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Perceived Racial Discrimination as a Predictor of Health Behaviors: the Moderating Role of Gender

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Abstract Perceived racial discrimination (PRD) has been implicated in undermining the mental and physical health of racial/ethnic minorities (e.g., Williams et al. in Am J Public Health 93:200–208, 2003; Wong et al. in J Pers 71:1197–1232, 2003). Researchers have begun to explore the indirect role of health behaviors as one factor in helping to explain this relationship. The goal of the present study was to examine the relationship between PRD and a wide range of health behaviors using a prospective, longitudinal design and to explore the role of gender in moderating these relationships. Using data from the Maryland Adolescent Development in Context Study, we examined the relationship between adolescent PRD (accumulated across ages 14–21) and health behaviors (i.e., diet, substance use, exercise) at age 30 in a sample of middle-class black men and women. Using structural equation modeling, results revealed that more cumulative PRD during adolescence was associated with less healthy eating, more substance use (among men), and more exercise (among women) in young adulthood. Implications of these findings for understanding the role of health behaviors in explaining the link between PRD and health outcomes are considered.

Keywords Discrimination · Health behavior · Substance use · Exercise · Diet · Gender

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Introduction

Racial/ethnic minority status in the United States is associated with poorer physical and mental health (e.g., Jackson et al. 1996; Williams et al. 2003) and higher rates of mortality (e.g., Barnes et al. 2008; Geronimus and Thompson 2004). A variety of mechanisms have been proposed to understand why this relationship exists, including racial discrimination. For example, institutional discrimination has been directly implicated by creating social and structural boundaries that limit the opportunities, resources, and living conditions of racial/ethnic minorities (e.g., Probst et al. 2004). Others have found that experiences of interpersonal discrimination because of one's race have implications for the health and well-being of racial/ethnic minorities (e.g., Hill et al. 2007; Troxel et al. 2003; Williams et al. 2003; Wong et al. 2003). For example, experiences of interpersonal racial discrimination can engender physiological reactions that, if experienced over time, can negatively impact the functioning of certain physiological systems (Harrell et al. 2003; Jackson et al. 2010; Mendes et al. 2008).

Recently, researchers have begun to explore the indirect role that health behaviors may play in explaining part of the link between experiences of perceived racial discrimination (PRD) and health outcomes (e.g., Copeland-Linder et al. 2011; Fuller-Rowell et al., in preparation; Gibbons et al. 2010; Pascoe and Richman 2009; Shelton et al. 2009). The logic of this perspective is that people may cope with the stress of PRD by engaging in negative health behaviors, like substance use, and these behaviors, experienced over time, may impact health (Jackson et al. 2010). A number of studies have explored the relationship between PRD and substance use (see Fuller-Rowell et al., in preparation), revealing that more PRD is associated with greater rates of

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smoking (e.g., Bennett et al. 2005; Borrell et al. 2007, 2010; Guthrie et al. 2002; Landrine and Klonoff 1996; Todorova et al. 2010), drinking (e.g., Borrell et al. 2007, 2010; Todorova et al. 2010; Martin et al. 2003), and other drug use (e.g., Borrell et al. 2007; Gibbons et al. 2004). Health behaviors are important predictors of health status and disease (e.g., Howard et al. 2008; Mann et al. 2003) and may serve as important mediating mechanisms in understanding why PRD impairs health. Accordingly, the goal of the present study is to better understand the relationship between PRD during adolescence and health behavior in young adulthood.

Limitations of Past Work

One limitation of the extant work examining the link between PRD and health behavior is that it has largely focused on substance use. By not including positive health behaviors like exercise or health behaviors related to diet, we may be missing an important part of how PRD impacts health, especially given high rates of obesity among racial/ethnic minority individuals (e.g., Baltrous et al. 2005; Sanchez-Vaznaugh et al. 2008; Wang and Beydoun 2007). For example, in addition to being associated with an increase in substance use, PRD may be associated with a decrease in healthy eating habits (or increase in unhealthy eating habits) as a way to cope with the stress of PRD (Jackson et al. 2010) and/or a decrease in exercise because the stress associated with PRD may tap the regulatory resources required to sustain regular exercise (Baumeister and Vohs 2004).

