hate crimes (69)) are highly publicized and salient in everyday life. But despite these differences, both PTSD and expectations of racism are characterized by sustained vigilance, threat, and feelings of unsafety--and these may be the critical underlying factors driving associations with poor cardiovascular health.

Our proposed conceptual framework linking expectations of racism to atherosclerosis and CVD risk is detailed in Figure 3. We begin with an acknowledgement of how both experiences and expectations of racism might vary based on the historical timeframe (e.g. pre- versus post the Civil Rights Act in the US; pre- versus post widespread use of social

media (70)), and the sociopolitical climate (e.g. the election of Barack Obama in 2008 (71), the increase in hate crimes in 2017 (69)). The association between experiences and expectations of racism is highlighted, as well as the (potentially) different emotional and affective pathways linking the two separate constructs to atherosclerosis and CVD risk.

Experiences of racism are hypothesized to lead to depression/depressive symptoms and hostility; theoretically through negative relational schemas about others and the world (59), but also independent of those schemas, as individuals who have positive schemas about the world (e.g. believing that it is just) often report the lowest levels of well-being following discriminatory stressors (72, 73). Expectations, on the other hand, are hypothesized to result in affective states such as anxiety, fear, and vigilance—primarily via heightened feelings of threat and unsafety. Hostility might also play a role. Hostility was strongly correlated with expectations of racism in our sample, which was not surprising, given the strong correlation between hostility and sensitivity to interpersonal rejection found in other studies (74, 75). Still, hostility was not associated with IMT, and including hostility as a covariate in our analyses did not alter our results. However, this could conceivably be due to our small sample size, thus we have retained hostility in our conceptual model as an important variable to consider in future studies.

All of the emotional/affective states identified in our conceptual model could lead to similar physiological changes, such as increased autonomic dysregulation (76, 77), disruptions in the diurnal variation in cortisol via neuroendocrine pathways (78, 79), and/or increased inflammation (78, 80). These physiological changes could be independent of, or directly mediated through negative health behaviors known to be associated with negative affect: including smoking, poor sleep, unhealthy eating, and physical inactivity (81). Both sets of factors (physiological and behavioral mechanisms) could ultimately lead to greater atherosclerosis and increased CVD risk. It is also possible that expectations (and experiences) of racism exert an effect on physiological and behavioral processes independent of emotional and affective states. These pathways are all detailed in Figure 3.

It is important to note that we did not observe a main effect of reports of racism on IMT in our sample. This is in direct contrast to a prior study of racial/ethnic discrimination and IMT by Troxel et al (29), and other studies in women that have observed linkages between self-reported experiences of discrimination and a range of cardiovascular indices including coronary artery calcification (8), visceral fat (82), and the metabolic syndrome (83). But all of these prior studies used the everyday discrimination scale (EDS) (84) to assess discriminatory experiences, and in the case of Troxel et al, only specific attributions to everyday racial/ethnic discrimination were associated with IMT. Because the construct of interest in the current analysis inquired about expected *racism*, we utilized the Schedule of Racist Events (SRE), as it assesses exposure to racism more explicitly than the EDS. However, the SRE is primarily event-based, capturing acute exposures to racism, while the EDS captures more chronic, day-to-day forms of mistreatment. Prior studies of acute exposures to racism and indices of cardiovascular health have also found null associations, particularly among African-Americans (85); and a 2014 meta-analysis found that studies using the EDS yielded larger racism and health effect sizes than studies that used other measures (5). Thus, it is possible that the absence of a main effect of racism on IMT in the

current sample was primarily due to the measure of racism used. Consequently, Figure 3 outlines an association between experiences of racism and atherosclerosis and CVD risk, even though that association was not observed in the current analysis. Future studies in this area would benefit from the inclusion of measures that capture chronic, as well as acute, experiences of racial discrimination.

Because our conceptual model was primarily driven by a desire to explicate the potential mechanisms through which expectations of racism might affect CVD risk (independent of experiences of racism) it does not include additional chronic stressors or adverse life events. Studies have consistently found that associations between racism/discriminatory stressors and CVD risk persist even after adjustment for these factors (29, 86, 87). Although the extant research in this area has focused on experiences rather than expectations of racism, our findings on expectations of racism and IMT are in keeping with this broader trend. Thus, we are conceptualizing additional chronic stressors and adverse life events as important contextual confounding variables known to vary by race (29, 86, 87) that could be controlled for in future studies where appropriate. However, based on our observations and findings from prior studies, evidence suggests that these factors may not be the critical component(s) linking expectations of racism to CVD risk.

