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# Representation of older Latinxs in cohort studies at the Rush Alzheimer's Disease Center

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## Abstract

The Rush Alzheimer's Disease Center (RADC) conducts five harmonized prospective clinical-pathologic cohort studies of aging - with one study, the Latino Core, focused exclusively on Latinxs, two studies consisting of mostly non-Latinx Whites, and two studies of mostly non-Latinx Blacks. This paper contextualizes the Latino Core within the other four harmonized RADC cohort studies. The overall aim of the paper is to provide information from the RADC so that researchers can learn from our participants and procedures to better advance the science of ADRD in Latinxs.We describe an annual clinical evaluation that assesses risk factors for Alzheimer's dementia among older adults without known dementia at enrollment. As all RADC cohort studies offer brain donation as a part of research participation, we discuss our approach to brain donation and subsequent participant decision-making among older Latinxs. We also summarize baseline characteristics for older Latinxs across the five RADC cohort studies in relation to the baseline characteristics of non-Latinx Blacks and non-Latinx Whites. Finally, we outline challenges and considerations as well as potential next steps in cognitive aging research with older Latinxs.

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The authors have no relevant conflicts of interest to declare.

**Keywords**

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## Introduction

Conservative estimates indicate that Alzheimer's disease and related dementias (ADRD) currently affects 5.8 million Americans, with a projected increase to 14 million by 2050.(1) Among Latinxs in the United States, the number diagnosed with ADRD is expected to grow by more than 800% - from nearly 400,000 in 2012 to approximately 3.5 million by 2060.(2) Compared to older non-Latinx Whites, older Latinxs have a higher risk and prevalence of ADRD - partially attributed to their longer life spans and the presence of adverse, albeit modifiable, risk factors such as obesity, metabolic syndrome, type 2 diabetes mellitus, and other cardiovascular conditions.(3) However, our understanding of the disproportionate ADRD burden among older Latinxs remains incomplete.

It is important to identify potential causes and related risk reduction strategies specific to this vulnerable population. We cannot assume that findings from ADRD studies, primarily with older non-Latinx Whites, will apply to other races and ethnicities. For example, several traditional risk factors for cognitive decline and Alzheimer's dementia in older non-Latinx Whites do not demonstrate the same level of risk in older Latinxs, including apolipoprotein ε4 status.(4) Older Latinxs face potentially distinctive risk factors for ADRD such as structural assimilation(5), and might have potential resilience factors like familial and other relationships, and religiosity or spirituality. Given that previous research has shown those factors to be associated with healthy aging(6) and cognition,(7) a greater understanding of their role in ADRD among older Latinxs is warranted. Furthermore, studies explicitly focused on older Latinxs can characterize the diversity among older Latinxs in relation to ADRD and address an urgent public health need.(8)

Researchers across the United States have contributed significantly to the field of Latinx health and aging, and continue to build evidence in this area (Table 1). For example, longitudinal studies of diverse populations have included non-demented Latinxs along with non-Latinx Blacks and Whites to examine stroke and related risk factors (9–11), as well as aging and incident dementia (9, 12–15). Research has also focused on blood biomarkers of older Latinxs from select countries of origin with and without a diagnosis of mild cognitive impairment (MCI) or Alzheimer's dementia (4, 16) (17–20). Other targeted studies of older Latinxs have incorporated a small cadre of cognitive measures in a larger framework (4, 21, 22) (23, 24). These and other studies (25–31) have contributed significantly to the field of Latinx health and aging.

Even with these studies, many questions remain regarding aging and ADRD in the Latinx community. One major gap in our understanding of cognitive aging and ADRD among older Latinxs pertains to the dearth of brain tissue from older Latinxs, especially from persons without dementia. Notably, a key feature of aging and ADRD research includes the requirement or option of organ donation upon death for a more complete understanding of ADRD, from etiology to potential prevention and treatment. Brain autopsies and resultant

examinations of brain tissue from decedents of diverse ethnic and racial backgrounds is essential for generalizability, for representation, and for improvement of ADRD treatment and care for all individuals affected by the disease.(32) Few studies with older Latinxs request organ donation from study participants upon death and, despite persistent efforts to increase the participation of older Latinxs in ADRD research, the amount of available brain tissue from Latinxs is limited.(33)

Through five cohort studies, the Rush Alzheimer's Disease Center (RADC) (8–10) aims to conceptualize and conduct needed studies of older adults across diverse racial and ethnic groups. The foundation for partnering with older Latinxs, in particular, began with our earliest cohort study, the Religious Orders Study (ROS)(34). Within ROS, we recruit and maintain Latinxs (among other races/ethnicities) who are Roman Catholic clergy without dementia, all of whom must agree to an annual clinical evaluation and organ donation upon death. Overall, ROS participants have high levels of education. Subsequently, through the Rush Memory and Aging Project (MAP)(35), we constructed the infrastructure for community-based outreach and recruitment coupled with community/home-based testing. MAP participation requires consenting to organ donation and most participants reside in Continuing Care Retirement Communities and other group residence sites. However, Latinxs, non-Latinx Blacks, and non-Latinx Whites of lower socioeconomic status tend to reside in individual homes throughout the greater Chicago area, and may be missed by these recruitment efforts. Although ROS/MAP remains productive in understanding correlates of Alzheimer's dementia and cognitive health in aging, ROS/MAP participants are largely non-Latinx Whites (88.8%), in no small part due to the requirement for organ donation as a condition of study enrollment. In 2004 the RADC extended its efforts to address cognitive aging in older non-Latinx Blacks with the introduction of the Minority Aging Research Study (MARS) and later the RADC African American Core (AACORE), both with a sole focus on community-dwelling, non-Latinx Blacks.(36, 37). Both MARS and AACORE recruit for brain donation as an optional component of the studies. From this foundation, we initiated a focused cohort study of Latinxs through the RADC, named the Latino Core. Like MARS and AACORE, participants are community-dwelling and organ donation is optional. Currently, all 5 cohorts (i.e., ROS, MAP, MARS, AACORE, and Latino Core) maintain a harmonized battery of tests, including assessments of many risk factors and cognitive and motor testing. The harmonization of data collection within the RADC addresses recent recommendations to establish a collaborative infrastructure across existing cohorts that include diverse racial and ethnic groups in an effort to address research gaps in the area.(8) Furthermore, the RADC is poised to identify whether or how baseline characteristics overlap or differ based on the unique personal, cultural, and historical contexts of older Latinxs – exclusively or in comparison to older non-Latinx Black and/or older non-Latinx Whites.

