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Research Article

Perceived Discrimination, Nativity, and Cognitive Performance in a Multiethnic Study of Older Adults: Findings From the Kaiser Healthy Aging and Diverse Life Experiences Study

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Abstract

Background: Despite growing research on the association between discrimination and disparities in cognitive aging, an evidence gap remains on how the association varies by racial/ethnic group. This study evaluates the associations of experiences of discrimination with cognitive function and whether these associations varied by race/ethnicity and nativity.

Method: Using the Kaiser Healthy Aging and Diverse Life Experiences (KHANDLE) cohort ($N = 1\,712$) with approximately equal groups of Black, White, Latino, and Asian community-dwelling older adults aged 65 years and older, we evaluated the associations between self-reported experiences of everyday and major lifetime discrimination with overall cognitive performance and domain-specific cognition (verbal episodic memory, semantic memory, and executive functioning) across race/ethnicity and nativity. Linear regression models examined the cross-sectional association between self-reported experiences of everyday and major lifetime discrimination with z -standardized coefficients for cognition. We tested for effect modification by race and nativity. All models controlled for age, sex, and education.

Results: Among KHANDLE participants (mean age: 76 years; $SD: 6.8$), everyday discrimination was not associated with cognitive scores. Major lifetime discrimination was associated with better average cognitive scores among Black participants but not among other racial/ethnic groups. Major lifetime discrimination was associated with better average cognitive scores among U.S.-born but not among non-U.S.-born individuals.

Conclusion: Our findings do not imply that discrimination improves cognition, but rather suggest that future research should include more detailed measures on discrimination and unfair treatment that could help disentangle the extent to which relationships are causal or reflect some other underlying factor.

Keywords: Cognitive aging, Epidemiology, Health disparities, Minority aging

In the United States and globally, the population is growing older and becoming more racially and ethnically diverse. By 2050, racial/ethnic minorities are projected to comprise 40% of U.S. adults aged

65 years and older and will comprise a large fraction of people affected by Alzheimer's disease or related conditions (1,2). Provided this rapid increase in the diverse aging population, it is imperative

to understand social factors that influence older adults' cognitive function. Previous studies have found racial/ethnic disparities in cognitive health (3–6). While the mechanisms underlying these racial disparities are not fully understood, existing research suggests that psychosocial experiences, including perceived discrimination, may be important contributing factors (7–10).

Discrimination is a form of psychosocial stress that has been associated with a range of negative health outcomes, including cognitive impairment (11,12). Psychosocial stress is believed to affect health through physiological and psychological mechanisms including elevated C-reactive protein levels (13,14), patterns of high blood pressure (15,16), depressive symptoms (17,18), and incident type 2 diabetes (19), all are risk factors for cognitive impairment in older adults. Discrimination and psychosocial stress, including sustained racism, may also impact cognitive health via neurobiological mechanisms including the activation of the hypothalamic–pituitary–adrenal axis; chronic exposure can then result in the sustained release of glucocorticoids (eg, cortisol) and lead to changes in the hippocampus (20,21), a brain region that has a major role in learning and memory. A growing body of research suggests that everyday discrimination and stressful life events are associated with lower cognitive performance (22–27). To our knowledge, only 2 studies have examined the independent association between discrimination and cognitive function among older adults in the United States (22,24). In these studies, perceived discrimination was associated with lower performance in episodic memory and perceptual speed (22) as well as executive functioning and visuoconstruction (24). However, despite growing research on perceived discrimination and cognitive health, this association has been mostly limited to Black and White older adults and not been explored in a more diverse sample. An important evidence gap remains on how the association varies in a more diverse sample which includes the 4 largest racial/ethnic groups in the United States—Black, White, Latino, and Asian older adults.

Experiences of discrimination differ across racial/ethnic groups and among foreign-born individuals compared to their U.S.-born counterparts. These differences present an additional challenge in studying the association between discrimination and cognitive function as they may result in additional heterogeneity. Although experiences of discrimination are more prevalent among individuals with disadvantaged social status, a study on the prevalence of discrimination in the United States found that as many as 61% of respondents reported exposure of everyday discrimination and 34% reported exposure to major lifetime discrimination (28). Additionally, where one lives and works, or who one interacts with, may also inadvertently affect an individual's experiences of discrimination. Among a community of older adults, a study found that older Black adults perceived more discrimination compared to older White adults (29). However, previous studies on neighborhood poverty and racial composition have shown that Black individuals living in lower-proportion Black neighborhoods or those moving to lower-poverty, lower-minority neighborhoods encounter more discrimination than those living in higher-proportion Black neighborhoods (30,31).

