Original Report

Associations of Major Lifetime and Everyday Discrimination with Cognitive Function among Middle-Aged and Older Adults

Ruijia Chen, ScD[1]; DeAnnah R. Byrd, PhD[2]; Keith E. Whitfield, PhD[3]; David R. Williams, PhD[4]

Objectives: We investigated the associations of lifetime and everyday discrimination with cognitive function.

Methods: Data were from the Chicago Community Adult Health Study (n=2952, mean age=43 years [SD=17]). We fitted multivariable linear regression models to quantify the discrimination-cognition associations.

Results: Major lifetime ($\beta_{1\text{ vs }0\text{ episodes of discrimination}}$ = 0.56; 95% CI, 0.15-0.96; $\beta_{2+\text{ vs }0\text{ episodes of discrimination}}$ = 0.64, 95% CI, 0.31-0.97) and everyday (β=0.10, 95% CI, 0.06-0.14) discrimination were positively associated with cognition, and these associations did not differ by race/ethnicity. Among older adults, major lifetime discrimination, but not everyday discrimination, was positively associated with cognition ($\beta_{2+\text{ vs }0\text{ episodes of discrimination}}$=1.79; 95% CI, 0.79-2.79).

Discussion: Measurement and selection bias may partially explain the counterintuitive study findings. We call for longitudinal research to further investigate the discrimination-cognition relationship. *Ethn Dis.* 2024;34(3):137–144; doi:10.18865/EthnDis-2023-42

Keywords: Lifetime Discrimination; Everyday DiscriminationCognitive Function; Race/Ethnicity

[1] Department of Epidemiology, Boston University School of Public Health, Boston, MA
[2] Edson College of Nursing and Health Innovation, Arizona State University, Phoenix, AZ
[3] University of Nevada, Las Vegas, NV
[4] Department of Social and Behavioral Sciences, Harvard University T.H. Chan School of Public Health, Boston, MA

Address correspondence to Ruijia Chen, ScD; Department of Epidemiology, Boston University School of Public Health, Boston, MA. rchen3@bu.edu

Introduction

Cognitive function refers to the mental ability to process cognitive information, such as memory, attention, concentration, processing speed, and executive function.[1] Cognitive functioning is a key determinant of independent living and quality of life, and it has been linked to various health outcomes, including depression, functional disabilities, and mortality.[2–4] While most people experience gradual declines in cognitive function as they age, there are large individual variations in levels of cognitive performance.[5–7] Identifying factors that contribute to these individual differences will provide insights into the types of research and interventions needed to improve the cognitive health of the general population. While much research has focused on older adults, investigating the determinants of cognitive function in younger and middle-aged adults is equally important. Doing so would help inform strategies to prevent cognitive decline before the clinical manifestation of diseases.

Discrimination is a common stressor that adversely affects cognitive function.[8–11] Studies have shown that exposure to discrimination can trigger physiological responses such as elevated heart rate and high blood pressure.[12,13] These responses may, in turn, lead to changes in cerebrovascular function and structure, vascular reactivity, and accumulation of amyloid β (Aβ), which are all associated with poor cognitive performance.[14–17] Moreover, experiencing discrimination may lead individuals to engage in unhealthy health behaviors such as smoking, alcohol abuse, unhealthy diets, and lack of sleep and physical activity.[17,18] These negative coping strategies have been linked to poor cognitive functioning.[19–21] Furthermore, discrimination can limit employment opportunities, potentially limiting access to complex jobs that could otherwise help promote cognitive reserve (ie, differences in susceptibility to dementia-related pathology) and improve cognitive functioning.[22–24]

A small body of research has investigated the relationship between discrimination and cognitive function among middle-aged and older adults. In a study of 407 older African Americans without dementia, Barnes et al found that being exposed to higher everyday discrimination was associated with poorer cognitive test performance and this association was no longer significant after adjustment for depression.[25] Similarly, another study using data from 4886 older adults aged 60 years and older from the English longitudinal study found that a greater level of everyday discrimination was associated with poorer memory recall.[26] In a study of 3304 older adults in the Health and Retirement Study Harmonized Cognitive Assessment Cohort, everyday discrimination at baseline was associated

with worse subsequent executive functioning, processing speed, and visuoconstruction.[27] However, using data from 4886 adults aged 60 years and older from the Health and Retirement Study, Sutin et al found that everyday discrimination due to race was associated with better cognitive test performance among African Americans and worse cognitive test performance among White persons.[28] Collectively, these studies show mixed findings for the association between discrimination and cognitive function among older adults.