A second limitation of extant work is the use of cross-sectional designs, which make it difficult, if not impossible, to determine the causal ordering between PRD and health behaviors. For example, using a cross-sectional design, it is possible that greater engagement in certain health behaviors (e.g., smoking) may lead to experiencing certain forms of PRD, or it is equally possible that experiencing more PRD may lead to engaging in certain health behaviors as a way to cope with the stress associated with PRD (Jackson et al. 2010). Although a number of studies using longitudinal designs have implicated the latter as more closely representing the causal flow of this relationship (e.g., Borrell et al. 2007; Fuller-Rowell et al., in preparation; Wiehe et al. 2010), there is still insufficient work exploring the link between PRD and health behaviors using longitudinal designs. Cross-sectional designs also preclude the possibility of examining how experiences of racial discrimination accumulate across time. As will be discussed in more detail below, research suggests that the effects of risk factors, like PRD, on outcomes accumulate over time (e.g., Braveman and Barclay 2009; Kuh et al. 2003).

A third limitation of previous work is the absence of research systematically considering the role of participant gender in moderating the link between PRD and health behaviors. In the extant research, gender is typically considered as a covariate and thus, its potential moderating effects are obscured. There are a few notable exceptions to this trend. For example, Wiehe et al. (2010) found that PRD was associated with more smoking among boys, but somewhat less smoking among girls. In contrast, Borrell et al. (2007, 2010) found no moderating effects of gender on the relationship between PRD and health behaviors like drinking, smoking, and drug use. We contend that gender may be an important factor in understanding the relationship between PRD and health behavior, given its association with a variety of factors relevant to this relationship. Specifically, gender is related to the amount and type of racial discrimination experienced by racial/ethnic minority individuals (Chavous et al. 2008; Cunningham 1999), plays an important role in how racial/ethnic minority children are socialized by their parents around issues of race (e.g., Bowman and Howard 1985; Thomas and Speight 1999), and impacts types of behaviors that are deemed socially acceptable for men and women (e.g., Eagly 1987; Eccles 1987; Frieze et al. 1978; Meece et al. 1982; Prentice and Carranza 2002). Gender differences in experiences with PRD, socialization, and social norms, as well as equivocal findings in the few studies examining gender in relation to health behaviors and PRD, support the need for additional research in this area.

In the present study, using a sample of primarily middle-class self-identified black individuals, we explored the link between PRD during adolescence and a variety of health behaviors reported at age 30. The primary advantage of the present study is that it addresses the limitations of existing work by (1) exploring a wide range of health behaviors, including exercise, diet, and substance use (2) using a prospective, longitudinal design in order to get better purchase on the direction of causality and the cumulative effects of PRD, and (3) considering the extent to which the effect of PRD on health behaviors is moderated by participant gender.

Study Overview and Predictions

In the present study, using data from the Maryland Adolescent Development in Context Study (described in more detail below), we examined how PRD reported during adolescence predicted health behavior assessed in young adulthood (age 30). Importantly, we examined this relationship controlling for health behaviors reported in early adolescence (age 12), before PRD was reported. In order to correct for measurement error and to test hypotheses

related to the structural relations among the implicated variables, we used structural equation modeling (SEM).

Given the longitudinal design, we are in the unique position to explore the predictive effects of *cumulative* PRD during adolescence on various health behaviors. Researchers have conceptualized a variety of ways in which PRD may influence health across the life course (e.g., Braveman and Barclay 2009). One prominent view is that the effects of risks, like PRD, accumulate over time, such that, for example, the effects of PRD from any single time point may be weaker than the effects of PRD considered across multiple time points (e.g., Kuh et al. 2003). Thus, in the present study, we use respondents' assessments of PRD across their adolescent years (considered broadly from age 14 to age 21) in an SEM framework to create a cumulative PRD latent variable reflecting the amount of discrimination experienced across the adolescent years.

We predicted that more cumulative PRD reported during adolescence would be associated with less healthy eating patterns, less exercise, and more substance use in young adulthood, controlling for these behaviors in early adolescence. We also expected that the relationship between PRD during adolescence and substance use during young adulthood would vary as a function of gender. Specifically, given gender norms that more strongly proscribe substance use among women than men (e.g., Elek et al. 2006), we expected that PRD would be related to substance use only among men.