Studies have also shown differences among foreign-born individuals compared to their U.S.-born counterparts. Although foreign-born individuals may be targeted for discrimination more than U.S.-born individuals, prior literature suggests that U.S.-born individuals have a heightened awareness of discrimination based on race/ethnicity compared to their foreign-born counterparts (32). Since foreign-born individuals are typically from societies where their racial/ethnic group is the majority, they are less likely to report

experiences of discrimination based on their race/ethnicity and more likely to attribute discriminatory behavior to other causes as they would in their country of origin (33,34). In contrast, race and racism are highly salient in the United States, and U.S.-born racial/ethnic minorities may be more likely to attribute experiences of discrimination to their race/ethnicity than to other social identities. While these differences provide an added layer of complexity in our interpretation of perceived discrimination, we aim to further unpack some of these differential factors that may also affect cognition.

The objective of this study was to evaluate the association between self-reported discrimination and cognitive performance in a multiethnic cohort of older adults residing in the United States and to assess whether this association varied by race/ethnicity or nativity status. We hypothesized that experiences of everyday and lifetime discrimination would be associated with worse late-life cognitive performance and that the association would be stronger among racial/ethnic minorities and among U.S.-born individuals.

Method

Study Participants

We used baseline data from the Kaiser Healthy Aging and Diverse Life Experiences (KHANDLE) cohort of community-dwelling older adults residing in the San Francisco Bay Area and Sacramento, California. KHANDLE aims to evaluate how race/ethnicity, life course health, and sociocultural factors influence late-life brain health and cognitive decline. Individuals eligible for KHANDLE were long-term members of Kaiser Permanente Northern California over the age of 65 on January 1, 2017, who previously participated in the Kaiser Permanente multiphasic health checkups between 1964 and 1973 or 1977 and 1985 and had no prior diagnoses of dementia at enrollment. Stratified random sampling by race/ethnicity and educational attainment was used in order to recruit approximately equal proportions of Asian, Black, Latino, and White participants and overrepresentation of individuals with lower levels of educational attainment.

A total of 1 712 participants with no prior dementia diagnosis at recruitment completed the baseline in-person interview. Participants were excluded from the analytic sample if they were missing 2 or more of the 9 everyday discrimination items or 2 or more of the 9 lifetime discrimination items ($n = 57$). Participants were also excluded if they had incomplete cognitive assessment data ($n = 18$) or covariates ($n = 2$).

Exposure Measures

Perceived *everyday discrimination* was assessed using the 9-item Everyday Discrimination Scale (EDS) (35). The EDS has been validated and is commonly used in the epidemiological literature and measures discriminatory experiences in everyday social situations (36,37). Sample items include “You are treated with less courtesy than other people are” and “People act as if they are afraid of you.” Items were assessed based on how often participants experienced each with categorical responses ranging from never to almost every day. Following previous work with this measure, responses were recoded to a dichotomized form (0 = rarely or never experienced; 1 = a few times per month, at least once a week, or almost every day) for each type of discriminatory event (13,38,39). These were then summed across the 9 items to obtain a total score (range: 0–9) with higher scores indicating more types of discriminatory events. EDS sum scores were then grouped into 4 categories (no discriminatory

events reported; low discrimination exposure: 1 event; moderate exposure: 2–3 events; and highest discrimination exposure: 4+ distinct events). Participants who endorsed at least one of the 9 items were then asked to indicate what they attributed the experience(s) to: ancestry/national origin, gender, race, age, religion, height, weight, sexual orientation, education or income level, a physical disability, some other aspect of their physical appearance, or an unspecified other category.

Perceived *lifetime discrimination* was assessed using a similar 9-item Major Experiences of Discrimination scale (40). This scale indicates whether participants had experienced any of the 9 listed items over the life course. Sample items for lifetime discrimination include “At any time in your life, have you ever been unfairly fired?” and “Have you ever been unfairly denied a bank loan?” Each item received a binary response (0 = No; 1 = Yes) and these were summed to obtain a total score (range: 0–9) with higher scores indicating more types of lifetime discrimination events experienced. Similar to the everyday discrimination scores, lifetime discrimination sum scores were grouped into 4 categories (no discriminatory events reported; low discrimination exposure: 1 event; moderate exposure: 2 events; and highest discrimination exposure: 3+ events). For each of the 9 lifetime discrimination events endorsed, participants again indicated what they attributed the particular experience of discrimination to.

