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Two-Year Longitudinal Outcomes of Subjective Cognitive Decline in Hispanics Compared to Non-hispanic Whites

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Abstract

Background: Subjective cognitive decline (SCD), considered a preclinical dementia stage, is less understood in Hispanics, a high-risk group for dementia. We investigated SCD to mild cognitive impairment (MCI) progression risk, as well as baseline and longitudinal features of depressive symptoms, SCD complaints, and objective cognitive performance among Hispanics compared to non-Hispanic Whites (NHW).

Methods: Hispanic (n = 23) and NHW (n = 165) SCD participants were evaluated at baseline and 2-year follow-up. Evaluations assessed function, depressive symptoms, SCD, and objective cognitive performance.

Results: Hispanics were at increased risk of progression to MCI (OR: 6.10, 95% CI 1.09–34.20, $P = .040$). Hispanic participants endorsed more depressive symptoms at baseline ($P = .048$) that

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worsened more longitudinally (OR: 3.16, 95% CI 1.18–8.51, $P = .023$). Hispanic participants had increased SCD complaints on the Brief Cognitive Rating Scale (BCRS) ($\beta = .40$ SE: .17, $P = .023$), and in specific BCRS domains: concentration ($\beta = .13$, SE: .07, $P = .047$), past memory ($\beta = .13$, SE: .06, $P = .039$) and functional abilities ($\beta = .10$, SE: .05, $P = .037$). In objective cognitive performance, Hispanic ethnicity associated with decline in MMSE ($\beta = -.27$, SE: .13, $P = .039$), MoCA ($\beta = -.80$ SE: .34, $P = .032$), Trails A ($\beta = 2.75$, SE: .89, $P = .002$), Trails B ($\beta = 9.18$, SE: 2.71, $P = .001$) and Guild Paragraph Recall Delayed ($\beta = -.80$ SE: .28, $P = .005$).

Conclusions: Hispanic ethnicity associated with a significantly increased risk of 2-year progression of SCD to MCI compared to NHW. This increased risk associated with increased depressive symptoms, distinctive SCD features, and elevated amnestic and non-amnestic objective cognitive decline. This supports further research to refine the assessment of preclinical dementia in this high-risk group.

Keywords

subjective cognitive decline; longitudinal studies; hispanic ethnicity; cognition; mild cognitive impairment; Alzheimer's disease

Introduction

Hispanics comprise the largest minority group in the United States^{1–4}, with the fastest growing population among those aged 65 years and older.³ Older Hispanics are at an increased risk of developing mild cognitive impairment (MCI) and Alzheimer's disease (AD) and AD-related dementias (ADRD) compared to non-Hispanic Whites (NHW)^{5–8} and are more likely to be diagnosed at more advanced stages of the disease.^{9,10} Despite these reports, there continues to be a lack of research on Hispanic populations,^{11,12} representing a challenge in clinical and research settings due to cultural and socioeconomic barriers.^{10,13} These trends motivate a better understanding of early stages of AD/ADRD in the Hispanic population.

Subjective cognitive decline (SCD), a self-reported experience of diminished cognitive abilities despite normal performance, associates with a higher risk for cognitive and functional decline and related AD/ADRD biomarkers,¹⁴ and thus may be considered a preclinical stage.^{15–26} Studies of Hispanic populations living in the U.S. suggests that although SCD rates are comparable to NHWs,^{12,19,24,27} it may develop at younger ages.^{27,28} Higher SCD severity has also been associated with lower global objective cognitive performance in Hispanics.^{11,12} Factors that may influence these findings include concurrent depression^{13,29} as well as limited education, income, and access to health care.^{27,28,30}

Despite these findings, there remain many important open questions about SCD in Hispanics,¹² as it may be expressed differently based on cultural and ethnic background¹⁵ and may have specific features and outcomes.^{11,29,31} This highlights the importance of characterizing the natural history of SCD and its capacity to predict cognitive decline in the Hispanic population,¹¹ in light of an increasing need to improve risk assessment and monitoring in this vulnerable group, especially in native Spanish-speaking populations.¹³