Method

Participants

Data for the present study come from the Maryland Adolescent Development in Context Study (MADICS). MADICS is a longitudinal study of neighborhood, peer, parent, and social factors influencing adolescent development in a sample of young adults residing in Prince George's County, Maryland (PIs: Jacquelynne Eccles & Arnold Sameroff). MADICS began as a part of the Study of Adolescents in Multiple Contexts (Cook et al. 1999), when all 5000 7th graders (age 12) in the county school district in 1991 were invited to participate in a large, longitudinal study. Of these 5000 adolescents, 1482 ($n = 879$ black; 49% women) adolescents and their families also participated in MADICS. These families were selected based on parental willingness and a stratified sampling procedure designed to proportionally represent families from each of the 23 junior high schools in the county. English was the primary language spoken in all of the MADICS families, and the vast majority of the youth respondents (above 95%) were born in the United States. Participants in the present study include 815 self-identified black or African American respondents who participated two or more times between age 12 (wave 1) and age 30 (wave 7).

Procedure

For the first wave of MADICS data collection (age 12), interviewers were recruited from the community and were trained in a three-day workshop. The racial composition of the interviewers matched that of the county at large (60% African American, 38% European/American, 2% Hispanic), and the race of the interviewer was matched to race of primary caregiver, when possible. The interviewer phoned the household and asked to speak with the parent identified by the school, usually the mother (identified as the primary caregiver). During this phone call, an in-home visit was scheduled. During the in-home visit, the primary caregiver and youth respondent completed a face-to-face structured interview and a self-administered paper–pencil questionnaire completed in a private place in the home. The primary caregiver was interviewed first (while the youth respondent completed the paper–pencil questionnaire), and the youth respondent was interviewed second (while the primary caregiver completed the paper–pencil questionnaire). Each face-to-face interview took approximately 1 h, and each paper–pencil questionnaire took approximately 30 min to complete. The interviewer was available to answer any questions about the paper–pencil questionnaire from either the parent or the youth. To ensure that interviewers were following the interview protocol accurately, approximately 15% of the families were randomly selected and contacted to verify that the interview had taken place and that the interviewer had followed the guidelines for conducting the interviews. No problems were identified in these verification calls. Similar procedures were followed for the age 14 (wave 3) and age 17 (wave 4) visits.

Wave 2 took place during the summer after the seventh grade and focused on family management processes using a more qualitative approach; thus, this wave will not be included in the present analyses. The age 19 (wave 5) and age 21 (wave 6) assessments were done via a mailed paper/pencil questionnaires, and the age 30 (wave 7) assessment was done either online or via a mailed paper/pencil questionnaire. The youth respondent was compensated $15–$50 (depending on the year of assessment) each time they participated.

Measures

Family Socioeconomic Status (SES)

We use a composite indicator of family SES created using information provided by the primary caregiver at the age 12 visit. It includes family income, the highest education

level of either parent, and highest occupational status of either parent (Nam and Powers 1983).

Perceived Racial Discrimination (age 14 and 17)

PRD at age 14 and 17 was assessed with the same 8 items assessing the frequency with which adolescents perceived personal discrimination at school by their teachers and peers because of their race (e.g., teachers called on them less; they got into fights). These 8 items were rated from 1 (*never*) to 5 (*every day*) and scored such that higher values indicate more perceived discrimination at school. The means of these variables served as the age 14 and age 17 PRD assessments included in our key SEMs (age 14: $\alpha = .89$; age 17: $\alpha = .89$).

Perceived Racial Discrimination (Age 19 and 21)

PRD at age 19 and 21 was assessed with the same 2 items reflecting the amount of discrimination participants perceived at work or in college. These two items were rated from 1 (*strongly disagree*) to 5 (*strongly agree*) and scored such that higher values indicate more perceived discrimination at work or college. The means of these variables served as the age 19 and age 21 PRD assessments included in our key SEMs (age 19: $\alpha = .55$, age 21: $\alpha = .73$).

Diet at Age 12

Diet at age 12 was assessed with two items: "How often do you eat at least one good meal a day" rated from 1 (*hardly ever*) to 5 (*every day*) and "Do you pay attention to making sure that your diet is healthy" rated from 1 (*almost never*) to 5 (*almost always*). These items were used as indicators of the age 12 latent healthy diet variable.

Exercise at Age 12

Exercise at age 12 was assessed with two items: "Have you ever participated in organized sports teams?" rated from 1 (*never*) to 4 (*yes, for several years*) and "In the last two weeks, how often did you play sports (outside of school time)?" rated from 1 (*never*) to 6 (*daily, more than an hour*). These items were used as indicators of the age 12 latent exercise variable.