There are several limitations to this study that should be noted. To begin with, our findings are cross-sectional and thus directionality of the association between expectations of racism and carotid IMT cannot be fully determined. However, the “silent” nature of carotid atherosclerosis makes reverse causality (i.e. those with more disease reporting higher expectations of racism) highly unlikely. Another limitation is the relatively small sample size. This limited our ability to control for a range of psychological confounders, and may have affected the likelihood of detecting a main effect of experiences of racism, as well as a significant expectations by experiences of racism interaction. Also, the scale we used to measure expectations of racism, the Race-Based Rejection Sensitivity Questionnaire, is typically examined in conjunction with personal (i.e. non race-based) sensitivity to rejection, which was not assessed in the current study. Because personal sensitivity to rejection has not been strongly linked to racism-related exposures --including the Race-Based Rejection Sensitivity Questionnaire (14, 88–90)-- we included hostility, as a trait-level characteristic that has shown linkages with these factors. Nonetheless, future studies utilizing this scale should also consider adjusting for personal sensitivity to rejection. Additionally, in our modification of the Race-Based Rejection Sensitivity Questionnaire, we dropped the anxious/concerned subscale utilized in the original version. This decision was driven by feedback from our participants; but given the proposed linkages between expectations of racism and overall anxiety, it is unclear whether excluding this subscale might have affected our results. Further, our sample was primarily comprised of educated African-American women. Although this is an important group to focus on – primarily because they have more access to integrated environments and are more likely to report (and perhaps have concerns about) racism than their lower-SES counterparts (91, 92) —findings based on the experiences of educated African-Americans may not generalize to their less-educated counterparts. Similarly, findings based on African-American women may not generalize to men or women from other racial/ethnic groups. Finally, we only had data on smoking for a subset of women in the sample, thus were unable to control for it in multivariable models.

Although the prevalence of smoking among African-American women is fairly low compared to White women, White men and African-American men (93) (particularly among educated African-American women, where the prevalence is less than 10% (94)); the lack of inclusion of smoking status in our analyses is a limitation of the current study.

These limitations are offset by several strengths. We utilized a well-validated social psychological measure of “expectations” of racism to test our hypotheses, and extended it for the first time to a community sample, with a pre-clinical biological endpoint. This allowed us to study a novel, culturally relevant stressor in a vulnerable sub-population at risk for CVD. We were also able to examine several key psychological factors that could potentially confound associations between expectations of racism and CVD risk, including chronic stress burden not directly due to race, depressive symptoms, and hostility. Further, although our study sample was small, the distribution of IMT measurements is concordant with published population norms for African American women (34).

In sum, current findings indicate that expectations of racism may be an important race-related stressor to consider in future research. We found evidence of a significant, independent association between expectations of racism and a marker of CVD risk; however prospective, longitudinal research is needed to determine whether expectations of racism are associated with changes in IMT and other markers of CVD risk over time. Additional observational and experimental studies are also needed to identify the psychological and physiological pathways through which expectations of racism might affect health. It may also be important to elucidate the circumstances that lead to heightened expectations of racism—such as vicarious exposure to racism and/or racial socialization – in order to determine whether these factors further contribute to elevated cardiovascular risk. Finally, additional research is needed to establish if stress-management interventions designed to improve coping with both the occurrence and expectation of racism might ultimately prove beneficial for African-American women’s cardiovascular health.

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The authors have no relevant Conflicts of Interest.

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Acronyms used in text:

CVD	Cardiovascular Disease
IMT	Intima Media Thickness
BMI	Body Mass Index
SBP	Systolic Blood Pressure

BDI	Beck Depression Inventory
DICOM	Digital Imaging and Communication in Medicine