Moreover, the AD trial field has increasingly focused on preclinical stages, demonstrating the importance of developing better measures to detect and track preclinical progression in individuals with diverse racial and ethnic backgrounds.^{32,33} SCD assessment may be a useful tool for recruitment or for determining clinical efficacy of new drugs.³⁴

Motivated by this, we analyzed baseline characteristics and progression risk from SCD to MCI over a 2-year period, an interval relevant to clinical trials and a period during which other studies of SCD in Hispanic cohorts have also noted changes.^{23,35} We also compared baseline and longitudinal changes in SCD phenotype, cognitive performance, and depressive symptoms among Hispanics compared to NHW.

Methods

Consent Statement

This study was an analysis of data collected from participants in the New York University Alzheimer's Disease Research Center (NYU ADRC) longitudinal study, which is approved by the Institutional Review Board of the NYU School of Medicine. All subjects provided informed consent.

Data Source and Participants

Analysis included de-identified data from middle to older age (46–87 years old) participants seen between 2006 and 2019 at the NYU ADRC. Participants were recruited from the community via events, advertisements, and physician referral. ADRC inclusion criteria were having a study partner, fluency of participant and study partner in English or Spanish, and willingness to undergo phlebotomy and neuroimaging. ADRC exclusion criteria were major neurological disease (other than Alzheimer's disease and related disorders), severe psychiatric illness, HIV/AIDS, organ failure/transplant, severe autoimmune disease, alcohol/recreational drug abuse, and significant malignancy within 5 years. Participants underwent annual evaluation using the National Alzheimer's Coordinating Center Uniform Data Set (NACC UDS) and additional measures. Consensus diagnoses were determined by a team of physicians and neuropsychologists.

From this resulting dataset, participants were further selected for this analysis if they self-identified as Hispanic or NHW, had their first visit between 2006 and 2019 with a consensus diagnosis of normal cognition with SCD based on the Global Deterioration Scale,³⁶ and had a 2-year follow-up. While NACC UDS underwent modifications during this period, we chose to analyze a subset of surveys and tests that were consistently done at each visit in order to minimize missing values.

Procedure and Measures

Participants completed a comprehensive neuropsychological assessment and a clinical evaluation. SCD characteristics were measured by the Brief Cognitive Rating Scale (BCRS).³⁷ The presence of depressive symptoms was assessed by the total score of the short version of the Geriatric Depression Scale (GDS).³⁸ Objective cognitive performance was evaluated by a neuropsychological battery of tests to assess global cognition, attention,

processing speed, executive function, memory, and language. This battery included the Montreal Cognitive Assessment (MoCA),³⁹ Mini-Mental State Examination (MMSE),⁴⁰ and the NACC UDS⁴¹ subtests: Digit Symbol Substitution Test (DSST), Trail Making Test A and B (Trails A and B), semantic verbal fluency (Animals and Vegetables), and the Guild Memory Test's Paragraph Recall - Immediate and Delayed (PARI, PARD) and geometric design recall (Designs).⁴² (See Supplemental Table 1)

Statistical Analyses

Cross-sectional and longitudinal analyses were performed on participants enrolled. Descriptive statistics were used to summarize the demographic characteristics of the sample, including mean and standard deviation (SD) for continuous variables and counts and percentages for categorical variables. Those characteristics were compared between Hispanics and NHW using chi-square tests or Fisher exact tests for categorical variables and two-sample t-tests for continuous variables.