Outcome Measures

Three cognitive domains (verbal episodic memory, semantic memory, and executive functioning) were derived from the Spanish and English Neuropsychological Assessment Scales (SENAS). The SENAS is a battery of cognitive tests that have previously undergone extensive development for valid comparisons of cognition and cognitive change across racially/ethnically and linguistically diverse groups (41). Item response theory and confirmatory factor analysis methods were used to construct measures that are psychometrically matched across domains with respect to the level of reliability across the ability continuum. Importantly, these measures do not have floor and ceiling effects and are normally distributed in the older adult population. The verbal episodic memory measure is derived from a multitrial word-list learning test (42). The semantic memory measure is a composite of highly correlated verbal (object naming) and nonverbal (picture association) tasks. The executive function measure is constructed from component tasks of category fluency, phonemic (letter) fluency, and working memory (digit span backward, list sorting) (43). Details of the administration procedures, development, and psychometric characteristics have been extensively described in previous publications (41,42). Each domain was z-standardized using the full KHANDLE baseline sample mean and standard deviation across all race/ethnicity classification; thus, a score of 0 represents the mean and a score of 1 is 1 *SD* above the mean. Additionally, we averaged the 3 domain scores into a single measure to obtain a composite measure of total cognition.

Covariate Measures

Our models adjusted for factors thought to plausibly influence both experiences of discrimination and late-life cognitive performance including age (modeled as a cubic spline given a potentially nonlinear association between age and cognition in older adults), sex, participant education, parental education, and nativity (U.S. born vs non-U.S. born). Education was self-reported as highest level of education completed and was coded as follows: 0 = 0–12 years; 1 = some college but no degree; 2 = associate’s degree; 3 = bachelor’s degree; and

4 = graduate school (master’s, doctoral, or other terminal professional degree). Maternal and paternal education were each included as binary indicator variables (>8 years of education vs ≤8 years of education or unknown education level). Sensitivity models additionally adjusted for income (dichotomized at <\$55 000) and social status, a single-item measure that assessed an individual’s perceived rank relative to others in their group (44).

Statistical Analysis

A series of linear regression models were used to examine the associations between each measure of perceived discrimination and total or domain-specific (ie, verbal episodic memory, semantic memory, or executive functioning) cognitive function. Our first series evaluated the association between perceived *everyday discrimination* and cognition; the second series evaluated the association between perceived *lifetime discrimination* and cognition.

First, we evaluated the associations between each measure of perceived discrimination and cognitive function in the sample overall. Then, to assess if these differed by race/ethnicity, we tested for interactions between each discrimination measure and race/ethnicity as well as evaluated race/ethnicity-stratified results. All models adjusted for age, sex, participant education, parental education, and nativity.

Next, using a simple linear regression model controlling for race/ethnicity, we analyzed whether reporting of everyday or lifetime discrimination differed for non-U.S.-born compared to U.S.-born individuals. In order to evaluate if the associations between everyday or lifetime discrimination and cognitive function differed by nativity, we tested for interactions between each discrimination measure and nativity in models pooling United States and non-U.S.-born individuals. We also evaluated models stratified by nativity. Additional models assessed the relationship only among participants who self-identified as Asian or Latino, the 2 racial/ethnic groups with sufficient numbers of non-U.S.-born individuals to support separate subgroup analyses.

We assessed if the associations with cognition differed by attribution of discrimination for the 3 characteristics to which discrimination was most commonly attributed: (i) race, ancestry, or national origin; (ii) age; and (iii) gender. This was assessed in models comparing each of these specific types of discrimination with no reported discrimination or with reported discrimination due to some other attribute. Finally, we examined the possibility of an alternative hypothesis, that higher socioeconomic status (SES) predicts exposure to discrimination and higher cognitive function, in sensitivity analysis models that additionally adjusted for income and social status, after running a prediction model for discrimination. All models used the lowest sum score category of discrimination as the reference group. All analyses were performed using STATA/IC v. 15 (StataCorp, College Station, TX).

Results

Sample Characteristics

The final analytic sample ($n = 1\ 635$) consisted of 30% White, 24% Asian, 26% Black, and 20% Latino participants (Table 1). The average age of participants was 76 years and 25% were non-U.S. born. Among non-U.S.-born participants, 81% identified as Asian or Latino.

Overall, 42% of participants reported rare or no experiences of everyday discrimination (lowest exposure) and 20% reported 4 or more (highest exposure) of the 9 distinct discriminatory events in

Table 1. Baseline Characteristics of KHANDLE, Overall and Stratified by Racial/Ethnic Group ($n = 1\ 635$)