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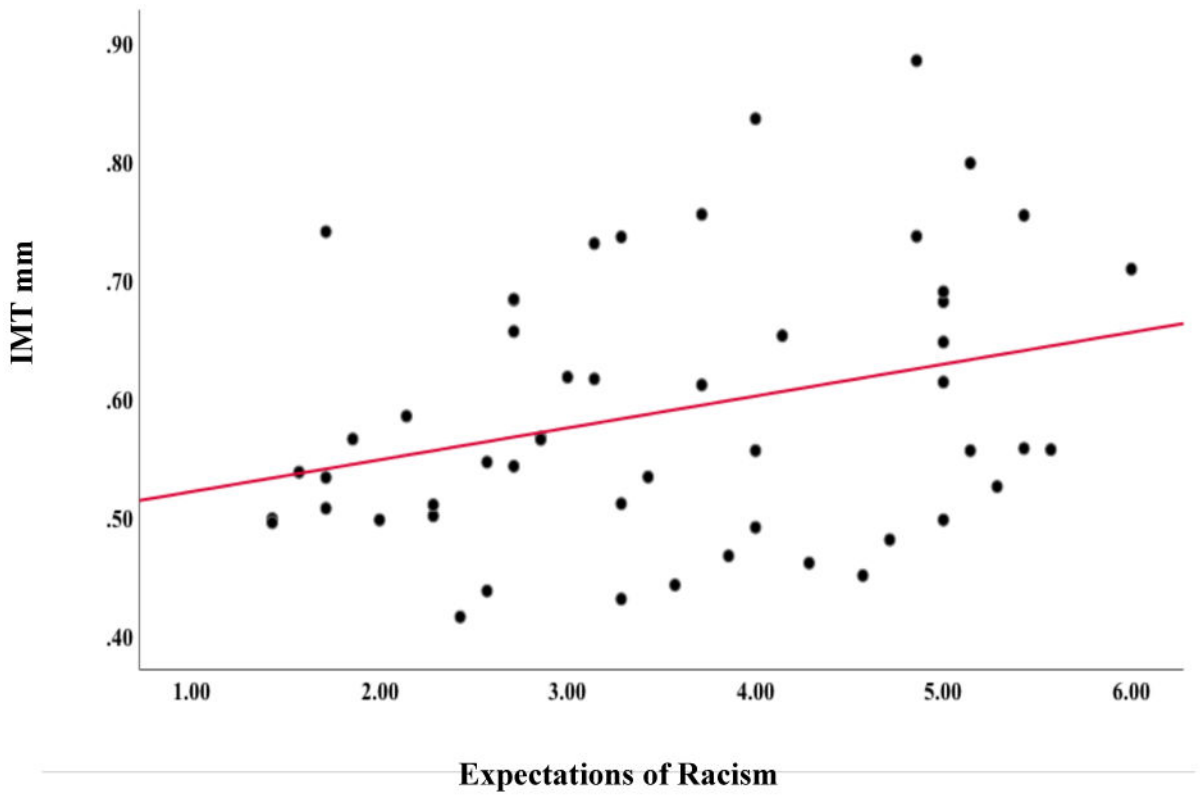


Figure 1.
Scatterplot of the basic association between Expectations of Racism and IMT