We conducted preliminary power analyses for detecting potential mean difference between the objective cognitive performance among the study subjects with SCD of Hispanics vs NHW. Our study has comparable sample size with some of the recently published studies such as the cross-sectional study reported by Nakhla M et al (2021),¹² where within the Latino group, self-reported SCD was related to lowered objective cognition measured using MDRS scores in linear regression ($r = -.672$, $P = .001$). We have data at both baseline and at 2-year follow-up at NYU ADRC. Preliminary power analyses using a two-sample t test indicate that we have power >85% at 5% significance level to distinguish the baseline as well as follow-up objective cognitive performance scores between 23 Hispanics and 165 NHW in MMSE, DDST, Trails A, Trails B and Guild PARD. Preliminary results (see Table 5 of this manuscript) indicated that Hispanics ethnicity was indeed significant ($P \leq .001$) in linear regression models of these objective cognitive performance scores at follow-up. These differential objective cognitive performance scores between Hispanics and NHW SCD subjects motivated our further investigation for the SCD rate of progression to MCI at 2-year, as well as baseline features and longitudinal outcomes of SCD complaints, objective cognitive performance and depressive symptoms among Hispanics compared to NHW.

In that sense, to study whether Hispanic ethnicity was associated with baseline or follow-up scores, slope of score change (changes in the scores using follow-up year's score minus baseline score divided by duration of its follow-up) or decline status longitudinally (performance decline = 1, no change or better = 0), we applied multiple linear regression or logistic regression models depending on the types of the response variables. To establish a more accurate cross-sectional and longitudinal analysis of our data, regression models were adjusted for age, sex, education level, GDS scores, and/or baseline values of each individual test being examined. All statistical analyses were performed using R, version 4.2.1 (R Core Team, Vienna, Austria), and P values <.05 were considered significant.

Results

Demographic Characteristics

A total of 188 participants met the inclusion criteria, including Hispanic ($n = 23$) and NHW ($n = 165$) groups. Basic participant demographic data are shown in Table 1. Hispanic participants were younger than NHW (63.32 ± 7.27 vs 67.61 ± 7.24 ; $P = .009$) and had on average 1.9 fewer years of formal education (15.17 ± 3.05 vs 17.10 ± 2.16 , $P < .001$). The overall cohort was comprised mostly by women. Average follow-up interval was $2.27 \pm .31$ years, with no statistically significant difference between the two groups ($P = .473$).

Progression from SCD to MCI

As shown in Table 2, Hispanic ethnicity associated with a higher risk for progression from SCD to MCI during the 2-year follow-up, (Model 1: OR: 6.10, 95% CI 1.09–34.20, $P = .040$). This effect was attenuated when baseline GDS score (Model 2: OR 4.62, 95% CI .80–26.56, $P = .086$) or change in MMSE (Model 3: OR 5.98, 95% CI 1.00–35.565, $P = .050$) was added to the model. This suggests that depressive symptoms and cognitive decline may influence the increased SCD→MCI progression risk in Hispanic participants.

Depressive Symptoms

We analyzed possible differences in the presence of depressive symptoms, the characteristics of symptomatology and change over time in Hispanic vs NHW participants, considering previous literature describing a stronger association between depressive symptoms and SCD in the former. Analyses demonstrated that Hispanic ethnicity associated with higher scores on the GDS at baseline ($\beta = .82$, SE: .41, $P = .048$), and at follow-up ($\beta = 1.15$, SE: .45, $P = .010$), as shown in Table 3. Moreover, results showed that Hispanic participants at baseline were more likely to report dropping activities (OR: 3.86, 95% CI 1.01–14.71 $P = .048$) and boredom (OR: 10.34, 95% CI 2.06–51.80, $P = .005$). At follow-up, Hispanic participants also were more likely to report memory loss (OR: 5.74, 95% CI 1.28–25.74, $P = .023$) in addition to dropping of activities (OR: 14.49, 95% CI 3.72–56.52, $P < .001$) and boredom (OR: 5.30, 95% CI 1.19–23.49, $P = .028$). Longitudinally, Hispanics had a higher likelihood for the GDS score to increase during the interval period (OR: 3.16, 95% CI 1.18–8.51, $P = .023$). Across items, Hispanic participants had a higher risk to newly report dropping activities upon follow-up (OR: 13.28, 95% CI 1.80–97.80, $P = .011$).