Substance Use at Age 12

Substance use at age 12 was assessed with three items: "In the past 30 days, how many cigarettes have you smoked" rated from 1 (*none*) to 7 (*2 packs or more per day*), "In the past 30 days, how many times have you used marijuana," and "In the past 30 days, how many times have you drank alcohol" both rated from 1 (*never*) to 6 (*more than 20 times)*. These items were used as indicators of the age 12 latent substance use variable.[1]

Diet at Age 30

Diet at age 30 was assessed with four items asking about participants' eating patterns during an average week: "how many times do you typically eat vegetables (not including French fries or other fried potatoes) and/or fruit (not including fruit juice)?" "how many times do you typically eat a meal or snack from a fast food restaurant, such as McDonald's, Pizza Hut, Burger King, Kentucky Fried Chicken, Taco Bell, Wendy's, and so on? Consider both eating out, carry out, and delivery of meals in your response," "how many times do you typically eat candy, ice cream, cookies, cakes, brownies, or other sweets?" "how many times do you typically eat potato chips, corn chips (e.g., Doritos, Fritos), pretzels, popcorn, crackers, or other salty snack foods?" These items were rated on a scale from 1 (*do not typically eat*) to 7 (*4 or more times per day)* and were scored such that higher values indicate a more healthy diet. These items served as indicators of the age 30 latent healthy diet variable.

Exercise at Age 30

Exercise at age 30 was assessed by asking the respondent how many hours she/he spends each week engaged in four exercise-related activities: "doing activities to increase muscle strength, such as lifting weights or calisthenics," "doing activities to improve flexibility, such as stretching or yoga," "doing moderate physical activity (defined as activities in which your heart beats faster than normal; for example, brisk walking, aerobics class, strength training, gentle swimming)," and "doing vigorous physical activity (defined as activities in which your heart rate increases a lot; for example, aerobics class, jogging, running, power walking, tennis)." These items were rated on a scale from 1 (*none*) to 8 (*21 or more hours*) and served as indicators of the age 30 latent exercise variable.

Substance Use at Age 30

Five items were used to assess substance use at age 30: "How many cigarettes have you smoked during the past 6 months" rated from 1 = *none* to 7 = *2 packs or more per day*), "How many times in the past 6 months have you

[1] Results were identical when drinking, smoking, and marijuana use were considered as separate indicators. Thus, in the interest of space, we have combined these indicators into one global substance use latent variable.

used marijuana" rated from 1 (*never*) to 6 (*more than 20 times)*, "How many drinks does it take to get you high?" and "About how many drinks do you usually drink at any one sitting" rated from 1 (*half a drink*) to 9 (*eight drinks or more*), and "In the last month, how many times did you have five or more drinks in a row?" rated from 1 (*never*) to 6 (*10 or more times)*. The three items assessing alcohol use were used as indicators of the age 30 latent alcohol use variable; this latent variable and the cigarette and marijuana use items were included as indicators of the age 30 latent substance use variable.

Results

Missing Data Analyses

We conducted several analyses to examine patterns of missing data. First, we compared individuals who were included in our analyses (those who participated two or more times; $n = 815$) to those who were excluded (those who participated only once; $n = 64$). These analyses revealed that included participants were more likely to be women [$\chi^2(1, n = 879) = 6.57$, $p = .01$] and engaged in less exercise at baseline [$F(1, 876) = 5.83$, $p = .016$] than excluded participants. Further analyses revealed that the difference between excluded and included participants in baseline exercise was not significant when split by gender ($ps > .30$), suggesting that this difference in baseline exercise could be accounted for by gender differences in included versus excluded participants. In addition, no differences were observed on family SES, substance use, or diet at baseline, $ps > .20$.

Second, among the 815 participants included in our analyses, we compared the baseline responses of individuals who participated at age 30 ($n = 318$) with those who did not participate at age 30 ($n = 497$) to examine how attrition could be predicted by baseline variables. These analyses revealed that those who participated at age 30 came from families with higher SES [$F(1, 811) = 17.98$, $p < .001$] were more likely to be women [$\chi^2(1, n = 815) = 37.91$, $p < .001$] and engaged in less exercise at baseline [$F(1, 812) = 13.95$, $p < .001$] than those who did not participate at age 30. Further analyses revealed that the difference between those who participated at age 30 and those who did not on baseline exercise was not significant when split by gender ($ps > .38$), suggesting that this difference in baseline exercise could be accounted for by gender differences in age 30 participation rates. In addition, no differences were observed on substance use or diet at baseline, $ps > .28$.