Through its five cohort studies, the RADC collects data and biospecimens including brain donation from community-based, urban, non-demented, diverse older Latinxs to examine the transition from normal aging to MCI to the earliest stages of dementia. The overall aim of the paper is to provide information from the RADC so that researchers can learn from our participants and procedures to better advance the science of ADRD in Latinxs. The specific aims of this paper are to: 1) outline the harmonized study design across the five RADC cohort studies, especially ROS, MAP, and the Latino Core, all of which include a detailed

assessment of risk factors for Alzheimer's dementia in older Latinxs without known dementia at baseline; 2) describe the annual clinical evaluation and our approach to discussing organ donation at time of death; 3) demonstrate the baseline characteristics of Latinxs, non-Latinx Whites, and non-Latinx Blacks across all five harmonized RADC cohort studies; and 4) provide suggestions for others doing such work, including future directions in conducting research in the Latinx community.

## Methods/Design

### Participants

Inclusion criteria for research participation among older Latinxs in RADC cohort studies include self-identification as Latinx, no known dementia diagnosis, and agreeing to an annual clinical evaluation and the donation of ante-mortem biospecimens. We aim for Latinxs 65 years and older. ROS, MAP, AACORE, and MARS do not have a Latinx requirement, but there are additional criteria. The Latino Core aims to maintain a panel of approximately 300 older Latinxs without dementia at baseline. The RADC and its cohort studies are based in Chicago, Illinois and study recruitment takes place across the greater Chicago metropolitan area, except ROS which recruits throughout the United States. With over 2 million Latinx residents, the greater Chicago metropolitan area (38) has among the highest number of Latinxs in the United States, with great diversity among Latinx residents. (38) Thus, the RADC is an ideal location for longitudinal studies of cognitive aging in older Latinxs. All five studies were approved by the Institutional Review Board of Rush University Medical Center. All participants provide informed consent and those who agree to brain donation also sign the Uniform Anatomical Gift Act (AGA).

### Procedures

RADC recruitment efforts across all cohort studies, including those focusing on older Latinxs, are conducted by the same team of staff members, with race/ethnicity-matched recruitment occurring most times. Recruitment efforts (non-probabilistic sampling) are similar across studies, in that presentations are conducted in various locations. ROS recruitment is primarily in convents and monasteries and MAP is primarily in CCRC sites. Before the Latino Core, Latinx recruitment was the same in ROS as for non-Latinx whites and African Americans, and the same as in MAP, except that in both studies agreement to organ donation is required at the time of enrollment. With the onset of Latino Core, there was explicit allocating of resources to recruiting Spanish-speaking Latinxs. Importantly, our staff for recruitment and testing are bilingual in Spanish and English, and bicultural, but they are part of two different teams: those involved in outreach and education with the ORE Core and research assistants, respectively. Building trust with organizations has been essential. By starting small, and building our networks in the Latinx community, we have gained the trust and respect of organizations. Presentations include staff engagement with, and presentations at, community-based locations where older Latinxs and their loved ones may visit including senior centers, community centers, churches, parks, health centers and clinics, senior housing facilities, senior fairs and health fairs, and consulates (e.g., the Mexican Consulate in Chicago, located less than a half mile from Rush University Medical Center). Additionally, our team has benefitted from interviews and stories of our work with our local

CBS station, the Chicago Tribune, and our local Univision station. These stories, especially those in Spanish, have expanded our outreach in the Latinx community in the Chicago area. We outline additional harmonized methods and procedures below.

## Measures available in all five RADC cohort studies (ROS, MAP, MARS, AACORE, and Latino Core)

The five RADC cohort studies utilize an extensive harmonized clinical evaluation interview and battery of neuropsychological tests. Research assistants collect data across several cohort studies. Those who are bilingual collect all data for the Latino Core. The complete clinical evaluation and battery of tests, including blood draws, takes approximately four hours for the initial baseline assessment; follow-up evaluations are typically shorter. The evaluations are performed by a multidisciplinary team consisting of a research assistant, psychometrician, phlebotomist, research nurse, neuropsychologist, and examining clinician. All assessments, across cohorts and race/ethnicity, are conducted in participants' personal residences. Older Latinx participants are tested in their preferred language, English or Spanish, by a data collector fluent in both languages. All assessments are conducted in either English or Spanish consistently throughout the evaluation (i.e., there is no switching between English and Spanish during the assessment). The cognitive test protocol and other measures were translated and back translated about 20 years ago when ROS first started recruiting Latina sisters in San Antonio. Since all five cohorts have a large common set of harmonized measures at the item level, we have predictive validity that comes from peer-reviewed manuscript publications. We added some tests at the start of the Latino Core which are also used in The Hispanic Community Health Study / Study of Latinos (HCHS/SOL) where US-Spanish translations were validated.

**Demographic Characteristics:** All participants report their gender (i.e., male or female), date of birth, and years of education. Age is calculated from birth date to date of the clinical examination. Participants also report their race (e.g. African American/Black) and ethnicity (e.g. Hispanic: yes or no) according to the 1990 US Census questions.

**Psychological, Experiential, and Medical Risk Factors:** The Big Five personality factors are assessed with the NEO Personality Inventory.(39) The 10-item form of the Center for Epidemiologic Studies-Depression Scale (CES-D) is used as an ongoing measure of depressive symptoms.(40) Items on a history of a decline in cognition or stroke and the relationship between stroke and cognitive impairment are adapted from the Consortium to Establish a Registry for Alzheimer's Disease (CERAD);(41) items on a history of parkinsonism and Parkinson's disease (PD) are adapted from DATATOP.(42) Items on a family history of dementia-related illnesses among first-degree relatives follows CERAD.(43) Current prescribed and over-the-counter medications are visually inspected and type, dosage, and frequency are recorded; medications are later coded according to the Drug Products Information Coding System.(44–46).

Household and community-level information is summarized to give the county average Duncan Socioeconomic Index (SEI) for head of households, literacy rate in those aged 6 years or older, and proportion of those aged 6–13 years in school, as previously reported.

(47–49) For all participants, physical activity is assessed using five questions adapted from the 1985 National Health Interview Survey,(50) and social activity is assessed using a 6-item scale that asks how often during the past year participants engaged in common types of activities that involve social interaction.(51) Parent education is the average of years of education of the mother and father.