SCD Characteristics

To examine the impact of Hispanic ethnicity on SCD, we analyzed the first 5 items of traditional BCRS as well as additional 3 items of the expanded BCRS that rated subjective concerns, as shown in Table 4. Importantly, models were adjusted for depressive symptoms. At baseline, there was no difference in the BCRS 1–5 total score. However, analyzing specific items showed that Hispanic participants reported statistically higher cognitive concerns in concentration ($\beta = .70$, SE: .15, $P < .001$) but less concerns than NHW in recent memory ($\beta = -.16$, SE: .07, $P = .026$). At follow-up, only the increased concern about concentration remained ($\beta = .47$, SE: .15, $P = .002$). Also, Hispanic ethnicity associated with an increase in the total BCRS score ($\beta = .40$, SE: .17, $P = .023$), and in the specific BCRS

domains of concentration ($\beta = .13$, SE: .07, $P = .047$), past memory ($\beta = .13$, SE: .06, $P = .039$) and functional abilities ($\beta = .10$, SE: .05, $P = .037$).

Objective Cognitive Performance

As shown in Table 5, the Hispanic cohort reported lower baseline performance on measures of global cognition and domain-specific tests: MMSE ($\beta = -1.17$, SE: .32, $P = .003$), DSST ($\beta = -13.82$, SE: 2.78, $P < .001$), Trails A ($\beta = 11.40$, SE: 2.31, $P < .001$) and Trails B ($\beta = 39.95$, SE: 7.64, $P < .001$), Verbal fluency on Animals ($\beta = -2.98$, SE: 1.31, $P = .024$) and Vegetables ($\beta = -2.61$, SE: .93, $P = .005$), Guild Delayed Paragraph Recall ($\beta = -2.09$, SE: .76, $P = .006$), and Guild Designs ($\beta = -1.18$, SE: .54, $P = .029$). On follow-up, lower performance was also associated with Hispanic ethnicity in these same tests, except Verbal fluency on Animals and Guild Designs, and the inclusion of Guild Immediate Paragraph Recall ($\beta = -1.54$, SE: .59, $P = .010$).

We then analyzed if Hispanic ethnicity was associated with worsening performance in those tests longitudinally, beyond lower performance from baseline. As shown in Table 6, the adjusted score change (or slope of score change) for Hispanic ethnicity was significantly associated with lower performance over time in the MMSE ($\beta = -.27$, SE: .13, $P = .039$), MoCA ($\beta = -.80$, SE: .34, $P = .032$), Trails A ($\beta = 2.75$, SE: .89, $P = .002$), Trails B ($\beta = 9.18$, SE: 2.71, $P = .001$) and Guild Paragraph Recall Delayed ($\beta = -.80$, SE: .28, $P = .005$).

Discussion

We found that Hispanic ethnicity associated with higher levels of SCD over time and with higher risk of progression from SCD to MCI in a two-year period. Similar results were reported by Chapman et al.⁴³ in which Latinx participants reported levels of SCD and had the greatest likelihood of progressing to dementia compared with non-Latinx Black and non-Latinx White participants. Previous cross-sectional studies yielded conflicting findings on the role of depression, reporting that SCD in older Hispanics was likely more reflective of depression²⁹ or objective global cognition.¹² Our Hispanic sample reported higher rates of depressive symptomatology with an increased tendency to worsen in time. We found that increased SCD→MCI progression risk in this population was possibly influenced by depressive symptoms. However, as discussed later, decline in objective cognition was higher in Hispanics even after adjusting for depressive symptomatology. As such, further studies are needed to address the role of depressive symptoms in impacting progression to MCI.