Although prior research has examined the association between discrimination and cognitive function among older adults, our understanding is limited, in part, owing to the limitations of these studies. First, existing research on discrimination and cognitive function has heavily focused on everyday discrimination—chronic and relatively minor unfair treatment experiences that occur on a day-to-day basis. Only 2 studies have examined the relationship of cognitive functioning with both major lifetime and everyday discrimination simultaneously.[29,30] However, major lifetime and everyday discrimination differ from each other, with regard to both the magnitude of the experience and relevant time frame. Specifically, major lifetime discrimination refers to discrete events that can occur at a specific point in a person's lifetime (eg, being unfairly fired from a job), whereas everyday discrimination describes chronic or episodic incidents of unfair treatment that can even be persistent and occur daily (eg, receiving poorer service at restaurants). The distinction between major lifetime (acute stress) and everyday (chronic stress) discrimination is important given that the type of stressful experience can affect the stress-health association. Prior research has shown that everyday discrimination, in particular, is more strongly associated with poor health than major lifetime discrimination.[31,32] Given the potentially important distinctions between lifetime and everyday discrimination and the possibility of differential effects on health, there is a need to study the association between cognitive function and both types of discrimination, simultaneously.

Additionally, most prior studies were conducted among older Black and White populations, and it is unclear how discrimination is associated with cognitive function among other racial/ethnic older adults. The level of discrimination experienced and its relationships with health outcomes may vary by race and ethnicity.[31,32] Furthermore, prior research among older Hispanic persons has found that experiences of discrimination and its covariates vary greatly by nativity (ie, whether an individual is born in the United States or not),[33,34] suggesting the need to examine the association between discrimination and cognitive function for both native-born and foreign-born Hispanic persons.

Using data from the Chicago Community Adult Health Study (CCAHS), we investigated the associations of major lifetime and everyday discrimination with cognitive function and the modifying role of race/ethnicity. We hypothesized that (1) higher major lifetime discrimination would be associated with lower levels of cognitive function; (2) higher everyday discrimination would be associated with lower levels of cognitive function; and (3) the associations between major lifetime and everyday discrimination with cognitive function would be moderated by race/ethnicity status, such that the effect of discrimination on cognition will be stronger among racial/ethnic minorities than White persons.

Methods

Sample

Data for this study were drawn from the CCAHS, a cross-sectional multistage probability sample of 3105 adults, aged 18 years and older and living in 343 neighborhood clusters within the city of Chicago. Face-to-face interviews with 1 individual in each household took place between May 2001 and March 2003, with a response rate of 72%. Data were weighted to match the city's age, race/ethnicity, and sex distribution based on 2000 census estimates. In this study, we restricted the analytic sample to individuals with complete exposures and outcomes. We further excluded those who were not self-identified as non-Hispanic Black, Hispanic, or White given their very small numbers, resulting in an analytical sample of 2952 adults. All of the participants provided informed consent. The CCAHS study was approved by the University of Michigan School of Public Health Institutional Review Board. A more detailed description of the study design is available elsewhere.[35]

Measures

Cognitive Function

We assessed cognitive function by using a modified version of the Telephone Instrument for Cognitive Status (TICS), a global mental test designed to assess the overall cognitive performance in the general population.[36] The TICS index included questions that assessed memory, orientation, and executive functions. Specifically, the index included (1) an immediate word recall test of 10 common nouns (10 points); (2) a delayed recall test of the same 10 nouns approximately 5 minutes later (10 points); (3) naming the day of the week and the date (2 points); (4) naming the current president of the United States and the preceding president (2 points); and (5) a serial 3's test that required subtracting 3 from 20 six times. Responses were coded as "1" for correct and "0" for incorrect. A sum score of the index was calculated by summing the number of correct answers (range, 0-25).

Discrimination

We assessed major lifetime discrimination by using a 4-item abbreviated

version of the Major Experiences of Discrimination Scale.[34] Specifically, respondents were asked if they had ever been unfairly (1) fired or denied a promotion; (2) not hired for a job; (3) stopped, physically threatened, or abused by the police; or (4) prevented from moving into a neighborhood. Respondents who indicated having experienced any of the above 4 events (0=no, 1=yes) were asked how many times the event happened during their lifetime (1=only 1 time; 2=2 to 3 times; 3=4 to 5 times; 4=6 or more times) and to provide a main reason (eg, due to race/ethnicity, gender) why they thought these experiences had happened to them. The items were recoded so that the values roughly represent the means of ranges in the response category. Specifically, "only 1 time" was coded as 1, "2-3 times" was recoded to 2.5, "4-5 times" was recoded to 4.5, and "6 or more times" was recoded to 6. We summed up the responses to the 4 questions and obtained the final score for major lifetime discrimination. Because the scale was highly skewed, we categorized major lifetime discrimination into (1) 0 episodes; (2) 1 episode; and (3) 2+ episodes.