	Overall	%	White	%	Asian	%	Black	%	Latino	%
<i>n</i>	1 635		486	30	398	24	418	26	333	20
Age in years, mean (<i>SD</i>)	75.9 (6.7)		76.8 (7.1)		75.6 (6.6)		75.3 (6.5)		76.0 (6.4)	
Male	668	41	205	42	187	47	137	33	139	42
Education completed										
0–12 y	272	17	70	14	42	11	73	17	87	26
Some college (no degree)	571	35	137	28	92	23	202	48	140	42
College	413	25	139	29	150	38	69	17	55	17
Graduate/professional	379	23	140	29	114	29	74	18	51	15
Parental education										
Maternal (>8 y)	936	57	368	76	208	52	222	53	138	41
Paternal (>8 y)	877	54	336	69	242	61	158	38	141	42
Nativity										
U.S. born	1 231	75	415	85	205	52	412	99	199	60
Non-U.S. born	404	25	71	15	193	48	6	1	134	40
Everyday discrimination scores										
Mean EDS score: 0–9 (<i>SD</i>)	1.7 (2.0)		1.3 (1.7)		1.6 (1.9)		2.3 (2.3)		1.7 (2.0)	
Self-reported everyday discrimination category (EDS score)										
No exposure (0)	693	42	244	50	180	45	129	31	140	42
Low exposure (1)	269	16	84	17	59	15	72	17	54	16
Moderate exposure (2–3)	349	21	89	18	90	23	95	23	75	23
High exposure (4+)	324	20	69	14	69	17	122	29	64	19
Lifetime discrimination scores										
Mean LDS score: 0–9 (<i>SD</i>)	1.5 (1.7)		1.1 (1.4)		1.2 (1.4)		2.3 (1.9)		1.3 (1.6)	
Self-reported lifetime discrimination category (LDS score)										
No exposure (0)	626	38	233	48	158	40	89	21	146	44
Low exposure (1)	377	23	112	23	112	28	83	20	70	21
Moderate exposure (2)	269	16	72	15	64	16	82	20	51	15
High exposure (3+)	363	22	69	14	64	16	164	39	66	20

Note: EDS = Everyday Discrimination Scale; KHANDLE = Kaiser Healthy Aging and Diverse Life Experiences; LDS = Lifetime Discrimination Scale.

their day-to-day lives. The mean everyday discrimination score was highest among Black participants (mean: 2.3; *SD*: 2.3) followed by Latino (mean: 1.7; *SD*: 2.0), Asian (mean: 1.6; *SD*: 1.9), and White (mean: 1.3; *SD*: 1.7) participants.

Similarly, 38% of participants reported rare or no experiences of major lifetime discrimination and 22% reported 4 or more of the 9 major experiences of discrimination in their lifetime. The mean lifetime discrimination score was highest for Black participants (mean: 2.3; *SD*: 1.9), followed by Latino (mean: 1.3; *SD*: 1.6), Asian (mean: 1.2; *SD*: 1.4), and White (mean: 1.1; *SD*: 1.4) participants.

Everyday Discrimination Regression Results

Everyday discrimination category was not associated with total cognitive performance or with individual cognitive domains (ie, verbal episodic memory, semantic memory, or executive functioning) in minimally adjusted models, adjusted for age, sex, race/ethnicity, and education, nor in fully adjusted models additionally adjusting for parental education and nativity (Table 2). There were no associations between everyday discrimination and cognition within any of the 4 racial/ethnic groups. The global test for interaction showed no evidence of differences in the association of everyday discrimination and cognition by race/ethnicity (interaction term p value = .88).

Major Lifetime Discrimination Regression Results

Major lifetime discrimination showed a graded association with total cognitive performance, such that individuals who reported high exposure to lifetime discrimination averaged 0.11 (95% CI: 0.01, 0.21) standardized units higher total cognitive scores compared with

individuals who reported no lifetime discrimination. Some categories of lifetime discrimination were also associated with each of the cognitive domains, but there was no graded pattern. In models stratified by race/ethnicity, the graded association of lifetime discrimination and cognition was most marked for Black participants with individuals who self-reported higher levels of lifetime discrimination having higher total cognitive scores and higher cognitive domain scores. For example, compared to Black participants who reported no lifetime discrimination, Black participants who reported high exposure to lifetime discrimination averaged 0.27 (95% CI: 0.05, 0.50) standardized units higher verbal episodic memory scores (Table 3). The global test for interaction suggested that the association of lifetime discrimination and total cognition may differ by race/ethnicity (interaction test p value = .10).

Comparing U.S. Born and Non-U.S. Born

U.S.-born individuals averaged nonsignificantly higher scores on *everyday discrimination* ($b = 0.17$; 95% CI: $-0.07, 0.42$) and significantly higher scores on *major lifetime discrimination* ($b = 0.34$; 95% CI: 0.14, 0.53) compared to non-U.S.-born individuals. There was no evidence that nativity modified the association between *everyday discrimination* and cognitive outcomes (interaction test p value = .29). In models stratified by nativity status, there was no association between everyday discrimination quartile and total or domain-specific cognitive performance in the overall sample (Table 4) or within Asian or Latino subgroups (Supplementary Table S1).