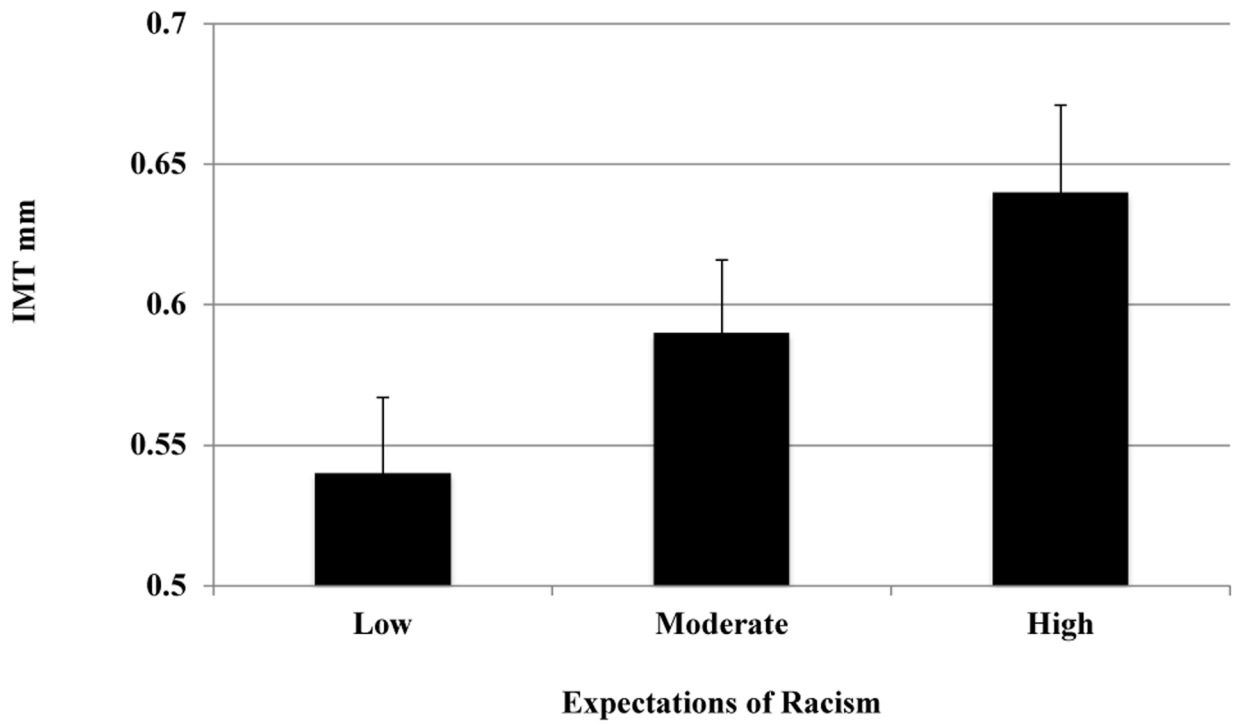


Figure 2.

Expectations of Racism and Intima Media Thickening (IMT) in African-American Women
Note: Adjusted for age and self-reported experiences of racism. Expectations of racism were modeled continuously in analyses, but are categorized for graphical purposes.

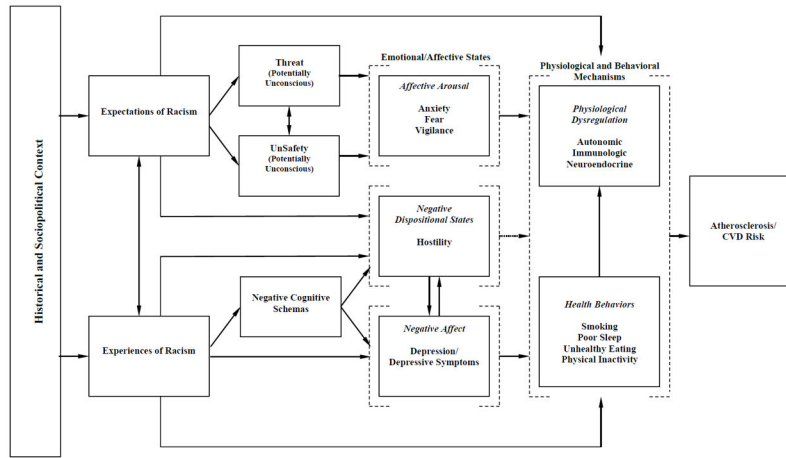


Figure 3. Conceptual Framework linking Expectations of Racism to CVD Risk in African-American Women.

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Table 1.

Sample Demographic, Psychosocial and Cardiovascular Risk Factor Characteristics

Characteristic	All Participants (N=52)		
	Mean±SD or n,%	Range	Shapiro-Wilk Statistic
Age (years)	40.9 ± 4.3	35-50	.94*
Education (years)	15.71 ± 2.34	12-21	.94*
Expectations of Racism	3.54 ± 1.29	1.43-6.00	.95
Experiences of Racism	1.68 ± .57	.29-3.65	.92*
Systolic Blood Pressure, mm Hg	124.95 ± 10.69	105-160	.97
Diastolic Blood Pressure, mm Hg	81.27 ± 9.17	66-114	.96
Hypertension, n (%)	8 (15.8)		
Body Mass Index (kg/m ²)	30.64 ± 5.99	19-51	.95
Normal weight, n (%)	9 (17.0)		
Overweight, n (%)	12 (22.6)		
Obese, n (%)	31 (58.5)		
Additional Chronic Stressors	1.71 ± .45	1.00-3.00	.96
Depressive Symptoms (BDI score)	6.37 ± 5.79	0-34.00	.78**
Hostility	13.87 ± 3.81	4-21	.97

Note: Values are mean ± SD or percentage.

**
p<.05***
p<.001

Table 2.

Correlations Among Study Variables

Variable	Expectations of Racism	Experiences of Racism	Additional Stressors	Hostility	Depressive Symptoms
Expectations of Racism					
Experiences of Racism	.61 **				
Additional Stressors	.23	.55 **			
Hostility	.43 *	.31 *	.28 *		
Depressive Symptoms	.19	.44 **	.53 **	.36 *	
IMT	.31 *	.001	-.12	.13	.02

Note:

*
p<.05,**
p<.01