Everyday discrimination was assessed by using a 5-item abbreviated version of the Everyday Discrimination Scale.[34] Respondents were asked how often they (1) were treated with less courtesy or respect than others; (2) received poorer service than others; (3) believed others acted as if they were not smart; (4) felt that others acted as if they were afraid of them; and (5) felt threatened or harassed. Responses ranged from 1 (≥1 time per week) to 5 (never). We reverse-coded the questions and summed responses to the 5 questions to create a continuous scale (range, 0-20), with higher scores indicating higher levels of everyday discrimination.

Covariates

We selected sociodemographic and health-related covariates from a review of previous literature.[37–39] Sociodemographic characteristics included age (in years), sex (female or male), race/ethnicity (Black, native-born Hispanic, foreign-born Hispanic, or White), household income (<$10,000, $10,000-$29,999, $30,000-$49,999, ≥$50,000, or missing income), education (less than high-school, high-school, some college, or college degree or higher), and employment status (working or not working). Of the 3,023 individuals, 78 self-identified as "other race/ethnicity", and because their socioeconomic profiles were similar to Whites, we combined "other" racial and ethnic groups with Whites to enhance the available data for the present study, following previous CCAHS research.[40,41] We refer to these combined category as "Whites" throughout the paper. Health-related covariates include chronic conditions, depressive symptoms, and obesity status.

Chronic conditions were based on the number of the following self-reported conditions the respondent indicated as ever having been diagnosed: (1) heart attack; (2) heart trouble; (3) hypertension; (4) stroke; (5) chronic bronchitis; (6) asthma; (7) arthritis; (8) diabetes; (9) ulcer; (10) leg circulation problems; (11) emphysema or Chronic Obstructive Pulmonary Disease; (12) osteoporosis; and (13) cancer. The number of chronic conditions was categorized into 4 groups: (1) 0 conditions; (2) 1 condition; (3) 2 conditions; and (4) 3 or more conditions. Depressive symptoms were measured by the 11-item modified version of the Center for Epidemiologic Studies Depression Scale (CES-D).[42] Sample items included "*I feel sad*" and "*my sleep was restless*." Each item was scored 1 (never) to 4 (most of the time), with a higher score representing a higher level of depressive symptoms. The overall depressive symptom score was constructed by taking the mean of the 11 items for cases that had at least 10 of the 11 items. The internal consistency was satisfactory, with a Cronbach α of 0.85. Obesity status (not obese or obese) was calculated by using body mass index. Body mass index was based on collected height and weight by trained interviewers at the time of the interview.

Statistical Analyses

Descriptive characteristics were compared for the whole sample and by race, ethnicity, and nativity status. We fitted multivariable linear regression models to examine the associations of major lifetime and everyday discrimination with cognitive function. The primary analyses involved the following 3 sets of models: model 1 was adjusted for age, sex, and race/ethnicity status; model 2 was further adjusted for education, income, and working status; and model 3 was additionally adjusted for chronic conditions, depressive symptoms, and obesity status. To test effect modification by race/ethnicity, interaction terms between race/ethnicity status (using "White participants" as the reference group) and each type of discrimination were added to model 3. We performed likelihood ratio tests to determine the statistical significance of the interaction terms.

All statistical procedures were performed by using R, and we used survey commands to account for sample weights and neighborhood clusters. Primary statistical significance was evaluated by using an α level of .05 level and 2-sided tests. To evaluate potential interactions, $P<.10$ was used.

Sensitivity Analyses

As cognitive impairment is more common among older adults, we restricted the sample to adults older than 65 years and then replicated the main analyses to see if the relationship between discrimination and cognitive function differed for an older age group (65+ years) versus the overall sample (18-92 years).

Results

Table 1 presents the sample characteristics. Of the 2952 participants, 32.5% were White, 40.9% were Black,

Table 1. Descriptive characteristics of the Sample, Chicago Community Adult Health Study (2001-2003)