Based on generally accepted criteria (e.g., Graham 2009), these patterns of missing data could be described as missing at random (MAR), in that missingness is predicted by observed data, namely gender and family SES. As outlined in Graham (2009), data patterns characterized by MAR can be accounted for using full information maximum likelihood models implemented in Mplus 6.0 (Muthén and Muthén 1998–2010) and by including the variables that predict missingness in these models. Thus, we conducted our key structural models on the 815 respondents who had data available at two or more time points using Mplus, and we included the relevant variables that predicted missingness in the models.

Data Analytic Strategy

To conduct our analyses, we estimated structural equation models (SEMs) using Mplus version 6.0 (Muthén and Muthén 1998–2010). To evaluate the overall fit of these SEMs, we report the fit indices provided by Mplus: the chi-square test, Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Models with CFIs greater than .90, RMSEAs $< .08$, and SRMRs $< .08$ indicate good model fit (Hu and Bentler 1999; McDonald and Ho 2002).

We first conducted measurement models of the key latent variables using confirmatory factor analysis in order to ensure that the measured indicators loaded on the hypothesized latent constructs. We constructed three measurement models: one for the cumulative PRD latent variable, a second for the age 12 health behavior latent variables, and a third for the age 30 health behavior latent variables.

Second, after establishing adequate measurement of the latent variables, structural models were tested to address the specific hypotheses. Three models were estimated to test the effects of cumulative PRD on the three age 30 latent health behavior controlling for the effects of the matching age 12 latent health behavior, gender (0 = female, 1 = male), and family SES. We removed any paths that were not significant in our final models. Third, using the multiple group command in Mplus, we examined whether the relationship between cumulative PRD and the three age 30 health behaviors varied as a function of gender. To do this, we compared the fit of a model in which all structural paths were constrained to be equal for men and women (the constrained model) with the fit of a model in which the path between cumulative PRD and each age 30 health behavior was allowed to vary for men and women (the unconstrained model). If the unconstrained model provides a better fit compared with the constrained model (using the chi-square difference test), it suggests that the relationship between cumulative PRD and that health behavior is significantly different for men versus women.

Measurement Models

Cumulative PRD

An initial cumulative PRD measurement model was estimated with the four PRD indicators. Fit for this model was poor: χ^2 (2) = 30.58, $p < .001$, CFI = .81, RMSEA = .136, SRMR = .072. However, modification indices suggested that allowing the residuals of the age 19 and age 21 PRD indicators to be correlated might improve model fit. Since residual correlations are expected between identical items that are administered over time, the covariances were added, resulting in a final measurement model that fit the data well: χ^2 (1) = 6.96, $p < .001$, CFI = .96, RMSEA = .088, SRMR = .032.

Age 12 Health Behaviors

An initial age 12 health behavior measurement model was estimated with two indicators for diet, two indicators for exercise, and three indicators for substance use. Fit for this model was excellent: χ^2 (11) = 3.52, $p < .001$, CFI = 1.00, RMSEA = .000, SRMR = .009.

Age 30 Health Behaviors

An initial age 30 health behavior measurement model was estimated with four indicators for the diet latent variable, four indicators for the exercise latent variable, and three indicators for the drinking latent variable, which combined with the cigarette and marijuana indicators to comprise the substance use latent variable. Fit for this model was adequate: χ^2 (62) = 179.88, $p < .001$, CFI = .91, RMSEA = .078, SRMR = .076. However, modification indices suggested that allowing the residuals of some indicators to be correlated within measures (i.e., moderate and vigorous physical activity; eating sweets and eating snack foods; how many drinks it takes to get drunk and how many drinks do you typically drink) might improve model fit. Since residual correlations are expected between very similar items within measures, the covariances were added, resulting in a final measurement model that fit the data well: χ^2 (59) = 109.58, $p < .001$, CFI = .96, RMSEA = .052, SRMR = .060.