Cardiovascular disease is assessed with the Rose Questionnaire as employed in the Established Populations for Epidemiologic Studies of the Elderly (EPESE). Sitting and orthostatic blood pressure and pulse are assessed as in the Trials of Hypertension Prevention. The amount and duration of alcohol use is documented with items from the EPESE.(52) Visual acuity is tested with a Snellen card as performed in EPESE and we assess gross auditory function. We document histories of head injury and sequelae using the Brain Injury Screening Questionnaire (BISQ).(53) BISQ data collection did not start until August 2017 and thus we present analyses for illustration.

**Self-Report Disability:** Self-reported disability status is assessed by participants' rating of their performance of basic activities of daily living (ADL) and self-care functions required for independent living (instrumental activities of daily living, IADL).(54–56) We also include brief measures of upper and lower extremity physical function, performance, and strength.(57, 58)

**Neurological Examination:** The neurological examination documents the presence of signs representing conditions, other than Alzheimer's dementia, with the potential to impair cognition. Special emphasis is placed on stroke and PD. The neurological examination is as outlined in CERAD.(41) The structured neurological examination incorporates items from the Stroke Data Bank and the National Institutes of Health Stroke Scale.(59, 60) A modified version of the complete motor section of the Unified Parkinson's Disease Rating Scale (UPDRS) is administered.(61, 62) Neurological examinations are conducted by nurse clinicians following extensive cross-training procedures with board-certified neurologists.

**Cognitive Performance Tests:** The cognitive function tests were selected to assess a broad range of cognitive abilities, emphasizing dissociable cognitive tasks that appear to have different anatomic substrates that are commonly affected by Alzheimer's dementia, (63–65) including those widely used for clinical classification of persons with possible dementia.(41, 66–76) Tests have been shown to be valid across ethnic and socioeconomic backgrounds and have been validated in Spanish.(77, 78) To date, the RADC uses the same education cutoffs for all cohorts. Tests of *episodic memory* include Word List Memory (scores of 0–30), Word List Recall (scores of 0–10) and Word List Recognition (scores of 0–10) from the procedures established by the CERAD; immediate and delayed recall of Story A from the Logical Memory subtest of the Wechsler Memory Scale-Revised (scores of 0–25); and immediate and delayed recall of the East Boston Story (scores of 0–12). Tests of *semantic memory* include Verbal Fluency; the Boston Naming Test (scores of 0–15); and subsets of items from the National Adult Reading Test (scores of 0–10). Tests of *working memory* include the Digit Span subtests (forward and backward; scores of 0–12) of the Wechsler Memory Scale-Revised; and Digit Ordering (scores of 0–14). Tests of *perceptual speed* include the oral version of the Symbol Digit Modalities Test (scores of 0–110),

Number Comparison (scores of 0–48), and the Stroop Neuropsychological Screening Test (scores of 0–80). *Visuospatial skills* with items from Judgment of Line Orientation (scores of 0–15) and Standard Progressive Matrices (scores of 0–16) are also tested. Finally, the Mini-Mental State Examination (MMSE) is used as an overall measure of cognitive abilities (scores of 0–30).(79) This protocol is portable, and administered by trained technicians. The level of function at each evaluation is summarized with composite scores in different cognitive domains, supported by factor analyses across RADC cohorts.(80–84) Composite scores have the advantage of increasing power by reducing random variability and floor and ceiling effects.

**Motor, Gait, and Physical Function Performance Tests:** Performance evaluations include eleven tests: 1) grip and 2) pinch strength measured bilaterally using the Jamar® hydraulic hand and pinch dynamometers (Lafayette Instruments, Lafayette) to assess manual strength. Upper extremity dexterity is based on 3) pegs placed in a pegboard (Purdue Pegboard) in 30 seconds. In addition, 4) participants tap an electronic tapper (Western Psychological Services, Los Angeles, CA) with their index finger as quickly as possible for 10 seconds. To evaluate gait, participants walk 8 feet and turn 360° and we measure the 5 + 6) time and 7 + 8) number of steps taken on each task. 9) To assess balance, participants stand on each leg for 10 seconds, and 10) stand on their toes for 10 seconds. Finally, 11) participants walk an 8-foot line heel to toe and we count the number of steps off line. Ten performance measures, excluding tandem gait, are scaled and averaged to obtain a summary global motor score(85) which has previously been reported to be associated with risk of mortality, incident disability, and incident dementia.(86) Component measures of strength (2 tests), dexterity (2 tests), and gait (4 tests) are also formed.

**Laboratory Testing:** Blood is drawn at baseline. We have DNA from peripheral blood mononuclear cells (PBMC) or brain tissue. Serum, plasma and cryopreserved lymphocytes are stored for future studies in secured −80°C freezers and liquid nitrogen tanks equipped with temperature-sensitive alarm systems. Blood is collected in sterile Vacutainer tubes as follows: 16 ml in serum separator tubes (SSTs), 16 ml in liquid K3 ethylenediaminetetraacetic acid (EDTA) tubes, and 16 ml in cell preparation tubes (CPTs) with anticoagulant for cell separation. A centrifuge is brought to all sites for processing of blood, and serum is separated within 1 hour of collection. Serum and plasma are immediately placed in 0.5 ml aliquots in O-ring sealed cryogenic vials. All specimens are stored until delivery to the RADC laboratory, either in person or by overnight courier, within 24 hours of collection. Routine laboratory results are obtained, reviewed and shared with the participants.

**Diagnostic Classification:** Diagnostic classification proceeds in a multi-step data-driven process, as previously described (87). Clinical diagnoses are made by the examining clinician, or by review of a summary of the results when an in-person evaluation is not performed. Classifications include the following: 1) **Alzheimer's Dementia:** The clinical diagnosis of Alzheimer's dementia follows the recommendations of the joint working group of the NINCDS/ADRDA;(88) 2) **MCI:** The classification of MCI refers to those persons with cognitive impairment who do not meet criteria for dementia;(89) 3) **Stroke:** Diagnostic

classification of stroke subtype is made as outlined for the Trial of ORG 10172 in Acute Stroke Treatment (TOAST) based on the medical history and neurologic examination findings.(90) The diagnosis of cognitive impairment related to stroke is consistent with the NINDS/AIREN criteria for vascular dementia except that brain scans are not obtained;(91) 4) **PD**: A diagnosis of PD is made according to CAPIT criteria;(92) 5) **Lewy Body Diseases:** The diagnosis of dementia with Lewy bodies follows the recommendations of the report of the Consortium on Dementia with Lewy Bodies International Workshop;.(93) and 6) **Other Conditions:** Other conditions including delirium, brain tumors, head trauma, and fronto-temporal dementia, while less common, follow contemporary standards.