	Black Americans (N=1207)	Native-born Hispanics (N=358)	Foreign-born Hispanics (N=429)	White Americans (N=958)	Total (N=2952)
Age, y					
Mean (SD)	44.2 (16.5)	36.2 (14.7)	38.8 (13.3)	44.5 (17.5)	42.5 (16.5)
Sex, n (%)					
Male	410 (34.0)	145 (40.7)	197 (45.9)	427 (44.6)	1179(39.9)
Female	796 (66.0)	213 (59.5)	231 (54.0)	531 (55.4)	1773 (60.1)
Income, n (%)					
<$10,000	210 (17.4)	49 (13.8)	30 (7.0)	51 (5.3)	340 (11.5)
$10,000–$29,999	378 (31.3)	112 (31.3)	153 (35.7)	181 (18.9)	824 (27.9)
$30,000–$49,999	216 (17.9)	70 (19.7)	91 (21.3)	181 (18.9)	558 (18.9)
≥50,000	204 (16.9)	72 (20.1)	67 (15.7)	338 (35.3)	681 (23.1)
Missing on income	199 (16.5)	55 (15.4)	88 (20.6)	207 (21.6)	549 (18.6)
Education, n (%)					
Less than high-school	289 (23.9)	118 (33.0)	249 (58.0)	114 (11.9)	770 (26.1)
High-school	347 (28.8)	104 (29.1)	82 (19.2)	195 (20.4)	729 (24.7)
Some college	386 (32.0)	94 (26.3)	65 (15.2)	234 (24.4)	779 (26.4)
Bachelor or more	185 (15.3)	42 (11.7)	32 (7.5%)	415 (43.3)	674 (22.8)
Employment status, n (%)					
No	518 (42.9)	142 (39.9)	129 (30.1)	307 (32.0)	1097 (37.2)
Yes	689 (57.1)	215 (60.1)	300 (69.9)	651 (68.0)	1855 (62.8)
Chronic conditions, n (%)					
0 chronic conditions	416 (34.5)	188 (52.5)	260 (60.6)	441 (46.0)	1305 (44.2)
1 chronic condition	325 (26.9)	88 (24.6)	93 (21.7)	263 (27.5)	769 (26.1)
2 chronic conditions	193 (16.0)	32 (9.0)	38 (8.9)	120 (12.5)	383 (13.0)
≥3 chronic conditions	273 (22.6)	50 (14.0)	38 (8.9)	134 (14.0)	495 (16.8)
Depressive symptoms (CES-D)					
Mean (SD)	1.96 (0.57)	1.93 (0.61)	1.70 (0.60)	1.80 (0.54)	1.86 (0.58)
Obesity, N (%)					
Not obese (BMI <30 kg/m^2)	690 (57.2)	141 (39.4)	147 (34.3)	746 (77.9)	1006 (33.2)
Obese (BMI ≥30 kg/m^2)	517 (42.8)	217 (60.6)	282 (65.7)	212 (22.1)	2017 (66.7)
Everyday discrimination					
Mean (SD)	4.61 (4.03)	4.44 (4.21)	1.74 (2.64)	3.36 (3.65)	3.77 (3.87)
Major lifetime discrimination, n (%)					
No major discrimination	512 (42.4)	177 (49.4)	304 (70.8)	606 (63.3)	1599 (54.2)
1 episode	174 (14.4)	41 (11.5)	62 (14.5)	146 (15.2)	423 (14.3)
≥2 episodes	521 (43.2)	140 (39.3)	63 (14.7)	206 (21.5)	930 (31.5)
Cognitive function					
Mean (SD)	13.8 (3.51)	14.4 (3.53)	14.3 (3.32)	16.2 (3.79)	14.7 (3.73)

Chi-squared test for categorical variables and analysis of variance for continuous variables to assess differences across the 4 racial/ethnic groups; results were weighted to account for the complex survey design

BMI, body mass index; CES-D, Center for Epidemiologic Studies Depression Scale

14.5% were foreign-born Hispanic, and 12.1% were native-born Hispanic. The average age of participants was 43 years (SD=17; range, 18-92 years). Most participants were female (39.9% male). White participants had higher household income and education than other racial/ethnic groups. Compared with other racial/ethnic groups, Black participants had more chronic conditions and depressive symptoms.

Compared with other racial/ethnic groups, Black participants also had the highest proportion of people who had experienced 2 or more episodes of major lifetime discrimination. The average level of everyday discrimination was highest among Black participants, followed by native-born Hispanic, non-Hispanic White, and foreign-born Hispanic participants. The average level of cognitive function was highest among White participants, followed by foreign-born Hispanic participants, Black participants, and native-born Hispanic participants.

Table 2 summarizes the results regarding the relationships between

Table 2. Associations of major lifetime and everyday discrimination with cognitive function in the Chicago Community Adult Health Study (N=2952) (2001–2003)

	Model 1		Model 2		Model 3	
	β	95% CI	*β*	95% CI	*β*	95% CI
Major lifetime discrimination						
No major discrimination (n=1599)	Ref		Ref		Ref	
1 episode (n=423)	0.68	0.29–1.09	0.49	0.08–0.90	0.56	0.15–0.96
≥2 episodes (n=930)	0.70	0.36–1.06	0.54	0.21–0.86	0.64	0.31–0.97
Everyday discrimination	0.11	0.07–0.14	0.07	0.04–0.11	0.10	0.06–0.14

Model 1 was adjusted for age, sex, and race/ethnicity status; model 2 was additionally adjusted for education, income, and employment status; and model 3 added body mass index, depression, and number of chronic conditions

Ref, No major discrimination

major lifetime discrimination, everyday discrimination, and cognitive function. After adjusting for all covariates, the average cognitive function was 0.56 higher (95% CI, 0.15-0.96) among those who reported 1 episode of major lifetime discrimination and 0.64 higher (95% CI, 0.31-0.97) among those who reported 2 or more episodes of major lifetime discrimination, compared with those who did not experience any major lifetime discrimination. As for everyday discrimination, after adjusting for all covariates, a 1-unit increase in everyday discrimination was associated with a 0.10-higher (95% CI, 0.06-0.14) level of cognitive function.