Structural Models

Diet

The structural model for diet fits the data well: χ^2 (47) = 87.01, $p < .001$, CFI = .92, RMSEA = .032, SRMR = .050 (see Fig. 1). Path coefficients revealed that

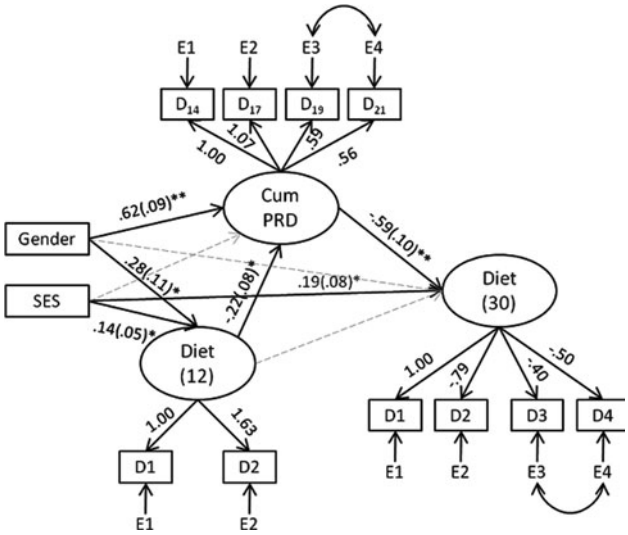

Fig. 1 Structural equation model predicting age 30 diet. Gender was coded as female = 0 and male = 1; Path coefficients are unstandardized; standard errors are shown in *parentheses*; *dashed lines* reflect paths that were non-significant and thus removed from the model (*$p < .05$, **$p < .001$)

men reported more cumulative PRD ($p < .001$) and more healthy eating at age 12 ($p = .01$) than women; those from higher SES families reported more healthy eating at age 12 ($p = .009$) and at age 30 ($p = .02$) than those from lower SES families; more healthy eating at age 12 was related to less cumulative PRD ($p < .004$), but controlling for this relationship, more cumulative PRD was related to less healthy eating at age 30 ($p < .001$), as was expected. The results of the multiple group analysis revealed that relationship between cumulative PRD and healthy eating at age 30 did not vary by gender, $\Delta\chi^2$ (1) = .60, $p = .44$.

Exercise

The structural model for exercise fits the data well: χ^2 (39) = 52.98, $p = .07$, CFI = .98, RMSEA = .021, SRMR = .045 (see Fig. 2). Path coefficients revealed that men reported more cumulative PRD ($p < .001$) and more exercise at age 12 ($p < .001$) than women; more exercise at age 12 was associated with more exercise at age 30 ($p = .007$); more cumulative PRD was marginally related to more exercise at age 30 ($p = .10$). However, the results of the multiple group analysis revealed that the relationship between cumulative PRD and exercise at age 30 varied as a function of gender, $\Delta\chi^2$ (1) = 4.22, $p = .04$. Among women, more cumulative PRD was associated with significantly more exercise at age 30 ($b = .35$, SE = .13, $p = .005$); among men, however, this relationship was not significant ($b = -.05$, SE = .16, $p = .75$).

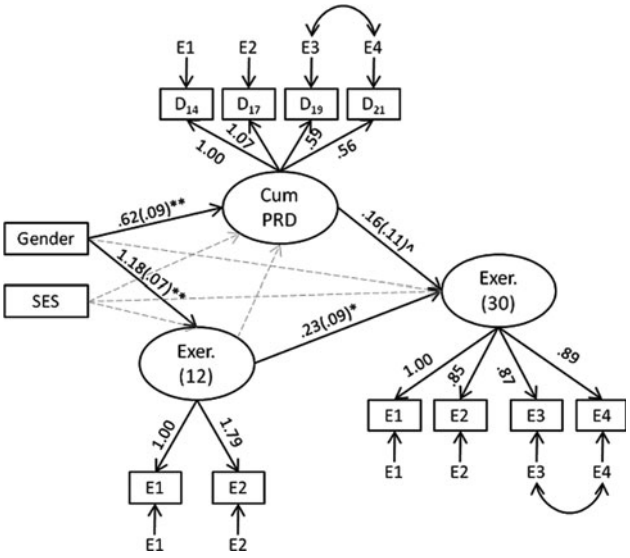

Fig. 2 Structural equation model predicting age 30 exercise. Gender was coded as female = 0 and male = 1; Path coefficients are unstandardized, and standard errors are shown in *parentheses*; *dashed lines* reflect paths that were non-significant and thus, removed from the model (*$p < .05$, **$p < .001$)

Substance Use

The structural model for substance use fits the data well: χ^2 (59) = 111.09, $p < .001$, CFI = .95, RMSEA = .033, SRMR = .062 (see Fig. 3). Path coefficients revealed that