### Measures only available from Latinx participants in RADC cohort studies

**Acculturation and Cultural Factors:** Partricipants are asked for city and country of birth, with Puerto Rico a separate response from the United States; and how long they have lived in the mainland United States. We record similar information regarding participants' parents in the Latino Core, but not ROS or MAP. We also document language preference for data collection.

Acculturation and cultural values (i.e., familisim) are assessed with the Short Acculturation Scale for Hispanics (SASH), which documents language- and social-based acculturation levels as well as an overall SASH score.(94) Those authors note that an average of 2.99 is the recommended cut point for which scores above this point represent higher levels of acculturation and scores below this point represent lower levels of acculturation. The 6-item version of the Sabogal Familism Measure(95) assesses participants' identification/ attachment with their family, a key aspect of cultural identity in Latinxs. These measures are also used in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL).(96)

## Data Analysis

When examining potential crude baseline differences among ethnic/racial groups on categorical variables, $\chi^2$ tests were employed in all cases (except for variables on PD for which Fisher exact tests were used). Analysis of Variance (ANOVAs) were employed for examining the same question for continuous variables when assumptions were met, and Kruskal-Wallis tests were utilized with the remaining variables. Statistically significant $\chi^2$ tests were followed by smaller $\chi^2$ tests and/or Fisher exact tests, significant ANOVAs were followed by Tukey tests, and significant Kruskal-Wallis tests were followed by Wilcoxon rank sum tests to examine pairwise differences among ethnic/racial groups.

## Results

Baseline characteristics across the RADC cohort studies are shown in Table 2. Enrollment started in 1994 in ROS, 1997 in MAP, and 2015 in Latino Core. Most Latinxs in the RADC cohort studies are from the Latino Core. As of March 2020, Latino Core consists of 218 Latinx participants, ROS has 64 Latinxs of 1457 participants and MAP has 121 Latinxs of 2140 participants. Among the 4938 total RADC participants, 8% are tested in Spanish. Among the 415 total RADC Latinx participants, 58% are tested in Spanish, and 77% of Latino Core participants are tested in Spanish. RADC Latinx participants represent seven

Latin American countries of origin including Colombia, Cuba, Ecuador, Guatemala, Honduras, Mexico, Peru, and the commonwealth of Puerto Rico. In the Latino Core, 56.3% report being born in Mexico, 16.8% in Puerto Rico, and 14.3% in the US. In MAP, only 7.3% of all participants report being born outside the US, the most of which are from Mexico (~1%). To date, 69 Latinx participants have died, of whom 66 agreed to organ donation and 48 (72.7%) underwent brain autopsy.

On average, Latinxs were approximately 72 years of age at baseline with 11 years of formal education. Latinxs were younger at baseline and had fewer years of education compared with non-Latinx Blacks and non-Latinx Whites. Rates of planned brain donation (i.e., those who signed the AGA divided by the total number of participants by group) for Latinxs were similar to those of non-Latinx Blacks, both of which were lower than in non-Latinx Whites (Table 2).

Table 3 shows that Latinxs experience higher levels of neuroticism and depressive symptoms; less social and cognitive activity; and lower parental education than non-Latinx Blacks and Whites. No differences in a family history of dementia were noted between groups.

Latinxs reported less mobility disability compared with non-Latinx Whites (Table 4). Compared with non-Latinx Blacks and Whites, Latinxs had lower scores on all working memory tests. Compared with non-Latinx Blacks and Whites, Latinxs had lower scores on most tests of episodic memory, semantic memory, and perceptual speed with the exception of the Stroop on which Latinxs scored better than non-Latinx Blacks on word reading and color naming, and better than non-Latinx Whites on word reading only (Table 5).

Latinxs had slower walking speeds compared with non-Latinx Blacks and non-Latinx Whites, and better scores of motor function but lower scores of bradykinesia, Parkinsonian gait, and tremors (Table 6). The three groups did not differ in terms of MCI, dementia, or stroke (Table 7). There were significantly fewer Latinxs born in the mainland US, and Latinxs lived in mainland US for more than 40 years (Table 8). Also, SASH acculturation scores demonstrated that Latinx participants in RADC cohort studies had low levels of acculturation.

## Discussion

The RADC Latino Core, along with Latinxs from ROS and MAP, generate critical resources needed to advance scientific knowledge regarding aging and ADRD among older Latinxs. First, these studies provide annually collected clinical data from older Latinxs free of dementia at baseline for studies of the transition from normal aging to MCI to the earliest stages of dementia. Second, they provide ante-mortem biospecimens including serum, plasma, genomic DNA, and viable peripheral blood mononuclear cells from older Latinxs to support biomarker studies of aging and ADRD in this population. Third, they provide post-mortem brain tissue and neuropathologic data to support studies of the neuropathology and neurobiology of aging and dementia among older Latinxs. Finally, due to harmonized testing

and biospecimen collection across all RADC cohort studies, there are opportunities for comparisons of Latinxs with non-Latinx Whites and Blacks.

We direct our attention and resources to explicit engagement, recruitment, and retention of older Latinxs through the Latino Core. In combination with ROS and MAP, the number of Latinx participants across RADC cohort studies is approaching a total of 500 participants. Latinxs in RADC cohort studies reported low levels of acculturation, similar to those found in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) cohort.(97) Latinxs also reported higher levels of neuroticism and depressive symptoms compared with non-Latinx Blacks and Whites. These findings follow previous literature reporting older Latinxs as having a higher odds of screening positive for depression, especially among Latinxs identifying as Mexican, Puerto Rican, or Cuban compared with non-Latinx Whites.(98) Elevated levels of neuroticism and depressive symptoms among Latinxs have great importance for brain health as older adults with depression, regardless of ethnicity, have demonstrated a higher rate of progression to Alzheimer's dementia over a relatively short period of follow-up.(99) Relatedly, the current study findings also outline neuropsychological test performance of Latinxs. Latinxs in our studies demonstrated low scores on many such tests. Fewer years of formal education have been noted as a risk factor for the development of ADRD, and could be a factor in the baseline scores of the Latinxs from RADC studies. Also, it is possible that Latinx participants have less experience with standardized surveys and tests, which could affect testing at baseline. Over time we can examine changes in cogntion, and control for level of education. Similarly, we will be able to analyze the impact of other factors, such as physical and social activity, and their impact on cognitive scores across race/ethnicity and within Latinxs.