The associations between major lifetime discrimination and cognitive function did not differ by race/ethnicity status. Likewise, the associations between everyday discrimination and cognitive function did not differ by race/ethnicity groups.

Sensitivity Analyses

After restricting the analyses to those aged 65 years and older (n=363), we found positive associations between 2 or more episodes of major lifetime discrimination and cognitive function. And, we found that everyday discrimination was not associated with cognitive function in this older age group (see Table 3).

Discussion

To date, the relationship between discrimination and cognition has not been clearly identified. In the present study, we examined the associations between major lifetime discrimination and everyday discrimination and cognitive functioning across 4 racial/ethnic groups. Three findings are salient. First, we found that both major lifetime and everyday discrimination were positively associated with higher levels of cognitive function. Second, these associations did not differ by race and ethnicity status. Third, after restricting the sensitivity analyses to those aged 65 years and older, we found positive associations between 2 or more episodes (vs 0 episodes) of major lifetime discrimination and cognitive function, but no association between everyday discrimination and cognitive function in these older adults.

Our findings that major lifetime and everyday discrimination are positively associated with cognitive function in the study sample are contrary to our original hypotheses 1 and 2. Moreover, our finding that the associations of major lifetime discrimination and everyday discrimination with cognitive function were not moderated by race/ethnicity is also inconsistent with our expectations. Prior research has occasionally found protective associations

Table 3. Associations of major lifetime and everyday discrimination with cognitive function among adults aged 65 years and older in the Chicago Community Adult Health Study (N=363) (2001–2003)

	Model 1		Model 2		Model 3	
	β	95% CI	*β*	95% CI	*β*	95% CI
Major lifetime discrimination						
No major discrimination (n=250)	Ref		Ref		Ref	
1 episode (n=49)	0.75	−0.72 to 2.22	0.75	−0.46 to 1.96	0.76	−0.43 to 1.96
≥2 episodes (n=64)	1.53	0.38–2.67	1.36	0.34–2.38	1.79	0.79–2.79
Everyday discrimination	0.12	−0.03 to 0.27	0.07	−0.08 to 0.22	0.11	−0.03 to 0.28

Model 1 was adjusted for age, sex, and race/ethnicity status; model 2 was additionally adjusted for education, income, and employment status; and model 3 added body mass index, depression, and number of chronic conditions

Ref, No major discrimination

between exposure to a variety of stressful experiences and health outcomes. For instance, Sutin and colleagues used data from the Health and Retirement Study and found that Black participants who reported everyday racial discrimination reported *better* cognitive health.[28] In the multisite Hispanic Community Health Study/Study of Latinos, researchers found that while chronic stress was associated with increased prevalence of coronary heart disease, stroke, diabetes, and hypertension, traumatic stressors (severe and extreme events like combat exposure and sexual assault) were associated with a higher prevalence of smoking and a *lower* prevalence of diabetes and hypertension.[43] The Copenhagen City Heart Study also found that the stressful experience of being placed in care outside of the home during childhood was associated with a *reduced* incidence of coronary heart disease in men but not women.[44]

Similarly, a study of Israeli men found that major stressful experiences were associated with *lower* levels of triglycerides, blood pressure, and uric acid, but with higher levels of smoking and other behaviors.[45] Research has found that some experiences of stress can lead to the development of positive adaptive strategies, which in turn can facilitate growth and protect against some of the negative effects of subsequent stressors.[46] The conditions under which some stressful experiences may have protective effects on certain health outcomes have yet to be clearly identified. Moreover, people with high levels of cognitive functioning may also work in environments or live in areas that are more racially and ethnically diverse. As such, they may be more likely to be exposed to discrimination and are better able to identify and label these encounters.[28] Previous research has suggested individuals with higher socioeconomic status (SES) are more likely to report discrimination than those with lower SES.[29,47,48] While our study accounted for education and income, it is possible that high SES could also provide additional social resources (eg, strong support networks) that contribute to cognitive reserve. These additional resources may exert positive impacts on cognitive function beyond the high SES alone.