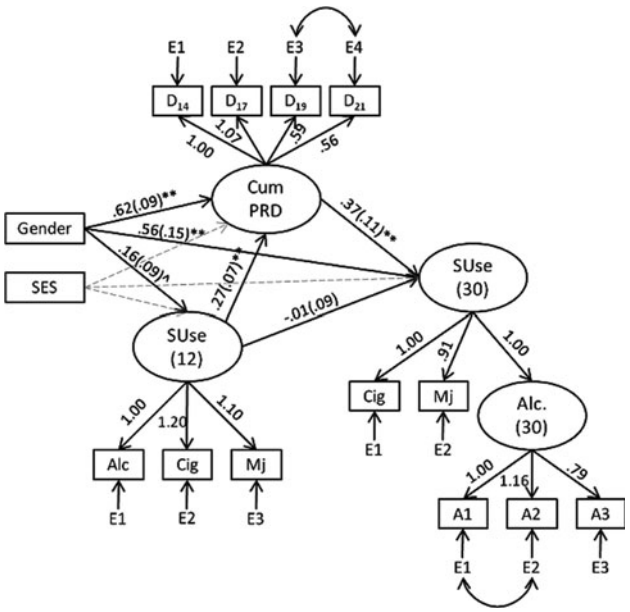

Fig. 3 Structural equation model predicting age 30 substance use. Gender was coded as female = 0 and male = 1; Path coefficients are unstandardized; standard errors are shown in *parentheses*; *dashed lines* reflect paths that were non-significant and thus removed from the model (^$p < .10$, *$p < .05$, **$p < .001$)

men reported more cumulative PRD ($p < .001$), marginally more substance use at age 12 ($p = .07$), and more substance use at age 30 ($p < .001$) than women; more substance use at age 12 was related to more cumulative PRD ($p < .001$), but controlling for this relationship, more cumulative PRD was related to more substance use at age 30 ($p = .001$) as was expected. The results of the multiple group analysis revealed that relationship between cumulative PRD and substance use at age 30 varied as a function of gender, $\Delta\chi^2$ (1) = 11.00, $p < .001$. Consistent with our hypotheses, among men, more cumulative PRD was related to more substance use at age 30 ($b = .73$, SE = .16, $p < .001$), whereas among women, this relationship was not significant ($b = -.05$, SE = .16, $p = .77$).

Discussion

In the present study, we explored the relationship between cumulative adolescent PRD and health behavior in young adulthood using a prospective longitudinal research design. Latent variable SEMs revealed that more substance use and unhealthy eating at age 12 were associated with more cumulative PRD during adolescence, suggesting that engaging in certain health behaviors may make people more likely to experience discrimination. However, controlling for these effects, as expected, we found that more cumulative PRD during adolescence was prospectively associated with more substance use and unhealthy eating at age 30, suggesting that people may respond to discrimination by engaging in these types of unhealthy behaviors. Interestingly, counter to predictions, more cumulative PRD during adolescence was associated with more exercise at age 30 (among women), suggesting that experiencing discrimination may make women *more* likely to exercise.

As expected, gender played an important role in moderating the relationship between cumulative PRD and substance use, with this relationship being significant and positive among men, but not significant among women. As discussed earlier, some work has shown that gender moderates the relationship between PRD and substance use (e.g., Wiehe et al. 2010), whereas other work has shown no moderation (Borrell et al. 2007, 2010). We suspect that one important difference that may account for these conflicting findings is the age of the respondents. In the present study, discrimination was assessed across ages 14–21, and in Wiehe et al., participants were between the ages of 15–19. In contrast, in Borrell et al. (2007), participants were between the ages of 18–30 at the start of the 15-year study, and in Borrell et al. (2010), participants were between the ages 45 and 84. Given the importance of gender roles during adolescence (e.g., Galambos 2003; Hill and Lynch 1983), we suspect that gender may emerge as a more

important moderator of this relationship during adolescence than during adulthood, when gender roles may be less salient. Thus, the results of the present study as well as Wiehe et al. (2010) support the idea that gender influences how adolescents cope with discrimination.