Moreover, we found that SCD complaints manifest differently between Hispanic and NHW participants. Unlike the typical amnesic complaints in NHW SCD populations, as similarly reported in other studies,⁴⁴ in our study the Hispanic cohort reported more attentional difficulties at baseline and in time had a worsening perception of long-term memory and functional abilities. This suggest that multi-domain SCD assessments may be critical to detection and tracking the preclinical stage in this population.

Our findings are consistent with prior studies of objective cognitive performance in Hispanic populations,^{11,31} where Hispanics with SCD had lower baseline performance and more decline in attention-, executive-, and memory-related tests, independent of

depressive symptomatology. Interestingly, we additionally found that the greater decline in memory was not reflected in subjective ratings, which could be partially related to impaired self-awareness that can accompany early AD states.⁴⁵ What do these patterns suggest as the etiology of worsened decline in the Hispanic population? The amnesic and dysexecutive pattern suggests that AD and cerebrovascular processes may be primary drivers, respectively. Of note, biomarker studies have reported lower amyloid positivity rates among Hispanics diagnosed with AD and MCI, compared to NHWs,^{46–48} yet higher levels of the plasma total tau,⁴⁹ a non-specific marker of neurodegeneration. This may highlight the increased importance of non-AD processes as drivers of neurodegeneration and cognitive decline in this population, such as cerebrovascular disease, as others have argued.^{49,50} Alternatively, a lower level of amyloidosis may be enough to trigger subsequent tauopathy and neurodegeneration in this population. Future work in this population is needed to define which AD/ADRD biomarkers relate to this SCD phenotype⁵¹ and track with this pattern of cognitive decline towards MCI.^{52–54}

Our study had multiple strengths and some limitations. Strengths included broad psychometric testing, in-depth phenotyping of SCD complaints and related depressive symptoms, diagnosis by consensus conference, uniform follow-up window, and a follow-up window that has applicability to interventional trials. Limitations include the following. First, the smaller sample size of the Hispanic subjects that met the inclusion criteria limited our ability to assess for sex differences or country of origin, and in some cases may have influenced lack of statistical significance in the statistical models. Second, our sample lacked AD related biomarkers or genetic risk factors, and their interaction with other comorbidities involved in the AD process.⁵⁵ Third, the two populations may have been recruited in different ways, which could drive bias in terms of self-awareness of cognitive complaints.¹⁵ Lastly, longitudinal analyses were limited to participants who had a 2-year follow-up, which may bias towards a particular subset of participants willing to adhere to more such follow-up intervals.

Overall, our study highlights the importance of further research on SCD to address its potential for risk assessment and monitoring of preclinical stages of AD/ADRD in Hispanic persons. This is especially critical given our finding of an increased SCD to MCI conversion rate in this population. Our findings of distinctive baseline and longitudinal features of depressive symptoms, SCD characteristics, and objective cognitive performance suggest that population-specific evaluations of SCD are needed to detect and track vulnerable persons in this high-risk group.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data Availability Statement

The data supporting the findings of this study are available within the article and/or its supplementary material.

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Table 1.

Demographic Characteristics.

Variables	Total (n = 188)		Hispanic (n = 23)		NHW (n = 165)		P-value
	Mean (SD)		Mean (SD)		Mean (SD)		
Age	67.08 (7.36)		63.32 (7.27)		67.61 (7.24)		.009
Education, years	16.87 (2.36)		15.17 (3.05)		17.10 (2.16)		<.001
Follow-up, years	2.27 (.31)		2.23 (.29)		2.28 (.31)		.473
Sex	N (%)		N (%)		N (%)		
Female	149 (79.3)		22 (95.7)		127 (77.0)		.051
Male	39 (20.7)		1 (4.3)		38 (23.0)		

SD: standard deviation. Bold indicates statistical significance.

Table 2.
SCD to MCI Conversion Analysis Using Logistic Regression.