Our third finding that major lifetime discrimination, but not everyday discrimination, was positively associated with cognitive function among older adults in the sensitivity analyses is somewhat unexpected and contradicts most previous research on everyday discrimination and cognitive function.[25,27] These findings, however, are in line with recent research using data from a multiethnic cohort of Kaiser Permanente members older than 65 years, which found major lifetime discrimination was associated with better cognitive function among Black older adults.[29] Selection bias and measurement errors may contribute to the findings of the present study. That is, individuals who participated in CCAHS may have been more resilient and had more coping resources (eg, social support, religiosity) to deal with discrimination, whereas those with fewer resources and thus more vulnerable to the negative health effects of discrimination may have been less likely to participate. It is possible that this selection bias among the CCAHS respondents may have prompted a spurious positive association between major lifetime discrimination and cognitive function. Given the lack of information on nonparticipants, we were unable to test this hypothesis. Future research could examine the impact of resilience factors on study participation and how selective participation may influence our understanding of the associations between perceived discrimination and cognitive function.

Our conclusions are further limited by some features of our measures and study design. First, we used abbreviated versions of the major lifetime and everyday discrimination scales, which include fewer items than the original scales. As a result, our measures may not capture all potential experiences of discrimination. Nonetheless, previous research has found similar results to ours when using the full scale of items from the original measures, suggesting that variations between the original and modified versions may not substantially alter the results.[29] The Everyday Discrimination Scale used in the present study captures a range of chronic aspects of interpersonal everyday hassles (eg, being treated with less respect or courtesy) to more blatant forms of discrimination (eg, receiving inferior service and being threatened or harassed).[48] Hence, our everyday discrimination measure may have not captured whether the discrimination was subtle or ambiguous. Although this scale has sound utility across multiple racial/ethnic groups in the United States,[21] future research should use additional measures to capture other aspects of the phenomenon of daily discrimination.[20] Particularly, studies are needed that will examine how multiple dimensions of stress and inequality relate to each other, and combine, simultaneously and interactively, to influence cognitive health over the life course.[9] Second, although we conceptualized discrimination as a risk factor for lower levels of cognitive function, it is possible that reverse causation exists such that individuals with better cognitive function may be more likely to report discriminatory events. This highlights the importance of future longitudinal research to better evaluate the complex relationship between discrimination and cognitive function. Studies that examine if and how these relationships exist longitudinally will contribute to our understanding of the long-term effects of discrimination on cognition. Longitudinal studies that incorporate a life-course approach to explicitly examine early life experiences would be especially helpful. Gee and colleagues,[49] for instance, showed that racism underlies the development of disparities over the life course. Specifically, this model emphasizes that there are disparities due to racism in both the amount of time and the quality of time

spent in a particular life stage, which may ultimately shape health inequalities.[49]

In this large and diverse cohort, major lifetime and everyday discrimination were associated with better cognitive performance. These findings do not suggest that discrimination is beneficial to cognitive functioning. Instead, they may be explained by resilience and coping capabilities or may be due to selection bias or measurement errors. Together with prior research, our findings add to the complexity of our understanding of the associations between major lifetime and everyday discrimination and cognitive function. To better understand the nuanced relationship between discrimination and cognitive function, longitudinal research with multiple assessments of discrimination and cognitive function is required.

Acknowledgment

This work was supported by the National Institute on Aging at the National Institutes of Health (1 K01 AG068376-01A1; F99AG068431; K00 AG068431) and the Alzheimer's Association (AARFD-21-852652).

Conflict of Interest

No conflict of interest reported by authors.

Author Contributions

Research concept and design: Chen, Byrd, Williams; Acquisition of data: Chen; Manuscript draft: Chen, Byrd; Data analysis and interpretation: Chen, Byrd, Whitfield, Williams; Administrative: Chen; Supervision: Williams, Byrd