The results for the relationship between PRD and exercise were counter to predictions. Although we expected PRD to be associated with less exercise, a positive relationship between PRD and exercise was observed among women in the present study. Replication of this finding is needed before strong conclusions can be made about this relationship. However, the observed relationship between PRD and exercise seems theoretically sensible given that exercise is often used as a strategy for coping with stress (e.g., Rostad and Long 1996). Moreover, Jackson et al. (2010; Mezuk et al. 2010) have argued that black Americans often cope with stress by engaging in unhealthy behaviors like substance use and comfort food eating—behaviors, they argue, that may protect against mental health disorders (e.g., depression) but increase the risk of physical health disorders (e.g., hypertension). Our findings suggest that black women may also cope with the stress of discrimination through positive behaviors, like exercise. Thus, exercise may be an adaptive coping strategy that could protect against both negative mental and physical health problems associated with stressful events like discrimination. However, a possible alternative explanation is that black women who perceive more racial discrimination may also perceive more discrimination because of their weight—given the high rates of obesity among black women (e.g., Wang and Beydoun 2007)—and thus, they may also report more exercise as a way to combat weight-based discrimination. Future research will be needed to test this possibility and more closely examine the role of exercise as an adaptive coping mechanism.

The present study is the first, to date, to examine the relationship between cumulative PRD during adolescence and a broad range of health behaviors in young adulthood. Thus, these findings represent an important extension of the work exploring the relationship between PRD during adolescence and substance use (e.g., Borrell et al. 2007; Fuller-Rowell et al., in preparation; Gibbons et al. 2004; Martin et al. 2003) by including health behaviors related to diet and exercise, using a prospective longitudinal design that examines cumulative PRD, and systematically considering the role of gender. In addition, these findings add to the growing body of literature documenting the ways in which PRD impacts health and well-being. Specifically, our findings suggest that one of the mechanisms through which PRD may negatively impact health is through its negative links with substance use and diet.

Limitations and Future Directions

An important limitation of the present study is that the data reported in this paper come from black participants who were raised in a particular county in Maryland (Prince George's County) with unique demographic features not typically observed within the United States more generally. Specifically, this sample includes black Americans from a largely middle-class community in which black Americans were the statistical racial/ethnic majority group. This calls into question the generalizability of these findings to the larger population of black Americans in the United States whose social context is likely quite different. Thus, in future work, we plan to conduct similar analyses reported in the present study using nationally representative longitudinal datasets. Replication of similar findings would strengthen the generalizability of the types of models reported in this paper. Another limitation of this work is that the health behavior variables included few items, had low reliability, and included different items at the age 12 and age 30 assessments. While the latent variable framework available within SEM helps to address some of these issues, this limitation remains.

Another potential limitation of the present study is the use of the cumulative PRD latent variable. Such an approach makes it difficult to understand the more nuanced relationships that might exist between PRD at certain developmental periods and certain health behaviors. For example, it is possible that PRD reported earlier in adolescence may have a larger effect on health behaviors in young adulthood than PRD reported later in adolescence. Given our data analytic strategy, we were unable to test these more nuanced hypotheses. In future work, we plan to examine the extent to which the wave-to-wave relationships between PRD and the different health behaviors are similar or different across time in order to understand the relative impact of early versus later experiences of PRD on health behavior. It is also possible that the relationship between cumulative PRD during adolescence and health behaviors in young adulthood may be explained by some third variable that was not included in the structural models. Future research will be needed to determine whether the relationship between cumulative PRD and health behavior continues to emerge after controlling for possible third variables, such as aspects of personality.

In future research, we also plan to extend the models tested in the present study to include mental and physical health variables as outcomes. Specifically, we will examine the role of health behaviors in young adulthood in mediating the relationship between cumulative PRD during adolescence and physical and mental health in adulthood. Based on the work of Jackson et al. (2010), we would expect substance use and unhealthy eating to be associated

with better mental health in the short run but poorer physical health in the long run. In these analyses, it will be important to disaggregate the three substance use indicators (i.e., drinking, smoking, marijuana use) in order to examine their unique effects on different types of mental and physical health outcomes. We plan to explore these issues using data from MADICS and other nationally representative datasets.

Conclusion

In sum, the present study reveals that cumulative PRD experienced during adolescence prospectively predicts health behavior (both health-promoting and health-impairing) in young adulthood and these relationships are patterned on gender. These findings add to the growing body of work demonstrating the multiple ways in which discrimination impacts health and well-being and fill an important gap in the literature. Understanding how PRD influences health behaviors will have important implications for developing models to understand why PRD negatively impacts health and for informing interventions that might attenuate these negative effects.

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