Models pooling U.S.- and non-U.S.-born individuals and including an interaction term between *major lifetime discrimination* and nativity showed evidence that nativity status modified the

Table 2. Linear Regression Coefficients for Perceived Everyday Discrimination Score Categories (compared to the reference category of no self-reported exposure to everyday discrimination) Predicting Total Cognitive Performance and Domain-Specific Scores, Stratified by Racial/Ethnic Group

	Overall ^a (n = 1 635)	White (n = 486)	Asian (n = 398)	Black (n = 418)	Latino (n = 333)
Everyday Discrimination Exposure	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Total cognitive performance					
Low exposure	0.07 (-0.04, 0.17)	0.08 (-0.11, 0.27)	0.08 (-0.14, 0.30)	0.08 (-0.12, 0.29)	0.06 (-0.17, 0.29)
Moderate exposure	0.06 (-0.04, 0.15)	0.01 (-0.18, 0.19)	0.14 (-0.05, 0.33)	0.09 (-0.10, 0.28)	0.05 (-0.15, 0.26)
High exposure	0.01 (-0.09, 0.11)	0.11 (-0.10, 0.32)	-0.09 (-0.30, 0.12)	0.04 (-0.13, 0.22)	-0.01 (-0.22, 0.21)
Verbal episodic memory					
Low exposure	0.09 (-0.04, 0.21)	0.07 (-0.14, 0.28)	0.10 (-0.17, 0.36)	0.02 (-0.21, 0.26)	0.17 (-0.11, 0.46)
Moderate exposure	0.05 (-0.07, 0.16)	0.09 (-0.12, 0.31)	0.08 (-0.15, 0.31)	-0.02 (-0.24, 0.20)	0.04 (-0.21, 0.30)
High exposure	0.00 (-0.11, 0.12)	0.09 (-0.14, 0.33)	-0.13 (-0.38, 0.12)	0.01 (-0.20, 0.22)	0.06 (-0.20, 0.33)
Semantic memory					
Low exposure	0.05 (-0.05, 0.15)	0.03 (-0.14, 0.19)	0.04 (-0.20, 0.28)	0.17 (-0.04, 0.37)	0.01 (-0.21, 0.22)
Moderate exposure	0.05 (-0.05, 0.14)	-0.08 (-0.24, 0.08)	0.20 (-0.01, 0.41)	0.12 (-0.07, 0.31)	0.02 (-0.18, 0.21)
High exposure	0.04 (-0.05, 0.14)	0.15 (-0.03, 0.32)	-0.03 (-0.26, 0.20)	0.09 (-0.09, 0.27)	-0.05 (-0.25, 0.15)
Executive functioning					
Low exposure	0.03 (-0.08, 0.14)	0.10 (-0.13, 0.32)	0.07 (-0.14, 0.27)	0.02 (-0.19, 0.22)	-0.04 (-0.28, 0.20)
Moderate exposure	0.04 (-0.06, 0.14)	0.00 (-0.22, 0.23)	0.07 (-0.11, 0.25)	0.11 (-0.08, 0.30)	0.07 (-0.14, 0.29)
High exposure	-0.02 (-0.13, 0.08)	0.03 (-0.22, 0.27)	-0.06 (-0.26, 0.14)	0.01 (-0.17, 0.19)	-0.03 (-0.25, 0.20)

Notes: Stratified models adjusted for age, sex, own education, parental education, and nativity.

^aOverall model adjusted for age, sex, race/ethnicity, own education, parental education, and nativity.

Table 3. Linear Regression Coefficients for Perceived Major Lifetime Discrimination Score Categories (compared to the reference category of no self-reported exposure to lifetime discrimination) Predicting Total Cognitive Performance and Domain-Specific Scores, Stratified by Racial/Ethnic Group