References

1. Lezak MD. *Neuropsychological Assessment*. Oxford University Press, USA; 2004.
2. Scult MA, Paulli AR, Mazure ES, Moffitt TE, Hariri AR, Strauman TJ. The association between cognitive function and subsequent depression: a systematic review and meta-analysis. *Psychol Med*. 2017;47(1):1-17.
3. Kalmar JH, Gaudino EA, Moore NB, Halper J, DeLuca J. The relationship between cognitive deficits and everyday functional activities in multiple sclerosis. *Neuropsychology*. 2008;22(4):442.
4. Pavlik VN, De Moraes SA, Szklo M, Knopman DS, Mosley Jr TH, Hyman DJ. Relation between cognitive function and mortality in middle-aged adults: the atherosclerosis risk in communities study. *Am J Epidemiol*. 2003; 157(4):327-334.
5. Mungas D, Beckett L, Harvey D, Tomaszewski Farias S, Reed B, Carmichael O, Olichney J, Miller J, DeCarli C. Heterogeneity of cognitive trajectories in diverse older persons. *Psychol Aging*. 2010;25(3):606.
6. Wu Z, Woods RL, Wolfe R, Storey E, Chong TT, Shah RC, Orchard SG, McNeil JJ, Murray AM, Ryan J. Trajectories of cognitive function in community-dwelling older adults: A longitudinal study of population heterogeneity. *Alzheimers Dement Diagn Assess Dis Monit*. 2021;13(1):e12180.
7. Wilson RS, Beckett LA, Barnes LL, Schneider JA, Bach J, Evans DA, Bennett DA. Individual differences in rates of change in cognitive abilities of older persons. *Psychol Aging*. 2002;17(2):179.
8. Brown LL, García C, Reeves AN, Pamplin JR, Mitchell UA. Stress is a Latent Construct: Exploring the Differential Experience of Stress and Discrimination on Depressive Symptoms Among Black Older Adults. *J Aging Health*. 2022;34(3):334-346.
9. Clark R, Anderson NB, Clark VR, Williams DR. Racism as a stressor for African Americans: A biopsychosocial model. *Am Psychol*. 1999;54(10):805.
10. Williams DR, Lawrence JA, Davis BA, Vu C. Understanding how discrimination can affect health. *Health Serv Res*. 2019;54:1374-1388.
11. Williams DR, Mohammed SA. Discrimination and racial disparities in health: evidence and needed research. *J Behav Med*. 2009;32(1):20-47.
12. Hill LK, Hoggard LS, Richmond AS, Gray DL, Williams DP, Thayer JF. Examining the association between perceived discrimination and heart rate variability in African Americans. *Cultur Divers Ethnic Minor Psychol*. 2017;23(1):5.
13. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA Study of young black and white adults. *Am J Public Health*. 1996;86(10):1370-1378.
14. Panza GA, Puhl RM, Taylor BA, Zaleski AL, Livingston J, Pescatello LS. Links between discrimination and cardiovascular health among socially stigmatized groups: A systematic review. *PloS One*. 2019;14(6):e0217623.
15. Cobb RJ, Parker LJ, Thorpe Jr RJ. Self-reported instances of major discrimination, race/ethnicity, and inflammation among older adults: evidence from the health and retirement study. *J Gerontol Ser A*. 2020;75(2):291-296.
16. Elias MF, Davey A. Midlife blood pressure, amyloid-β, and risk for Alzheimer disease: one more reason to treat hypertension. *Hypertension*. 2012;59(4):771-772.
17. Borrell LN, Kiefe CI, Diez-Roux AV, Williams DR, Gordon-Larsen P. Racial discrimination, racial/ethnic segregation, and health behaviors in the CARDIA study. *Ethn Health*. 2013;18(3): 227-243.
18. Zapolski TC, Rowe AT, Banks DE, Faidley M. Perceived discrimination and substance use among adolescents: Examining the moderating effect of distress tolerance and negative urgency. *Subst Use Misuse*. 2019;54(1):156-165.
19. Ploughman M. Exercise is brain food: the effects of physical activity on cognitive function. *Dev Neurorehabilitation*. 2008;11(3):236-240.
20. Chamberlain SR, Odlaug BL, Schreiber LR, Grant JE. Association between tobacco smoking and cognitive functioning in young adults. *Am J Addict*. 2012;21:S14-S19.
21. Thomas VS, Rockwood KJ. Alcohol abuse, cognitive impairment, and mortality among older people. *J Am Geriatr Soc*. 2001;49(4):415-420.
22. Pager D, Shepherd H. The sociology of discrimination: Racial discrimination in employment, housing, credit, and consumer markets. *Annu Rev Sociol*. 2008;34:181-209.
23. Smart EL, Gow AJ, Deary IJ. Occupational complexity and lifetime cognitive abilities. *Neurology*. 2014;83(24):2285-2291.
24. Stern Y. Cognitive reserve in ageing and Alzheimer's disease. *Lancet Neurol*. 2012;11(11): 1006-1012. https://doi.org/10.1016/S1474-4422(12)70191-6
25. Barnes LL, Lewis TT, Begeny CT, Yu L, Bennett DA, Wilson RS. Perceived discrimination and cognition in older African Americans. *J Int Neuropsychol Soc*. 2012;18(5):856-865.
26. Shankar A, Hinds P. Perceived discrimination: Associations with physical and cognitive function in older adults. *Health Psychol*. 2017;36(12):1126.
27. Zahodne LB, Morris EP, Sharifian N, Zaheed AB, Kraal AZ, Sol K. Everyday discrimination and subsequent cognitive abilities across five domains. *Neuropsychology*. 2020;34(7):783.
28. Sutin AR, Stephan Y, Carretta H, Terracciano A. Perceived discrimination and physical, cognitive, and emotional health in older adulthood. *Am J Geriatr Psychiatry*. 2015;23(2):171-179.
29. Meza E, Peterson R, Gilsanz P, George KM, Miles SJ, Eng CW, Mungas DM, Mayeda ER, Glymour MM, Whitmer RA. Perceived Discrimination, Nativity, and Cognitive Performance in a Multi-ethnic Study of Older Adults: Findings from the Kaiser Healthy Aging and Diverse Life Experiences (KHANDLE) Study. *J Gerontol Ser A*. Published online 2021.
30. Wang K, Maglalang DD, Woo B, De Fries CM, Hasche LK, Falcón LM. Perceived discrimination and cognitive function among older Puerto Ricans in Boston: The mediating role of depression. *Int J Geriatr Psychiatry*. 2022;37(5).
31. Ayalon L, Gum AM. The relationships between major lifetime discrimination, everyday discrimination, and mental health in three racial and ethnic groups of older adults. *Aging Ment Health*. 2011;15(5):587-594.
32. Liu SY, Kawachi I. Discrimination and Telomere Length Among Older Adults in the United States: Does the Association Vary by Race and Type of Discrimination? *Public Health Rep*. 2017;132(2):220-230. https://doi.org/10.1177/0033354916689613
33. Pérez DJ, Fortuna L, Alegria M. Prevalence and correlates of everyday discrimination among US Latinos. *J Community Psychol*. 2008;36(4):421-433.
34. Sternthal MJ, Slopen N, Williams DR. Racial disparities in health: how much does stress really matter? *Bois Rev Soc Sci Res Race*. 2011;8(1): 95-113.