Model	Hispanic	
	OR [95% CI]	P-value
Logistic model 1 ^a	6.10 [1.09–34.20]	.040
Logistic model 2 ^b	4.62 [.80–26.56]	.086
Logistic model 3 ^c	5.98 [1.00–35.65]	.050

OR: odds ratio for Hispanic ethnicity, CI: confidence Interval. Bold indicates statistical significance.

^a Adjusted for age, sex, education level, and time to follow-up.

^b Adjusted for age, sex, education level, time to follow-up, and baseline GDS score.

^c Adjusted for age, sex, education level, and adjusted score change of MMSE.

Table 3.

Geriatric Depression Scale (GDS) Analysis.

Items	Baseline analysis (Yes/No) ^a			Follow-up analysis (Yes/No) ^a			Item worsening (Yes/No) ^b		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Item 1. Satisfaction	1.41	.35 – 5.67	.481	1.07	.29 – 3.92	.920	.61	.10 – 3.70	.590
Item 2. Drop activities	3.86	1.01 – 14.71	.048	14.49	3.72 – 56.52	.001	13.28	1.80 – 97.80	.011
Item 3. Emptiness	1.91	.37 – 9.85	.440	2.70	.56 – 13.05	.217	2.97	.44 – 20.07	.264
Item 4. Boredom	10.34	2.06 – 51.80	.005	5.30	1.19 – 23.49	.028	2.51	.37 – 17.07	.347
Item 5. Good mood	1.67	.17–16.17	.660	3.16	.70 – 14.28	.134	1.85	.29 – 11.74	.513
Item 6. Afraid	3.46	.92 – 13.07	.067	3.23	.98 – 10.67	.055	1.56	.34 – 7.20	.570
Item 7. Happiness	1.24	.24 – 6.47	.798	2.01	.56 – 7.22	.287	2.06	.45 – 9.50	.354
Item 8. Helplessness	1.48	.29 – 7.56	.640	2.64	.58 – 12.09	.212	1.93	.18 – 21.13	.591
Item 9. Stay home	2.66	.70 – 10.11	.151	1.65	.37 – 7.30	.511	<.0001	-	.994
Item 10. Memory problems	1.89	.42 – 8.49	.409	5.74	1.28 – 25.74	.023	5.15	.60 – 44.29	.135
Item 11. Alive	<.001	-	.994	.98	.08 – 11.55	.987	1.20	.09 – 16.54	.890
Item 12. Feel worthless	<.001	-	.998	<.001	-	.997	<.001	-	.999
Item 13. Energy	1.08	.28 – 4.20	.914	.78	.23 – 2.73	.703	.89	.19 – 4.26	.888
Item 14. Hopelessness	0	-	1	3.50	.12 – 102.46	.467	.001	-	.999
Item 15. Worse than others	1.87	.22 – 15.68	.565	3.34	.37 – 29.91	.281	>100	-	.995
Total GDS score		.82 (.41)	.048		1.15 (.45)	.010	3.16	1.18 – 8.51	.023

OR: odds ratio for Hispanic ethnicity, CI: confidence interval, Effect: effect of Hispanic ethnicity, SE: standard error. Bold indicates statistical significance.

^aLogistic model for Hispanic ethnicity adjusted for age, sex and education level.

^bLogistic model for Hispanic ethnicity adjusted for age, sex, education level, baseline GDS score and time to follow-up.

^cLinear model for total GDS score to assess effect of Hispanic ethnicity adjusted for age, sex and education level.

Table 4.

Brief Cognitive Rating Scale (BCRS) Analysis [Using Linear Regressions].

BCRS axis	Baseline ^a			Follow-up ^a			Adjusted score change analysis ^b		
	Effect	SE	P-value	Effect	SE	P-value	Effect	SE	P-value
BCRS 1–5	.50	.30	.102	1.05	.40	.009	.40	.17	.023
BCRS 1: Concentration	.70	.15	<.001	.47	.15	.002	.13	.07	.047
BCRS 2: Recent memory	-.16	.07	.026	.08	.09	.358	.03	.04	.380
BCRS 3: Past memory	.01	.14	.943	.27	.14	.054	.13	.06	.039
BCRS 4: Orientation	.01	.12	.963	.03	.13	.820	.002	.06	.979
BCRS 5: Function	-.04	.09	.656	.21	.11	.060	.10	.05	.037
BCRS 6: Speech	-.11	.07	.133	-.08	.09	.353	-.04	.04	.321
BCRS 7: Psychomotor	-.06	.17	.730	-.10	.15	.486	-.04	.07	.558
BCRS 8: Mood and behavior	.08	.14	.595	-.25	.14	.076	-.12	.06	.053

Effect: effect of Hispanic ethnicity, SE: standard error. Bold indicates statistical significance.

^a Linear model for Hispanic ethnicity adjusted for age, sex, education level and baseline Geriatric Depression Scale (GDS) score.^b Adjusted Score Change: (score at follow-up visit – score at baseline)/time to follow-up. The analysis results were based on linear models for Hispanic ethnicity adjusted for age, sex, education level, baseline GDS score, and the item's corresponding score at baseline.

Table 5.

Psychometric Performance: Baseline and Follow-Up.^a

Test	Baseline			Follow-up		
	Effect of hispanic	Standard error (SE)	P-value	Effect of hispanic	Standard error (SE)	P-value
MMSE	-1.17	.32	.003	-1.05	.30	.001
MoCA	-1.11	1.29	.400	-1.33	.74	.083
DSST	-13.82	2.78	<.001	-14.22	2.88	<.001
Trails A	11.40	2.31	<.001	14.82	2.59	<.001
Trails B	39.95	7.64	<.001	51.00	8.08	<.001
Animals	-2.98	1.31	.024	-1.92	1.25	.127
Vegetables	-2.61	.93	.005	-2.91	1.01	.004
PARI	-1.13	.58	.051	-1.54	.59	.010
PARD	-2.09	.76	.006	-2.97	.71	<.001
Designs	-1.18	.54	.029	-.79	.63	.216

MMSE: Mini Mental State Examination; MoCA: The Montreal Cognitive Assessment; DSST: Digit Symbol Substitution Test; Trails A: Trail Making Test part A; Trails B: Trail Making Test part B; Animals: Semantic Verbal Fluency – Animals; Vegetables: Semantic Verbal Fluency – Vegetables; PARI: Guild's Paragraph Recall Immediate; PARD: Guild's Paragraph Recall Delayed; Designs: Geometric Design Recall. Bold indicates statistical significance.

^aLinear model for assessing impact of Hispanic ethnicity adjusted for age, sex, education level and baseline Geriatric Depression Scale (GDS) score.

Table 6.
Adjusted Score Change Linear Regression Analysis for Cognitive Tests.^a

	Effect of hispanics	Standard error (SE)	P-value
MMSE	-.27	.13	.039
MoCA	-.80	.34	.032
DSST	-.93	.80	.244
Trails A	2.75	.89	.002
Trails B	9.18	2.71	.001
Animals	-.08	.44	.864
Vegetables	-.74	.40	.067
PARI	-.43	.24	.074
PARD	-.80	.28	.005
Designs	-.08	.26	.745

MMSE: Mini Mental State Examination; MoCA: The Montreal Cognitive Assessment; DSST: Digit Symbol Substitution Test; Trails A: Trail Making Test part A; Trails B: Trail Making Test part B; Animals: Semantic Verbal Fluency – Animals; Vegetables: Semantic Verbal Fluency – Vegetables; PARI: Guild's Paragraph Recall Immediate; PARD: Guild's Paragraph Recall Delayed; Designs: Geometric Design Recall.

^a Adjusted Score Change: (score at follow-up visit – score at baseline)/time to follow-up. The analysis results were based on linear models for Adjusted Score Change to assess impact of the Hispanic ethnicity adjusted for age, sex, education level, baseline GDS score, and the item's corresponding score at baseline.