That said, more work is needed to understand and improve cognition among this underserved segment of the US population. One area in further need of study is the potential role of language use and proficiency on test performance. Being bilingual often distinguishes Latinxs from non-Latinx Blacks and non-Latinx Whites. Toward this end, our team is actively working to develop measures not only of language proficiency, but also patterns of use in our cohort studies involving Latinx participants. Although we do not have that information yet, we are actively pursuing such research at the RADC to determine best practices around both self-reported and objectively-assessed proficiency.

In the future, achieving high rates of follow-up will be critical in studies of cognitive aging and the transition from normal aging to MCI to dementia. RADC staff have substantial experience with the techniques necessary to facilitate follow-up and they will continue to use these evidence-based strategies, including the following: 1) overcoming barriers to participation by conducting all evaluations in participants' homes; 2) frequent contact with participants including quarterly telephone calls, newsletters, and acknowledgement cards for special occasions; 3) frequent dissemination of research findings, in part, through educational presentations on ADRD and healthy aging in both English and Spanish; and 4) engagement and communication with participants' families. Notably, in the Latino Core we conduct quarterly "Cafecitos" as retention events in different areas across the Chicago metropolitan area where groups of participants reside. Currently, Cafecitos consist of small gatherings of approximately 30 participants in which we report study updates, facilitate

social networking among participants, and provide a presentation on a topic they are interested in (e.g., healthy eating, mental health). Bilingual professionals are solicited to lead these presentations and discussions.

However, challenges exist in recruiting and retaining older Latinxs in research. One challenge to conducting research with older Latinxs involves the intertwined needs for bicultural and/or race/ethnicity-matched staff who are bilingual in English and Spanish - both verbally and written - and continuous outreach efforts. All assessments in RADC cohort studies, including Latino Core, are done in participants' homes/buildings and, at times, require multiple visits per participant, possibly resulting in the need for extended recruitment timelines. However, our experience has indicated that gaining the trust and respect of participants, which requires substantial time investment, is necessary for their recruitment and retention. The increasing polarization of immigrants in the US highlights the need to establish this trust and respect.

Moreover, gaining the trust of participants' family members is vital, given the collectivist nature of Latinxs. For example, in the consent process we make sure family members are aware of the older adults' interest in the study. Although we do not have direct data yet on how this might have affected recruitment and retention, we assume that the affect has been positive, given the collectivist nature.

Another challenge pertains to RADC cohorts currenlty consisting of smaller numbers of some Latinx backgrounds (e.g., Cubans) and fewer men than women. We postulate that the smaller numbers of some Latinx backgrounds not only reflects the heterogeneity of Latinxs in the US but also our primary Chicagoland catchment area which consists primarily of Latinxs of Mexican and Puerto Rican background. Regarding smaller numbers of men, efforts are being made to learn from our current participants about best approaches to addressing this issue; furthermore, we are specifically targeting men's groups, such as at churches.

Finally, completed brain autopsies present a potential challenge. Overall, we aim to facilitate brain donation in an effort to identify and understand potential Alzheimer's dementia pathways among older adults, especially ethnic and racial minorities. At the RADC rates of planned brain donation of Latinxs were similar to those of non-Latinx Blacks, both of which were lower compared with non-Latinx Whites. In an effort to ensure successful brain and organ donation resulting in a completed brain autopsy, we employ the following strategies, all of which are done with participant permission: 1) provide a specific packet to each participant who consents to organ donation (by signing an AGA form which gives legally binding permission for donation at the time of the donor's death, and family members do not have the right to override this decision); the packet includes flyers and a magnet for his/her refrigerator that gives the RADC telephone number to call upon death, as well as a frequently asked questions document, 2) send information to participants' family members, notifying them of the participants' RADC cohort study involvement and organ donation wishes, and provide them with our telephone number to call upon death, 3) give the lead investigator's business card to particpants who have signed the AGA form and strongly encourage them to share it with family members, as the study coordinator will need to be

notified at the time of death. After receiving the business card, the family member can call the lead investigator, who can describe the study and emphasize the important role they play in informing us about their loved one's death in an effort to honor participants' brain donation wishes, 4) ask for funeral home information at home visits by the lead investigator and by data collectors at follow-up testing from those who signed the AGA for organ donation, 5) send letters to funeral homes informing them that a RADC cohort study participant has signed the AGA for organ donation and made arrangements to use their funeral home upon death, so they can call us if they receive notification of the death, and 6) discuss organ donation with those who are not opposed to organ donation but have not signed the AGA for organ donation. These efforts have led to approximately one-third of Latino Core participants signing the AGA.

Despite the strengths of our current work, there are limitations. We lack probabilistic sampling which could bias comparisons across and within our RADC cohorts. Also, it is possible that there are differences between Latinxs participating in a study in a big Midwest urban area compared to Latinxs from different geographic reasons, countries of origin, and rural settings. Moreover, we have ongoing challenges to obtaining organ donation.

Future work at the RADC focused on Latinx communities will include adding measurements that can help us learn more about brain health in Latinxs via genetic testing and biomarkers.(100–107) We have plans to collect proteomic data and magnetic resonance imaging (MRI) in all Latino Core participants. Our current collection of MRI data from those Latinxs who have signed the AGA for organ donation provides vital data on the brain in vivo that can be combined with other data being collected and described in this paper, including ex vivo autopsy-confirmed neuropathologies related to normal and pathological aging.

Overall, the work at the RADC, especially cohort studies of aging that include older Latinxs, aims to represent older Latinxs in the field of cognitive aging and ADRD. The comprehensive nature of the RADC cohort studies with Latinxs, as seen in Tables 2–8, will allow us to make unique contributions to cohort studies of aging. Adding more Latinx participants to the rich datasets of the RADC cohort studies has several advantages, including the following: ethnic and racial comparisons with non-Latinx Whites and Blacks due to the harmonization of measures across cohort studies; and within group comparisons due to the variability of the Latinx participants across RADC cohort studies. Taken together, the data collected can be used to develop risk reduction trials and add to the drug discovery pipeline.