	Overall ^a (n = 1 635)	White (n = 486)	Asian (n = 398)	Black (n = 418)	Latino (n = 333)
Lifetime Discrimination Exposure	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Total cognitive performance					
Low exposure	0.08 (-0.02, 0.17)	0.00 (-0.18, 0.17)	0.08 (-0.10, 0.27)	0.16 (-0.05, 0.37)	0.17 (-0.04, 0.38)
Moderate exposure	0.08 (-0.02, 0.19)	0.13 (-0.07, 0.33)	-0.07 (-0.29, 0.15)	0.22 (0.00, 0.43)	0.14 (-0.09, 0.38)
High exposure	0.11 (0.01, 0.21)	0.04 (-0.17, 0.25)	0.00 (-0.22, 0.22)	0.32 (0.13, 0.51)	0.02 (-0.20, 0.24)
Verbal episodic memory					
Low exposure	0.11 (-0.01, 0.22)	-0.01 (-0.20, 0.19)	0.09 (-0.13, 0.31)	0.28 (0.03, 0.53)	0.18 (-0.08, 0.43)
Moderate exposure	0.06 (-0.07, 0.18)	0.04 (-0.19, 0.27)	-0.10 (-0.36, 0.16)	0.26 (0.01, 0.52)	0.09 (-0.20, 0.38)
High exposure	0.03 (-0.09, 0.15)	0.04 (-0.20, 0.28)	-0.18 (-0.44, 0.08)	0.27 (0.05, 0.50)	0.04 (-0.23, 0.31)
Semantic memory					
Low exposure	0.06 (-0.03, 0.16)	-0.01 (-0.16, 0.13)	0.13 (-0.07, 0.33)	0.08 (-0.13, 0.30)	0.10 (-0.10, 0.29)
Moderate exposure	0.04 (-0.06, 0.15)	0.04 (-0.13, 0.22)	0.00 (-0.24, 0.24)	0.09 (-0.13, 0.31)	0.11 (-0.11, 0.33)
High exposure	0.17 (0.07, 0.27)	0.09 (-0.09, 0.27)	0.28 (0.04, 0.52)	0.26 (0.07, 0.46)	0.01 (-0.19, 0.22)
Executive functioning					
Low exposure	0.02 (-0.08, 0.12)	0.02 (-0.19, 0.22)	-0.02 (-0.19, 0.15)	0.03 (-0.18, 0.24)	0.14 (-0.08, 0.35)
Moderate exposure	0.11 (-0.01, 0.22)	0.24 (-0.01, 0.48)	-0.08 (-0.28, 0.13)	0.18 (-0.04, 0.40)	0.16 (-0.09, 0.40)
High exposure	0.06 (-0.05, 0.16)	-0.04 (-0.28, 0.21)	-0.10 (-0.31, 0.11)	0.25 (0.05, 0.44)	0.00 (-0.23, 0.23)

Notes: Stratified models adjusted for age, sex, own education, parental education, and nativity.

^aOverall model adjusted for age, sex, race, own education, parental education, and nativity.

association of lifetime discrimination with total cognition (interaction $p = .06$) such that higher reported exposure to lifetime discrimination predicted higher total cognitive scores among U.S.-born but not among non-U.S.-born individuals. For example, among U.S.-born individuals, average total cognitive performance scores were 0.13 (95% CI: 0.02, 0.24) standardized units higher among participants who reported high exposure to lifetime discrimination compared with participants who reported no exposure to lifetime discrimination. Among U.S.-born Asian individuals, average semantic memory scores were 0.34 (95% CI: 0.05, 0.63) standardized

units higher and average verbal memory scores were 0.38 (95% CI: 0.01, 0.74) standardized units lower for those with high exposure to lifetime discrimination compared with participants who reported no lifetime discrimination (Supplementary Table S2).

Comparing Attributions for Discrimination

Among participants who reported at least one experience of *everyday* discrimination, 43% reported the discrimination was likely due to their race, ancestry, or national origins, 33% attributed the

Table 4. Linear Regression Coefficients for Everyday and Lifetime Discrimination Categories Predicting Total Cognitive Performance and Domain-Specific Scores, Stratified by Nativity Status

Level of Discrimination Exposure	Everyday Discrimination		Major Lifetime Discrimination	
	U.S. Born (<i>n</i> = 1 231)	Non-U.S. Born (<i>n</i> = 404)	U.S. Born (<i>n</i> = 1 231)	Non-U.S. Born (<i>n</i> = 404)
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Total cognitive performance				
Low exposure	0.06 (−0.05, 0.18)	0.07 (−0.17, 0.31)	0.04 (−0.07, 0.15)	0.14 (−0.06, 0.34)
Moderate exposure	0.02 (−0.09, 0.13)	0.16 (−0.05, 0.37)	0.14 (0.02, 0.26)	−0.10 (−0.35, 0.14)
High exposure	0.04 (−0.07, 0.15)	−0.11 (−0.34, 0.12)	0.13 (0.02, 0.24)	−0.01 (−0.26, 0.25)
Verbal memory				
Low exposure	0.04 (−0.10, 0.18)	0.22 (−0.05, 0.48)	0.07 (−0.06, 0.20)	0.21 (−0.02, 0.43)
Moderate exposure	0.00 (−0.13, 0.13)	0.17 (−0.07, 0.40)	0.12 (−0.03, 0.26)	−0.16 (−0.43, 0.12)
High exposure	0.03 (−0.10, 0.16)	−0.12 (−0.39, 0.14)	0.06 (−0.07, 0.20)	−0.06 (−0.34, 0.22)
Semantic memory				
Low exposure	0.07 (−0.03, 0.18)	−0.03 (−0.28, 0.22)	0.04 (−0.06, 0.14)	0.09 (−0.12, 0.30)
Moderate exposure	0.02 (−0.09, 0.12)	0.16 (−0.06, 0.38)	0.07 (−0.04, 0.18)	−0.05 (−0.30, 0.21)
High exposure	0.09 (−0.02, 0.19)	−0.14 (−0.38, 0.11)	0.17 (0.07, 0.27)	0.16 (−0.11, 0.42)
Executive functioning				
Low exposure	0.04 (−0.08, 0.17)	−0.01 (−0.24, 0.23)	−0.01 (−0.12, 0.11)	0.05 (−0.14, 0.25)
Moderate exposure	0.04 (−0.08, 0.16)	0.06 (−0.14, 0.27)	0.15 (0.02, 0.28)	−0.05 (−0.29, 0.19)
High exposure	−0.02 (−0.14, 0.10)	−0.01 (−0.24, 0.22)	0.09 (−0.03, 0.21)	−0.10 (−0.35, 0.14)

Note: Models adjusted for age, sex, race, own education, parental education, and nativity.

discrimination to age, and 16% to gender (Supplementary Figure S1). Participants who reported race, ancestry, or national origins as the reason for their experienced everyday discrimination averaged 0.12 (95% CI: 0.03, 0.21) standardized units higher semantic memory scores compared to participants who reported no everyday discrimination and participants who reported everyday discrimination due to some other reason. No association was found between everyday discrimination attributed to age or gender and cognitive performance.

Among participants who reported at least one experience of major lifetime discrimination, 50% attributed the discrimination to their race, ancestry, or national origins, 20% to gender, and 13% to age (Supplementary Figure S2). Participants who reported race, ancestry, or national origins as the reason for their experienced major lifetime discrimination averaged 0.14 (95% CI: 0.05, 0.22) standardized units higher semantic memory scores compared to participants who reported no major lifetime discrimination and participants who reported major lifetime discrimination due to some other reason. Similarly, participants who reported age as the reason for their experienced major lifetime discrimination averaged 0.15 (95% CI: 0.01, 0.29) standardized units higher executive functioning scores compared to participants that did not report major lifetime discrimination due to age. No association was found between major lifetime discrimination attributed to gender and cognitive performance (Supplementary Figures S3 and S4).

Sensitivity Analysis

Sensitivity models adjusting for income and social status as potential confounders showed similar null findings for the association between everyday discrimination and cognition (Supplementary Table S3). Adjusting for income and social status attenuated the observed association coefficient for major lifetime discrimination and verbal episodic memory among Black participants. Compared to Black participants who reported no lifetime discrimination, Black participants who reported high exposure to lifetime discrimination averaged

0.19 (95% CI: −0.04, 0.43) standardized units higher verbal episodic memory scores in the newly adjusted model (Supplementary Table S4). Adjusting for income and SES did not substantially change the association between discrimination and semantic memory or executive functioning. Models predicting discrimination showed that being Black and high income were strong predictors for reported lifetime discrimination ($p = .02$).

Discussion

In a multiethnic cohort of Kaiser Permanente members older than 65 years, we found no evidence of an association between reports of everyday discrimination and cognitive function but found some evidence of a positive association between reports of major lifetime discrimination and cognitive function across multiple domains. In models stratified by race/ethnicity, self-reported major lifetime discrimination experiences were associated with higher total cognitive performance, and each of the 3 domain-specific cognitive scores among Black participants, although the graded association between lifetime discrimination and verbal episodic memory was no longer present once we controlled for income. We found very little evidence of any association between self-reported discrimination and cognition for Asian, Latino, or non-Latino White participants. In models stratified by nativity, our findings provide some evidence that nativity modified the association between lifetime experiences of discrimination and cognition, such that U.S.-born individuals who self-reported major lifetime discrimination averaged better cognitive scores than U.S.-born individuals who reported no such discrimination. There was no association between major lifetime discrimination and cognition among non-U.S.-born individuals.

We do not intend to imply that discrimination improves cognition, but rather understand how the association between discrimination and cognition differs across racial/ethnic groups. Findings from previous studies evaluating the association between discrimination and cognition have been inconsistent. In comparison to our study, which found no evidence in the association between everyday

discrimination and cognitive performance, Sutin et al. (23) found that racial everyday discrimination was associated with lower cognitive health performance (ie, memory and mental status as measured by a memory task and the Mini-Mental State Examination) at baseline in the Health and Retirement Study. However, the study found significant interaction between race and discrimination, such that Black participants who perceived racial discrimination scored higher on mental status both at baseline and at 4-year follow-up, whereas White participants who perceived racial discrimination scored lower (23). Other studies of perceived everyday discrimination and cognition in older African Americans have found contrary results, showing a negative association. Zahodne et al. (45) found that greater everyday discrimination was associated with lower baseline memory and faster memory decline over a 6-year period among Black participants in the Health and Retirement Study even after adjusting for C-reactive protein. In a different study, Barnes et al. (22) also found that a higher level of perceived everyday discrimination was associated with lower episodic memory performance among older African Americans in the Chicago metropolitan area.

Inconsistency with previous studies could be partly explained by the differences in measures and context for experiences of discrimination. There continues to be some disagreement regarding the best approach for measuring experiences of discrimination and the significance of racial/ethnic discrimination compared to overall mistreatment (18). While the Sutin et al. (23) and Zahodne et al. (45) studies used the 5-item EDS, the current study used the 9-item version. Also, while most studies have focused on *everyday* discrimination and cognition, this is the first study, to our knowledge, to explore the association with *major lifetime* discriminatory events, which could represent more traumatic instances of discrimination as opposed to the more subtle but common everyday experiences of discrimination. This could be particularly true for this older cohort given that adults aged 65 years and older tend to be less mobile and restrict their daily activities. This is also consistent with previous reports of declining discrimination with age (18). More in-depth measures on discrimination and unfair treatment that carefully examine how respondents understand these terms may provide additional clarification on how individuals report their experiences.

Other potential explanations for our findings include unmeasured confounding and reverse causation. Due to the cross-sectional design, we are unable to disentangle the extent to which the observed association is causal or the extent to which it may reflect additional unmeasured confounding. For instance, it is possible that the discrimination–cognitive association varies by social context, including where people live and who they interact with. A recent study on the impact of region and urbanicity on the discrimination–cognitive association among older non-Hispanic Blacks found that although the association between everyday discrimination and episodic memory does not vary across U.S. regional contexts, more everyday discrimination was significantly associated with lower episodic memory when living in urban areas (46). Long-term Northern California residents may differ from others represented in previous studies. Drawing from previous work on the prevalence of discrimination by neighborhood poverty and racial composition, it is possible that individuals with increased SES are more likely to encounter and report experiences of discrimination (23,47) and more likely to perform better on cognitive tests. Additionally, cognitive scores could be associated with lifetime SES beyond education and higher-SES individuals could have additional resources to buffer against the negative consequences of discrimination (48). While adjusting for income and social status in sensitivity models attenuated the association between

lifetime discrimination and verbal episodic memory, this did not substantially change the association between discrimination and semantic memory or executive functioning among Black participants. This is consistent with our hypothesis that Black individuals with higher SES are exposed to more discrimination, although there may be additional underlying factors or residual confounding that remains unaccounted for.

Finally, the cross-sectional design of the current study precludes us from ruling out reverse causation as an alternate explanation for our findings. Although only participants who were cognitively healthy at baseline were included in our study, participants with better memory may be able to recall experiences of discrimination better. Other limitations of this study include a moderate sample size and selective survival of these groups, potentially influenced by race/ethnicity, nativity, and experiences of discrimination. Our moderate sample size did not allow for us to further distinguish between racial/ethnic discrimination and overall discrimination. In order to increase statistical power, we combined U.S.-born and non-U.S.-born participants that self-identified as Asian or Latino, which could potentially miss some heterogeneity within the groups.

Despite these limitations, a major strength of the present study is the racial/ethnic diversity of the cohort, all residing in the San Francisco Bay Area and Sacramento, California. This is also the first study, to our knowledge, to evaluate the association between *major lifetime* discrimination and cognitive health. While results may not be generalizable to older adults in other geographic areas, this allows us to compare perceived discrimination across racial/ethnic groups residing in a similar setting with access to the same health care services. Additionally, while previous studies evaluating the association between perceived discrimination and cognition have focused on differences between Black and White older adults, or exclusively on Black or Latino individuals, this is the first study, to our knowledge, analyzing the association between perceived discrimination and cognitive health simultaneously across the 4 largest racial/ethnic groups of older adults in the United States.

Conclusion

Contrary to our hypotheses, we found no evidence that experiences of discrimination among older adults aged 65 years and older were associated with worse cognition. To the contrary, Black participants who self-reported more experiences of major discrimination across the life course averaged better cognition than individuals who reported no such discrimination. This may reflect the lifetime stratification processes that differentially expose some Black individuals to higher levels of discrimination.

Supplementary Material

Supplementary data are available at *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* online.

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Conflict of Interest

None declared

Author Contributions

E.M., R.A.W., and M.M.G. planned the study and developed the statistical analysis with input from the other authors. E.M. analyzed the data and drafted the manuscript, and other authors revised the manuscript and provided input to the interpretation of the results.

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