35. Morenoff JD, House JS, Hansen BB, Williams DR, Kaplan GA, Hunte HE. Understanding social disparities in hypertension prevalence, awareness, treatment, and control: the role of neighborhood context. *Soc Sci Med*. 2007;65(9):1853-1866.
36. Brandt J, Spencer M, Folstein M. The telephone interview for cognitive status. *Neuropsychiatry Neuropsychol Behav Neurol*. 1988;1(2):111-117.
37. Marden JR, Tchetgen Tchetgen EJ, Kawachi I, Glymour MM. Contribution of socioeconomic status at 3 life-course periods to late-life memory function and decline: early and late predictors of dementia risk. *Am J Epidemiol*. 2017;186(7):805-814.
38. McDermott LM, Ebmeier KP. A meta-analysis of depression severity and cognitive function. *J Affect Disord*. 2009;119(1-3):1-8.
39. Nguyen CT, Couture MC, Alvarado BE, Zunzunegui MV. Life course socioeconomic disadvantage and cognitive function among the elderly population of seven capitals in Latin America and the Caribbean. *J Aging Health*. 2008;20(3):347-362.
40. Cuevas AG, Chen R, Thurber KA, Slopen N, Williams DR. Psychosocial stress and overweight and obesity: findings from the Chicago community adult health study. *Ann Behav Med*. 2019;53(11):NP-NP.
41. Slopen N, Non A, Williams DR, Roberts AL, Albert MA. Childhood adversity, adult neighborhood context, and cumulative biological risk for chronic diseases in adulthood. *Psychosom Med*. 2014;76(7):481.
42. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1(3):385-401.
43. Gallo LC, Roesch SC, Fortmann AL, Carnethon MR, Penedo FJ, Perreira K, Birnbaum-Weitzman O, Wassertheil-Smoller S, Castañeda SF, Talavera GA. Associations of chronic stress burden, perceived stress, and traumatic stress with cardiovascular disease prevalence and risk factors in the HCHS/SOL Sociocultural Ancillary Study. *Psychosom Med*. 2014;76(6):468.
44. Andersen I, Diderichsen F, Kornerup H, Prescott E, Rod NH. Major life events and the risk of ischaemic heart disease: does accumulation increase the risk? *Int J Epidemiol*. 2011;40(4):904-913.
45. Melamed S, Kushnir T, Strauss E, Vigiser D. Negative association between reported life events and cardiovascular disease risk factors in employed men: the CORDIS study. *J Psychosom Res*. 1997;43(3):247-258.
46. Seery MD, Holman EA, Silver RC. Whatever does not kill us: cumulative lifetime adversity, vulnerability, and resilience. *J Pers Soc Psychol*. 2010;99(6):1025.
47. Borrell LN, Kiefe CI, Williams DR, Diez-Roux AV, Gordon-Larsen P. Self-reported health, perceived racial discrimination, and skin color in African Americans in the CARDIA study. *Soc Sci Med*. 2006;63(6):1415-1427. https://doi.org/10.1016/j.socscimed.2006.04.008
48. Kelaher M, Paul S, Lambert H, Ahmad W, Paradies Y, Davey Smith G. Discrimination and health in an English study. *Soc Sci Med 1982*. 2008;66(7):1627-1636. https://doi.org/10.1016/j.socscimed.2007.12.005
49. Gee GC, Hing A, Mohammed S, Tabor DC, Williams DR. Racism and the life course: Taking time seriously. *Am J Public Health*. 2019;109(S1):S43-S47.