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**Table 1.**

Ongoing Longitudinal Studies with Latinos and Aging Focus

| Study Name | Focus of Grant | Home University | Start date | Only Latinx Participants | Geographic Region | Latinx Background | Cognitive Status | Age |
|---|---|---|---|---|---|---|---|---|
| Northern Manhattan Study (NOMAS) | Stroke | Columbia University | 1990 | No | Mid-Atlantic | Caribbean Latinxs | No exclusion criteria | ≥ 40 years |
| Washington Heights-Inwood Columbia Aging Project (WHICAP) | ADRD | Columbia University | 1989 | No | Mid-Atlantic | Caribbean Latinxs | Non-demented | ≥ 65 years |
| Texas Alzheimer's Research & Care Consortium (TARCC) | ADRD | Baylor College of Medicine (BCM), Texas Tech University (TTUHSC), University of North Texas (UNTHSC), and the UT Southwestern Medical Center (UTSW) | 1999 | No | South | Mexican | Persons with mild cognitive impairment (MCI) or dementia; normal controls | ≥ 50 years |
| Health & Aging Brain among Latinx Elders (HABLE) | ADRD | University of North Texas (UNTHSC), University of Southern California, University of California, San Francisco | 2017 | No | South | Mexican | Non-demented | ≥ 50 years |
| UC Davis clinical cohort studies | ADRD | University of California at Davis | 2003 | No | West | All Latinxs | Normal cognition, mild cognitive impairment (MCI) or dementia | ≥ 60 years |
| Facing Rural Obstacles to health Now Through Intervention, Education & Research (Project FRONTIER) | General health issues | Texas Tech University (TTUHSC) | 2006 | No | Rural South | Mexican | Persons with mild cognitive impairment (MCI) or dementia; normal controls | ≥ 40 years |
| Hispanic Community Health Study/Study of Latinos (SOL) & Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA) | Acculturation and disease Aging, disease, and cognition | San Diego State University/ University of California San Diego, University of Illinois at Chicago/Northwestern University, Yeshiva University, University of Miami, University of North Carolina | 2008 2015 | Yes | Southwest, Midwest, Mid-Atlantic, Southeast | Cuban, Puerto Rican, Dominican, Mexican, and Central/South American | Non-demented | 18–74 years |
| Sacramento Area Latino Study on Aging (SALSA) | Physcial and cognitive impairment and disease | University of California, San Francisco | 1996 | Yes | West | Mexican | No exclusion criteria | ≥ 60 years |
| Hispanic Established Population for the Epidemiological Study of the Elderly (H- EPESE) | Physical and mental health conditions, and functional impairments | University of Texas Medical Branch | 1993 | Yes | South, Southwest, Mountain | Mexican | Non-demented (cognition a sub-aim of study) | ≥ 65 years |

| Study Name | Focus of Grant | Home University | Start date | Only Latinx Participants | Geographic Region | Latinx Background | Cognitive Status | Age |
|---|---|---|---|---|---|---|---|---|
| Mexican Health and Aging Study (MHAS) | Aging, disease, and disability | University of Texas Medical Branch (UTMB), the Instituto Nacional de Estadistica y Geografia (INEGI, Mexico), the University of Wisconsin, the Instituto Nacional de Geriatria (INGER, Mexico), the Instituto Nacional de Salud Publica (INSP, Mexico), and University of California Los Angeles (UCLA) | 2001 | Yes | Mexico | Mexican | Non-demented (cognition a sub-aim of study) | ≥ 50 years |
| Latinx Cohort Studies | Aging, health, and cognition | Rush University | 2015 | Yes | Midwest, New York, New Orleans San Antonio | All Latinxs; primarily Mexican | No known dementia | ≥ 60 years |

**Table 2.**

Baseline demographic characteristics of participants across RADC cohort studies

| | Latinx % or M (SD) | Non-Latinx Whites % or M (SD) | Non-Latinx Blacks % or M (SD) | Non-Latinx Other Race % or M (SD) |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| Age[adef] | 72.22 (7.66) | 79.03 (7.45) | 73.31 (6.75) | 77.54 (7.69) |
| Female (%)[bd] | 78.3 | 71.9 | 78.8 | 70.0 |
| Education (years)[adef] | 11.58 (5.34) | 16.57 (3.55) | 14.79 (3.43) | 15.07 (3.39) |
| Tested in Spanish (%) | 58.0 | 0 | 0 | 0 |
| Planned brain donation (%)[bde] | 62.8 | 100 | 58.1 | 80.0 |

[a]Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b]Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c]Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d]Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e]Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f]Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.

**Table 3.**

Baseline psychological, experiential, and medical risk factor characteristics of participants across RADC cohort studies

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| Personality (M, SD) | | | | |
| Neuroticism[ade] | 18.2 (5.7) | 15.7 (6.6) | 14.5 (6.3) | 15.6 (5.5) |
| Extroversion | 15.2 (2.6) | 15.5 (3.1) | 15.6 (3.2) | 15.6 (2.8) |
| CES-D Scale[cd] (M, SD) | 1.8 (2.3) | 1.0 (1.5) | 1.4 (1.8) | 0.6 (1.0) |
| Family history of dementia (%) | | | | |
| Mother | | | | |
| Yes | 20.8 | 21.3 | 20.2 | 8.3 |
| Possible/suspect | 4.0 | 3.8 | 3.4 | 12.5 |
| No | 75.2 | 74.9 | 76.4 | 79.2 |
| Father | | | | |
| Yes | 7.5 | 11.7 | 9.1 | 0 |
| Possible/suspect | 3.1 | 4.0 | 3.5 | 8.3 |
| No | 89.4 | 84.4 | 87.4 | 91.7 |
| Cognitive (M, SD) | | | | |
| Current activity[cde] | 2.5 (0.7) | 3.2 (0.7) | 2.9 (0.6) | 3.0 (0.8) |
| Past activity[cde] | 2.5 (0.8) | 3.0 (0.7) | 3.1 (0.7) | 2.8 (0.7) |
| Resources[cde] | 6.4 (3.7) | 10.5 (3.0) | 9.8 (3.1) | 9.0 (4.9) |
| Parental education[cde] | 6.0 (4.2) | 9.9 (3.5) | 8.9 (3.6) | 8.5 (4.6) |
| Physical (M, SD) | | | | |
| Current activity[ce] | 3.8 (4.8) | 3.1 (3.7) | 2.5 (4.0) | 3.8 (4.1) |
| Social (all current) (M, SD) | | | | |
| Social networks[c] | 6.5 (5.3) | 7.6 (7.6) | 6.3 (5.8) | 6.9 (7.7) |
| Social activity[cde] | 2.5 (0.6) | 2.6 (0.6) | 2.7 (0.6) | 2.6 (0.7) |
| Social isolation[cde] | 2.5 (0.7) | 2.2 (0.6) | 2.1 (0.6) | 2.5 (0.6) |
| | | | | |
| Head blow experienced (BISQ)[bd] (%) | 42.4 | 50.1 | 44.4 | 31.5 |
| Hypertension[bde] (%) | 61.0 | 48.1 | 74.7 | 63.3 |
| Myocardial infarction (%) | 5.8 | 9.7 | 8.0 | 10.3 |
| Congestive heart failure (%) | 3.8 | 4.9 | 6.2 | 4.6 |
| Cancer[bd] (%) | 18.7 | 32.8 | 25.2 | 12.5 |
| Incontinence (≥ several/week)[be] (%) | 45.3 | 51.6 | 34.2 | 50.0 |

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| Broken hip (%) | 3.2 | 5.2 | 2.0 | 4.4 |
| Joint pain (%) | 42.0 | 41.9 | 45.7 | 34.6 |
| Neck pain[bd] (%) | 26.8 | 15.9 | 17.1 | 13.6 |
| Visual acuity[cde] (%) | | | | |
| 20/40 | 53.1 | 74.0 | 69.9 | 62.5 |
| 20/50 | 21.6 | 12.9 | 14.8 | 16.7 |
| < 20/50 | 25.3 | 13.3 | 15.3 | 20.8 |
| Adequate gross auditory function (%) | 89.0 | 88.9 | 89.9 | 93.8 |
| | | | | |
| Smoker (ever)[be] (%) | 29.1 | 33.1 | 44.9 | 33.3 |
| Smoker (current)[bde] (%) | 3.9 | 1.8 | 7.9 | 3.3 |
| Alcohol use (≥1 drink/day)[bd] (%) | 4.0 | 8.2 | 5.0 | 4.2 |
| | | | | |
| Systolic blood pressure[ae] (M, SD) | 132.3 (19.5) | 134.1 (18.1) | 137.9 (20.5) | 132.6 (19.9) |
| Diastolic blood pressure[ade] (M, SD) | 77.2 (11) | 74.2 (11.0) | 80.1 (12.1) | 76.2 (12.2) |
| Body mass index[adf] (M, SD) | 29.6 (5.8) | 27.3 (5.5) | 30.2 (6.5) | 26.3 (5.6) |
| | | | | |
| Serum (MCG) (M, SD) | 5444.0 (1449.7) | 4915.7 (1608.1) | 5130.6 (1738.4) | 5370.4 (1244.9) |
| Plasma (MCG) (M, SD) | 6255.8 (1713.9) | 6077.6 (1841.8) | 6369.4 (1652.3) | 6200.0 (1925.7) |
| Cryo PBMC (MCG) (M, SD) | 5.6 (5.0) | 6.4 (12.0) | 7.5 (5.1) | 6.3 (4.3) |

[a] Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b] Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c] Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d] Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e] Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f] Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.

**Table 4.**

Baseline self-report disability of participants across RADC cohort studies

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| Katz scale[c] (M, SD) | 0.2 (0.7) | 0.2 (0.7) | 0.1 (0.5) | 0.4 (1.0) |
| Rosow/Breslau scale[cd] (M, SD) | 0.5 (0.9) | 0.7 (1.0) | 0.7 (0.9) | 0.9 (1.2) |
| IADL scale[cd] (M, SD) | 0.9 (1.6) | 1.0 (1.6) | 0.6 (1.2) | 1.1 (1.9) |
| Life space[cde] (M, SD) | 5.1 (1.3) | 5.4 (1.1) | 5.5 (0.9) | 5.1 (1.6) |
| Driving ≥1/week (%) | 94.7 | 93.6 | 95.0 | 88.9 |

[a] Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b] Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c] Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d] Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e] Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f] Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.

**Table 5.**

Baseline cognitive test performance of participants across RADC cohort studies

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| MMSE[cde] (M, SD) | 27.5 (2.9) | 27.8 (3.0) | 27.5 (2.8) | 26.9 (2.3) |
| Episodic memory (M, SD) | | | | |
| Logical memory Ia[cd] | 9.8 (4.1) | 11.1 (4.5) | 10.1 (2.0) | 9.6 (3.9) |
| Logical memory IIa[cd] | 8.3 (4.2) | 9.4 (4.7) | 8.4 (2.4) | 7.5 (4.3) |
| East Boston Immediate recall[cd] | 9.2 (2.0) | 9.5 (2.0) | 9.2 (2.0) | 8.6 (2.2) |
| East Boston Delayed recall[cd] | 8.7 (2.3) | 9.0 (2.6) | 8.7 (2.4) | 8.8 (1.5) |
| Word list memory[cde] | 15.5 (4.3) | 17.3 (4.7) | 17.6 (4.3) | 16.3 (4.5) |
| Word list recall[cde] | 4.9 (2.2) | 5.3 (2.5) | 5.4 (2.3) | 5.4 (2.5) |
| Word list recognition | 9.6 (1.2) | 9.4 (1.5) | 9.5 (1.3) | 9.3 (2.0) |
| Semantic memory (M, SD) | | | | |
| Boston Naming Test[cde] | 12.8 (2.0) | 13.7 (1.6) | 13.2 (2.0) | 13.4 (1.9) |
| Verbal fluency[cd] | 32.4 (8.3) | 34.0 (10.0) | 31.9 (8.7) | 28.8 (9.0) |
| Reading test[cd] | 6.0 (2.7) | 8.2 (2.1) | 5.8 (3.0) | 6.9 (2.6) |
| Working memory (M, SD) | | | | |
| Digit span forward[cde] | 6.1 (2.3) | 8.3 (2.0) | 8.0 (2.0) | 6.9 (1.8) |
| Digit span backward[cde] | 4.6 (1.9) | 6.2 (2.1) | 5.3 (2.0) | 4.6 (1.3) |
| Digit ordering[cde] | 6.2 (1.8) | 7.2 (2.1) | 6.5 (1.7) | 6.4 (1.7) |
| Perceptual speed (M, SD) | | | | |
| Symbol digit[cde] | 32.1 (13.4) | 38.9 (11.6) | 35.8 (11.9) | 32.3 (13.0) |
| Number comparison[cde] | 20.6 (8.2) | 24.9 (7.5) | 22.9 (7.6) | 23.1 (6.0) |
| Stroop word reading[cef] | 51.7 (13.1) | 50.1 (13.3) | 47.7 (13.6) | 42.0 (11.2) |
| Stroop color naming[ce] | 18.6 (8.0) | 18.7 (7.7) | 16.3 (7.8) | 17.0 (6.4) |
| Visuospatial ability (M, SD) | | | | |
| Line orientation[cd] | 8.2 (3.3) | 10.1 (3.1) | 7.7 (3.3) | 9.5 (3.0) |
| Prog matrices[cd] | 9.9 (3.0) | 11.3 (3.1) | 10.1 (3.0) | 10.1 (3.4) |
| Composite measures (z- scores) (M, SD) | | | | |
| Global cognition[ade] | −0.1 (0.6) | 0.9 (0.7) | −0.1 (0.6) | −0.3 (0.5) |
| Episodic memory[ad] | −0.04 (0.7) | 0.03 (0.8) | 0.03 (0.7) | −0.15 (0.7) |
| Semantic memory[ad] | −0.3 (0.9) | 0.1 (0.9) | −0.2 (0.9) | −0.3 (0.9) |

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| Working memory[ade] | −0.6 (0.8) | 0.1 (0.8) | −0.2 (0.7) | −0.5 (0.6) |
| Perceptual speed[ade] | −0.5 (1.0) | 0.1 (0.9) | −0.1 (0.9) | −0.4 (1.0) |
| Visuospatial ability[ad] | −0.3 (0.8) | 0.2 (0.8) | −0.4 (0.8) | −0.2 (0.9) |

[a] Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b] Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c] Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d] Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e] Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f] Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.

**Table 6.**

Baseline motor performance tests of participants across RADC cohort studies

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| Lower limb function (M, SD) | | | | |
| Walking speed[ade] | 0.5 (0.2) | 0.6 (0.2) | 0.6 (0.2) | 0.6 (0.2) |
| Turning speed[ade] | 0.2 (0.1) | 0.2 (0.1) | 0.2 (0.1) | 0.2 (0.1) |
| Errors on tandem[c] | 1.5 (2.0) | 1.9 (2.6) | 1.5 (2.1) | 1.4 (1.8) |
| Upper limb function (M, SD) | | | | |
| Finger tapping | 53.9 (9.6) | 55.2 (8.6) | 54.8 (8.9) | 51.6 (9.1) |
| Purdue pegboard[adef] | 11.7 (2.3) | 10.3 (2.5) | 11.0 (2.5) | 9.6 (2.6) |
| Grip strength[adef] | 45.5 (17.5) | 46.9 (19.1) | 56.1 (19.7) | 41.9 (14.6) |
| Pinch strength[ade] | 12.2 (4.5) | 11.2 (4.9) | 13.9 (5.3) | 9.8 (4.6) |
| Global motor score[ae] (M, SD) | 1.0 (0.2) | 1.0 (0.2) | 1.1 (0.2) | 0.9 (0.2) |
| | | | | |
| Modified UPDRS score (M, SD) | | | | |
| Total mUPDRS[cde] | 5.7 (7.1) | 7.7 (7.5) | 3.4 (4.7) | 5.7 (6.6) |
| Bradykinesia[cde] | 8.4 (12.0) | 10.6 (12.0) | 5.6 (9.7) | 5.8 (8.6) |
| Parkinsonian gait[cde] | 10.3 (13.7) | 14.7 (15.4) | 6.4 (10.5) | 13.8 (16.4) |
| Rigidity[ce] | 2.2 (6.1) | 2.9 (7.8) | 0.7 (3.1) | 1.7 (4.2) |
| Tremor[cde] | 1.7 (4.8) | 2.7 (5.5) | 0.6 (2.7) | 1.7 (4.0) |

[a]Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b]Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c]Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d]Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e]Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f]Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.

**Table 7.**

Baseline diagnostic classification of participants across RADC cohort studies

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| Dementia (%) | 4.8 | 5.8 | 4.2 | 6.7 |
| Mild cognitive impairment (%) | 25.1 | 24.0 | 22.5 | 23.3 |
| Stroke (%) | 6.3 | 8.3 | 6.3 | 14.3 |
| Parkinson's disease[b] (%) | 2.6 | 3.0 | 1.1 | 0 |

[a] Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b] Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c] Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d] Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e] Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f] Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.

**Table 8.**

Baseline acculturation and cultural factors of participants across RADC cohort studies

| | Latinx | Non-Latinx Whites | Non-Latinx Blacks | Non-Latinx Other Race |
|---|---|---|---|---|
| N | 415 | 3191 | 1302 | 30 |
| Country of birth[b] (%) | | | | |
| USA[def] | 28.5 | 96.5 | 98.6 | 70.4 |
| Colombia | 1.7 | 0.03 | 0 | 0 |
| Costa Rica | 0 | 0.03 | 0 | 0 |
| Cuba | 0.5 | 0 | 0 | 0 |
| Ecuador | 1.5 | 0 | 0 | 0 |
| El Salvador | 0.2 | 0 | 0 | 0 |
| Guatemala | 0.7 | 0 | 0 | 0 |
| Honduras | 1.2 | 0 | 0 | 0 |
| Mexico | 30.0 | 0 | 0 | 0 |
| Peru | 0.7 | 0 | 0 | 0 |
| Puerto Rico | 9.5 | 0 | 0 | 0 |
| Other | 25.4 | 3.5 | 1.4 | 29.6 |
| Years lived in mainland US (M, SD) | 42.5 (15.6) | | | |
| SASH acculturation (M, SD) | | | | |
| Language | 2.2 (1.2) | - | - | - |
| Social | 2.4 (0.8) | - | - | - |
| Total | 2.2 (1.0) | - | - | - |
| Familism (M, SD) | 21.1 (4.6) | - | - | - |

[a] Difference noted among categories or among ethnic/racial groups on ANOVA ($p < .01$)

[b] Difference noted among categories or among ethnic/racial groups on $\chi^2$ test ($p < .01$)

[c] Difference noted among categories or among ethnic/racial groups on Kruskal-Wallis ($p < .01$)

[d] Difference noted between Latinx-Non-Latinx Whites ($p < .05$)

[e] Difference noted between Latinx-Non-Latinx Blacks ($p < .05$)

[f] Difference noted between Latinx-Non-Latinx Other Race ($p < .05$)

Note: Other Races include American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian.