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# Subjective cognitive decline and objective cognition among diverse U.S. Hispanics/Latinos: Results from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA)

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## Abstract

**Introduction:** Despite increased risk of cognitive decline in Hispanics/Latinos, research on early risk markers of Alzheimer's disease in this group is lacking. Subjective cognitive decline (SCD) may be an early risk marker of pathological aging. We investigated associations of SCD with objective cognition among a diverse sample of Hispanics/Latinos living in the United States.

**Methods:** SCD was measured with the Everyday Cognition Short Form (ECog-12) and cognitive performance with a standardized battery in 6125 adults aged ≥ 50 years without mild cognitive impairment or dementia ($\bar{x}_{age}$ = 63.2 years, 54.5% women). Regression models interrogated associations of SCD with objective global, memory, and executive function scores.

**Results:** Higher SCD was associated with lower objective global ($B = -0.16$, SE = 0.01), memory ($B = -0.13$, SE = 0.02), and executive ($B = -0.13$, SE = 0.02, $p$'s < .001) function composite scores in fully adjusted models.

**Discussion:** Self-reported SCD, using the ECog-12, may be an indicator of concurrent objective cognition in diverse middle-aged and older community-dwelling Hispanics/Latinos.

KEYWORDS
cognition, cognitive complaints, depression, everyday cognition scale, Hispanics, Latinos/as, latinx, memory complaints, neuropsychology, subjective cognitive decline

## 1 | BACKGROUND

The fast-growing rate of the older adult population will inevitably result in a larger number of people living with Alzheimer's disease (AD). Without effective AD treatments, it has become paramount to identify early risk markers and predictors of cognitive decline to improve prevention efforts. Although Hispanics/Latinos are at increased risk for mild cognitive impairment (MCI) and AD compared to non-Hispanic Whites,[1–3] research investigating early risk markers in this growing segment of the population is lacking.

One such potential early risk marker is subjective cognitive decline (SCD), a pre-MCI stage used to describe self- or informant-reported perception of *"persistent decline in cognitive capacity in comparison with a previously normal status."*[4] In individuals without objective cognitive impairment, SCD has been increasingly recognized as an early risk marker of cognitive decline[5–7] that reflects an "at risk" stage preceding MCI.[8,9] Supporting this notion are data from several studies indicating that SCD is associated with altered preclinical AD biomarker profiles and with progression to MCI and dementia in older non-Hispanic Whites.[10–13] For example, cognitively normal individuals who report SCD have higher rates of progression to MCI and dementia and decline more rapidly compared to those without self-reported SCD.[14] Moreover, a recent study showed that SCD can precede AD and non-AD related dementia and that dementia risk is higher among individuals with SCD who present to memory clinics compared to community-dwelling samples.[15] Furthermore, specific features of SCD, such as onset within 5 years, confirmation of perceived cognitive decline by an informant, and decline-related worries, have been associated with higher amyloid beta (A$\beta$) load in cognitively normal older adults.[16] Despite Hispanics/Latinos being at higher risk for MCI and AD,[1,17–19] and reporting greater SCD than non-Hispanic Whites,[20] SCD remains understudied in this growing aging group.[21] Because SCD may be expressed differently as a function of cultural/ethnic background,[8] it is important to identify its correlates and potential to predict cognitive decline in this underserved population.

Prior SCD research with Hispanics/Latinos living in the United States suggests that SCD reporting may be associated with symptoms of depression rather than objective cognition,[22] and that older Mexican Americans with SCD perform lower on tests of attention and executive function, and are more likely to endorse symptoms of depression than those without SCD.[23] Indeed, because symptoms of depression correlate highly with SCD in several studies,[24–26] it is important to account for them when studying the relationship of SCD and cognition.

Given the paucity of SCD research with Hispanics/Latinos living in the United States and previous research focusing on older and less diverse Hispanic/Latino samples, we investigated cross-sectional associations of self-reported SCD and objective cognitive performance accounting for demographics, symptoms of anxiety and depression, and cardiovascular disease (CVD) risk factors in a large sample of diverse, middle-aged, and older Hispanics/Latinos from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA). Consistent with previous cross-sectional SCD research among Hispanics/Latinos and non-Hispanic Whites,[22,24,25] we hypothesized that the association of SCD reports with objective cognitive performance would be attenuated after adjusting for demographics, symptoms of depression, anxiety, and cardiovascular disease (CVD) risk factors.

### RESEARCH IN CONTEXT

1. **Systematic review**: The authors reviewed the literature using traditional (eg, PubMed) sources. Subjective cognitive decline (SCD) may be an early risk marker of Alzheimer's disease (AD). Although Hispanics/Latinos are at higher risk of AD compared to non-Hispanic Whites, research on SCD in this population is lacking. We cite the limited literature on SCD and cognition in Hispanics/Latinos, together with recent findings from non-Hispanic White groups.
2. **Interpretation**: Findings suggest that SCD can be a useful marker of concurrent objective cognitive function in middle-aged and older U.S. community-dwelling Hispanics/Latinos from diverse backgrounds.
3. **Future directions**: Longitudinal studies are needed to determine if SCD predicts cognitive decline and progression to mild cognitive impairment and AD in Hispanics/Latinos living in the United States. Future research should determine the biomarker and neural correlates of SCD in this population to better characterize its role as a potential early risk marker of AD.

### HIGHLIGHT

1. SCD may be an early risk marker of Alzheimer's disease.
2. The association of SCD with objective cognition in US Hispanics/Latinos is unknown.
3. We found that SCD was associated with objective cognition in Hispanics/Latinos.
4. SCD may reflect objective cognition in diverse Hispanics/Latinos in the US.

## 2 | METHODS

### 2.1 | Participants

We examined data from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) and the SOL-INCA (an ancillary study to HCHS/SOL),[27] a multisite (Bronx, NY; Chicago, IL; Miami, FL; San Diego, CA), probability-sampled, prospective cohort study that enrolled Hispanic/Latino participants from diverse backgrounds

(Central American, Cuban, Dominican, Mexican, Puerto Rican, and South American) to examine CVD and pulmonary risk factors (eg, diabetes).[28] HCHS/SOL included non-institutionalized community living individuals between the ages of 18 and 74 years and excluded those on active duty military service, not currently living at home, planning to move from the area in the next 6 months, or those unable to attend the in-person clinic examination.[29] For this study, we included Hispanics/Latinos (ages 50 to 86) from SOL-INCA (Visit 2; October 2015 through March 2018), without a self-reported diagnosis of MCI or dementia during medical history interview (n = 6125). All evaluations and cognitive testing were conducted in the participant's preferred language (English or Spanish) by trained bilingual field center staff. Institutional review board approval was obtained from all study sites and all participants provided written informed consent.

## 2.2 | Subjective cognitive decline (SCD) measurement

SCD was measured with the short (12-item) form of the Everyday Cognition Scale (ECog-12), which was developed as an informant-rated report of cognitively mediated functional abilities in older adults.[30,31] Although we used the self-report version of the ECog in this study, as opposed to the informant version, the self-report version has been shown to equally predict progression to MCI.[32] Previous research suggests that the ECog has good psychometric properties,[30] and the short form used in this study discriminates between dementia and normal cognition.[31] Moreover, the ECog has been used in several studies as a measure of SCD.[33–36] A recent study found that the cross-sectional relationship between informant-reported ECog scores and neuropsychological test performance was very similar across a group of non-Hispanic White, Black, and Hispanic/Latino individuals, with plans to extend this work to the self-report version.[37] The ECog-12 asks participants to rate their current ability to perform cognitively mediated daily tasks related to everyday memory, language, visuospatial abilities, and executive functions compared with their ability to do the same task 10 years ago. Items are rated on a scale of 1-4, with *1* = Better or no change and *4* = Consistently much worse. The global, executive, and memory ECog-12 sub-domain scores were generated by averaging over the component items (sum of items/number of items) to maintain a range of 1 to 4 (with higher scores reflecting greater self-reported SCD). Average z-scores for the overall (12 items) and domain-specific items (executive and memory), respectively, were generated to include in the models to facilitate comparisons of associations (beta estimates) across models.

## 2.3 | Objective cognitive performance

Three different theory-driven cognitive composite scores were calculated to evaluate associations between SCD and objective cognition. The memory composite comprised averaged z-scores for the Brief-Spanish English Verbal Learning Test (B-SEVLT) Sum and Recall scores. The executive function composite comprised averaged z-scores of the Trail Making Test Parts A and B (reverse coded for concordance with other measures so that higher values would indicate better performance), Digit Symbol Substitution (DSS) test, and the Word Fluency (letters F and A) test. A global cognitive composite was also created by averaging across z-scores of all tests.

To ensure that our results were not being overly influenced by individuals with low cognitive status, we used the Six Item Screener (SIS) to conduct sensitivity analyses. The SIS is a brief and reliable instrument developed to identify cognitive impairment, with diagnostic properties similar to the Mini Mental State Examination (MMSE).[38]

## 2.4 | Analyses

We generated descriptive statistics to characterize the SOL-INCA sample on the outcomes, exposures, and covariates of interest (Table 1). Survey adjusted chi-square tests assessed background differences for categorical variables and *t* tests for continuous variables. All objective and subjective cognitive measures were standardized (z-score) to facilitate comparisons across models.

### 2.4.1 | Covariates

All covariates were measured at SOL-INCA Visit 2, except for education. We adjusted for respondent age in years (50 to 59; 60 to 69; and 70+), sex (male, female), baseline level of education (<12 years, 12 years or equivalent, >12-years), and Hispanic/Latino background. Given the extensive literature linking CVD risk factors to cognitive decline in Hispanics/Latinos,[39–42] we also adjusted for four CVD risk factors including (1) hypertension (defined as average systolic or diastolic blood pressure ≥140/90 mm Hg) or if the participant self-reported currently taking antihypertensive mediations, (2) diabetes status (normal glucose regulation, impaired glucose tolerance, and diabetes) measured according to American Diabetes Association criteria,[43] (3) a binary indicator for dyslipidemia (yes/no) based on total cholesterol (≥240 mg/dL), LDL cholesterol (≥160 mg/dL), HDL cholesterol (<40 mg/dL), or receiving cholesterol-lowering medication, and (4) smoking status (current vs never or former). Finally, we adjusted for residual effects of variations in depressive and anxiety symptoms by controlling for the Center for Epidemiologic Studies Depression Scale-10 (CESD-10)[44] and the Generalized Anxiety Disorders Scale-7 (GAD-7),[45] respectively.

### 2.4.2 | Statistical analyses

Survey regression analyses examined (1) crude, (2) demographic adjusted (age, sex, education, and Hispanic/Latino background), and (3) full covariate adjusted (demographic adjustment + CESD-10, GAD-7, hypertension, diabetes, dyslipidemia, and smoking status) associations among ECog-12 global and sub-domain scores (memory and

**TABLE 1** Participant characteristics

| | Dominican | Central American | Cuban | Mexican | Puerto Rican | South American | Other | Total | *P*-value |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | % (SE) | | | | |
| **Sex** | | | | | | | | | |
| Female | 59.65 (2.35) | 59.59 (2.88) | 49.05 (1.99) | 56.15 (1.57) | 53.37 (2.09) | 58.17 (2.86) | 53.80 (6.12) | 54.54 (0.88) | .013 |
| Male | 40.35 (2.35) | 40.41 (2.88) | 50.95 (1.99) | 43.85 (1.57) | 46.63 (2.09) | 41.83 (2.86) | 46.20 (6.12) | 45.46 (0.88) | |
| **Age** | | | | | | | | | |
| 50-59 | 43.13 (2.67) | 42.17 (2.79) | 33.23 (2.25) | 44.67 (1.87) | 33.97 (1.93) | 39.25 (3.27) | 44.42 (6.16) | 39.54 (1.00) | <.001 |
| 60-69 | 36.23 (2.77) | 39.00 (2.66) | 33.55 (2.23) | 36.53 (1.55) | 37.20 (2.12) | 35.70 (2.91) | 33.88 (5.80) | 35.89 (0.92) | |
| 70+ | 20.64 (2.70) | 18.83 (2.81) | 33.22 (2.67) | 18.79 (1.49) | 28.83 (2.00) | 25.06 (3.51) | 21.69 (5.67) | 24.57 (0.97) | |
| **Education (years)** | | | | | | | | | |
| <12 | 45.69 (2.74) | 42.83 (2.74) | 22.95 (2.06) | 48.10 (1.84) | 42.02 (2.04) | 24.85 (3.04) | 29.43 (5.50) | 38.33 (1.07) | <.001 |
| 12 or Equivalent | 20.17 (2.01) | 19.78 (2.30) | 24.28 (1.60) | 20.17 (1.40) | 22.96 (1.69) | 19.57 (2.56) | 12.03 (3.98) | 21.26 (0.77) | |
| >12 | 34.13 (2.39) | 37.39 (2.56) | 52.77 (2.11) | 31.73 (1.75) | 35.03 (2.15) | 55.58 (3.47) | 58.54 (6.07) | 40.42 (1.02) | |
| **Hypertension status** | | | | | | | | | |
| Not hypertensive | 34.82 (2.50) | 47.65 (2.62) | 34.34 (1.82) | 52.10 (1.59) | 36.67 (1.85) | 49.72 (3.40) | 31.83 (5.02) | 42.41 (0.88) | <.001 |
| Hypertensive | 65.18 (2.50) | 52.35 (2.62) | 65.66 (1.82) | 47.90 (1.59) | 63.33 (1.85) | 50.28 (3.40) | 68.17 (5.02) | 57.59 (0.88) | |
| **Diabetes status** | | | | | | | | | |
| No diabetes | 19.27 (2.17) | 16.46 (2.01) | 17.20 (1.20) | 15.81 (1.18) | 16.50 (1.49) | 17.61 (2.25) | 15.11 (3.39) | 16.71 (0.69) | .005 |
| Pre-diabetes | 44.06 (2.86) | 48.61 (2.69) | 50.74 (2.26) | 47.43 (1.60) | 40.74 (2.19) | 57.93 (3.16) | 49.29 (5.90) | 47.61 (0.96) | |
| Diabetes | 36.67 (2.58) | 34.93 (2.50) | 32.06 (2.05) | 36.77 (1.63) | 42.76 (2.11) | 24.46 (3.00) | 35.61 (5.78) | 35.68 (0.94) | |
| **Hypercholesterolemia status** | | | | | | | | | |
| No Hypercholesterolemia | 46.03 (2.78) | 47.03 (2.42) | 42.15 (2.02) | 47.53 (1.53) | 43.93 (2.19) | 46.27 (3.18) | 43.97 (5.51) | 45.25 (0.92) | .388 |
| Hypercholesterolemia | 53.97 (2.78) | 52.97 (2.42) | 57.85 (2.02) | 52.47 (1.53) | 56.07 (2.19) | 53.73 (3.18) | 56.03 (5.51) | 54.75 (0.92) | |
| **Smoking status** | | | | | | | | | |
| Non-smoker | 89.27 (1.62) | 90.81 (1.60) | 79.53 (1.62) | 89.37 (1.00) | 77.70 (1.54) | 92.73 (1.53) | 80.10 (5.11) | 85.02 (0.68) | <.001 |
| Smoker | 10.73 (1.62) | 9.19 (1.60) | 20.47 (1.62) | 10.63 (1.00) | 22.30 (1.54) | 7.27 (1.53) | 19.90 (5.11) | 14.98 (0.68) | |
| | | | | | Mean (SD) | | | | |
| **Age (years)** | 62.46 (7.95) | 62.34 (8.89) | 64.71 (6.89) | 62.01 (8.22) | 64.27 (8.50) | 63.48 (9.86) | 62.66 (5.50) | 63.20 (8.14) | <.001 |
| **CESD-10** | 7.05 (6.19) | 6.21 (7.06) | 6.52 (5.26) | 5.64 (5.67) | 8.31 (6.72) | 6.07 (7.02) | 5.93 (4.24) | 6.48 (6.09) | <.001 |
| **GAD-7** | 3.72 (4.28) | 3.42 (5.52) | 3.68 (3.93) | 3.33 (4.80) | 5.02 (5.53) | 3.23 (5.39) | 2.95 (2.85) | 3.70 (4.75) | <.001 |
| **Memory Composite (z-score)** | −0.22 (0.78) | 0.21 (1.08) | 0.08 (0.75) | 0.17 (0.95) | −0.40 (0.95) | 0.27 (1.16) | 0.23 (0.62) | 0.03 (0.93) | <.001 |
| **Executive Composite (z-score)** | −0.45 (0.87) | −0.20 (0.95) | 0.01 (0.61) | 0.10 (0.93) | 0.02 (0.85) | 0.18 (0.94) | 0.18 (0.60) | −0.00 (0.84) | <.001 |
| **Global Composite (z-score)** | −0.36 (0.73) | −0.06 (0.85) | 0.04 (0.58) | 0.13 (0.80) | −0.12 (0.80) | 0.22 (0.90) | 0.19 (0.54) | 0.01 (0.76) | <.001 |
| **ECog-12 Memory Score** | 1.70 (0.71) | 1.72 (0.75) | 1.68 (0.51) | 1.82 (0.72) | 1.76 (0.72) | 1.68 (0.75) | 1.60 (0.47) | 1.74 (0.67) | <.001 |
| **ECog-12 Executive Score** | 1.36 (0.57) | 1.42 (0.66) | 1.40 (0.43) | 1.51 (0.63) | 1.39 (0.59) | 1.45 (0.66) | 1.32 (0.34) | 1.43 (0.57) | <.001 |
| **ECog-12 Global Score** | 1.35 (0.58) | 1.40 (0.66) | 1.36 (0.44) | 1.49 (0.64) | 1.39 (0.58) | 1.40 (0.66) | 1.27 (0.35) | 1.41 (0.57) | <.001 |
| **ECog-12 Memory (z-score)** | −0.09 (1.04) | −0.06 (1.10) | −0.13 (0.75) | 0.09 (1.06) | −0.01 (1.06) | −0.12 (1.10) | −0.23 (0.69) | −0.03 (0.98) | <.001 |
| **ECog-12 Executive (z-score)** | −0.16 (0.96) | −0.06 (1.11) | −0.10 (0.73) | 0.09 (1.06) | −0.11 (0.99) | −0.02 (1.12) | −0.23 (0.57) | −0.04 (0.96) | <.001 |
| **ECog-12 Global (z-score)** | −0.13 (0.99) | −0.05 (1.12) | −0.12 (0.74) | 0.10 (1.07) | −0.07 (0.98) | −0.05 (1.12) | −0.27 (0.60) | −0.04 (0.97) | <.001 |

Results from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA; unweighted n = 6125).
Notes: CESD, Center for Epidemiologic Studies Depression Scale-10; GAD-7, Generalized Anxiety Disorders Scale-7; ECog-12, 12-Item form of the Everyday Cognition Scale.

executive function) and their respective objective cognitive composite scores (global, memory, and executive function).

Analyses accounted for the complex study design including probability weights, stratification, and clustering. Detailed discussions of the HCHS/SOL and SOL-INCA design are published elsewhere.[27–29] Reported values were weighted to account for the disproportionate selection of the sample and to adjust for any bias effects due to differential non-response in the selected sample (except sample size which we report unweighted). Weights were also trimmed to limit precision losses and calibrated to the 2010 U.S. Census characteristics by age, sex, and Hispanic/Latino background in each field site's target population. All statistical analyses were performed using the survey functionalities in Stata V16.1.

#### 2.4.3 | Sensitivity analysis

We conducted two sets of sensitivity analyses to ensure that our results were not driven by individuals with low cognitive status as well as by individuals with worry about SCD. First, to determine if the associations of SCD scores and objective cognitive composite scores were overly influenced by individuals with lower cognitive status, those with scores ≤4 on the SIS[38] were excluded from the analytic sample (n = 5253 individuals included in the sensitivity analysis). Second, we tested for modification of the association between SCD and objective cognitive composite scores through self-reported worry about SCD.[36] Worry about SCD was based on responding Yes to the following question: *Are you worried or believe that you are having problems with your attention, concentration, or memory?* We then interacted this binary response with the SCD global and sub-domain scores in the above-specified models. Subsequently, we re-estimated all the above models stratifying by participant's response.

## 3 | RESULTS

### 3.1 | Association of SCD with objective cognition in the full analytic sample

The average age of the target population was 63.2 years (±8.1); 54.5% were women and 38.3% reported <12 years of education. In addition, 57.6%, 35.7%, and 54.8% met study criteria for hypertension, diabetes, and hypercholesterolemia, respectively, whereas 15% were current smokers. We found significant variations in age, education, hypertension and diabetes, and depressive and anxiety symptoms by Hispanic/Latino background. We also found significant and consistent differences in global and domain-specific mean objective cognitive composite scores and SCD (ECog-12) by Hispanic/Latino background. Detailed estimates of prevalence rates (for categorical variables) and means and standard deviations (for continuous variables of interest) by Hispanic/Latino background are presented in Table 1. Raw ECog-12 and cognitive performance scores are presented in Table S1.

The estimated beta coefficients, and their standard errors, for the sequentially fitted models testing the associations between ECog-12 and objective cognitive composite scores are presented in Table 2. As indicated, all objective and subjective cognitive measures were z-scored to facilitate interpretation of the estimated associations using a common metric (SD units change in outcome corresponding to SD unit change in exposure). Figure 1 depicts the post hoc estimated average marginal means for the crude and sequentially adjusted models for each considered subjective exposure and objective cognitive composite outcome. Figure S1 depicts scatterplots of the association between SCD and objective cognition.

Higher ECog-12 global scores (indicating greater SCD) were significantly associated with lower objective global cognitive composite scores ($\beta = -0.24$; standard error [SE] = 0.01; $P < .001$) and this association remained significant even after full covariate adjustment. Adjusting for age, education, sex, and Hispanic/Latino background attenuated the magnitude of the association by 29.2% ($\beta = -0.17$; SE = 0.01; $P < .001$). We found minimal additional attenuation (5.9%) after further adjusting for CVD risk factors, depression, and anxiety scores ($\beta = -0.16$; SE = 0.01; $P < .001$). Higher ECog-12 executive and memory sub-domain scores were inversely related to objective executive function ($\beta = -0.22$; SE = 0.02; $P < .001$) and memory composite scores ($\beta = -0.18$; SE = 0.02; $P < .001$), respectively. As with the global scores, the magnitude of associations was primarily attenuated by adjustments to demographic, but not CVD risk factors or depression and anxiety scores (Table 2).

### 3.2 | Sensitivity analysis

Excluding individuals with low mental status (SIS ≤4) scores from the analytic sample had minimal effects on the qualitative interpretation of the primary findings. The effect sizes were decreased slightly overall for the global and domain-specific measures. The estimated associations for the sequentially adjusted models are presented in Table 3. Post hoc estimates of the average marginal cognitive performance means over the continua of ECog-12 sub-domain scores are presented in Figure S2.

We found no evidence for modification in the associations of SCD and objective cognitive performance by self-reported worries regarding SCD. Interaction results are presented in Table 4 and plots of the post hoc estimates of the average marginal cognitive performance means over the continua of ECog-12 sub-domain scores are presented in Figure S3. Stratified estimates of associations between SCD and objective cognition by worry group (Yes vs No) are presented in Table 5.

## 4 | DISCUSSION

We found that higher self-reported SCD, measured with the ECog-12, is significantly associated with worse concurrent objective cognitive composite scores in SOL-INCA, a large, community-based, and representative sample of diverse middle-aged and older Hispanics/Latinos

**TABLE 2** Estimated associations between subjective cognitive decline sub-scale scores (ECog-12) and objective cognitive composite scores

| | M1<br>Beta (SE) | M2<br>Beta (SE) | M3<br>Beta (SE) |
|---|---|---|---|
| | | **Global Cognition⇑** | |
| ECog-12 Global⇑ | −0.24*** (0.01) | −0.17*** (0.01) | −0.16*** (0.01) |
| | | **Executive Composite Scores⇑** | |
| ECog-12 Executive⇑ | −0.22*** (0.02) | −0.15*** (0.01) | −0.13*** (0.02) |
| | | **Memory Composite Scores⇑** | |
| ECog-12 Memory⇑ | −0.18*** (0.02) | −0.15*** (0.01) | −0.13*** (0.02) |

**Notes:** Results are derived from survey linear regression models using data from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA unweighted n = 6,125). M1 Crude Model; M2 Demographic Adjusted Model; M3 Full Covariate Adjusted Model. Demographic adjustment incudes age, education, sex, and Hispanic/Latino background. Full covariates adjustment additionally accounts for hypertension, diabetes, hypercholesterolemia, current smoking status, Center for Epidemiologic Studies Depression Scale-10, and Generalized Anxiety Disorders Scale-7 scores. ECog-12 = 12-Item form of the Everyday Cognition Scale. SE = Standard error. *$P < .05$; **$P < .01$; ***$P < .001$; ⇑ z-scores.

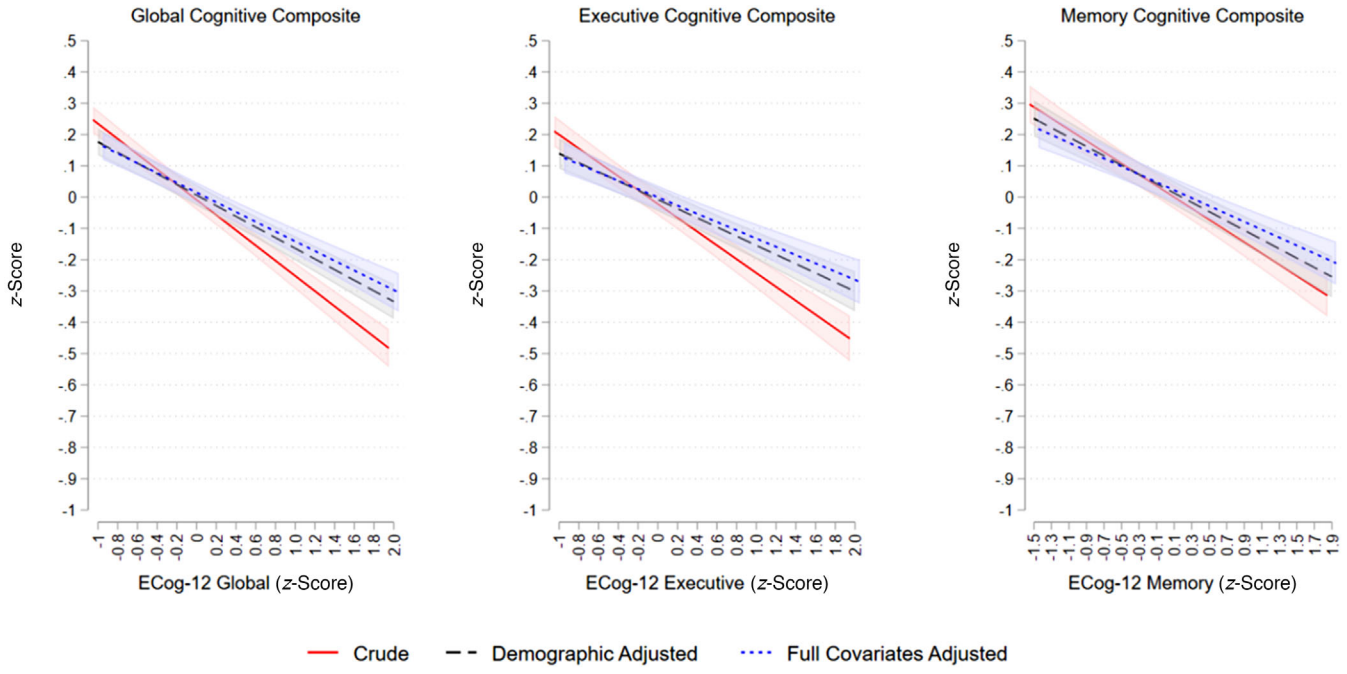


**FIGURE 1** **Notes**: Average marginal mean estimates for objective cognitive performance (and their 95% confidence intervals) as a function of subjective cognitive decline (ECog-12). Results are from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA). Demographic adjustment incudes age, education, sex, and Hispanic/Latino background. Full covariates adjustment additionally accounts for hypertension, diabetes, hypercholesterolemia, current smoking status, Center for Epidemiologic Studies Depression Scale-10, and Generalized Anxiety Disorders Scale-7 scores. ECog-12 = 12-Item form of the Everyday Cognition Scale

living in the United States. For each SD unit increase on the ECog-12, there was a decrease of approximately one-sixth of a SD unit in global cognition (B = −0.16, SE = 0.01, $P < .001$) in fully adjusted models. Although the relationship of SCD and objective cognition (without covariate adjustment) was attenuated by ≈29.2% after adjustment for age, sex, education, and Hispanic/Latino background, this association was not significantly attenuated further (5.9%) when including depression, anxiety, and CVD risk factors in fully adjusted models. These associations were not significantly influenced by individuals with low cognitive status or by those reporting worries related to SCD. This is contrary to previous findings suggesting that SCD is not associated with objective cognition but rather with symptoms of depression in Hispanic/Latino older adults[22] and non-Hispanic Whites.[24,25] Because SCD reporting has been identified as a possible early risk marker of cognitive decline that can help aid (along with other sensitive markers) in the diagnosis of preclinical AD in non-Hispanic/Latino samples,[4,8] longitudinal research is needed to discern how SCD may predict objective cognitive decline in Hispanics/Latinos.

Discrepancies between previous research and the current findings may be due to several factors. First, previous findings used a 5-item

**TABLE 3** Estimated associations between objective cognitive composite scores and subjective cognitive decline sub-scale scores (ECog-12) among individuals not meeting criteria for low mental status based on the Six Item Screener (scores ≤4; unweighted n = 5,253)

| | M1<br>Beta (SE) | M2<br>Beta (SE) | M3<br>Beta (SE) |
|---|---|---|---|
| | | **Global Cognition⇑** | |
| ECog-12 Global⇑ | −0.22*** (0.01) | −0.14*** (0.01) | −0.13*** (0.01) |
| | | **Executive Composite Scores⇑** | |
| ECog-12 Executive⇑ | −0.20*** (0.02) | −0.12*** (0.01) | −0.11*** (0.01) |
| | | **Memory Composite Scores⇑** | |
| ECog-12 Memory⇑ | −0.14*** (0.02) | −0.12*** (0.02) | −0.09*** (0.02) |

Results are derived from survey linear regression models using data from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA).
**Notes**: M1 Crude Model; M2 Demographic Adjusted Model; M3 Full Covariate Adjusted Model. Demographic adjustment incudes age, education, sex, and Hispanic/Latino background. Full covariates adjustment additionally accounts for hypertension, diabetes, hypercholesterolemia, current smoking status, Center for Epidemiologic Studies Depression Scale-10, and Generalized Anxiety Disorders Scale-7 scores. ECog-12 = 12-Item form of the Everyday Cognition Scale. SE, standard error. *$P < .05$; **$P < .01$; ***$P < .001$; ⇑ z-scores.

**TABLE 4** Estimated interactions between objective cognitive composite scores and subjective cognitive decline sub-scale scores (ECog-12)

| | M1 | M2 | M3 |
|---|---|---|---|
| | | **Global cognition⇑** | |
| ECog-12 Global x Worry⇑ | *F*-test = 0.096<br>*P* = .756 | *F*-test = 0.105<br>*P* = .746 | *F*-test = 0.037<br>*P* = .848 |
| | | **Executive composite scores⇑** | |
| ECog-12 Executive x Worry⇑ | *F*-test = 3.758<br>*P* = .053 | *F*-test = 2.446<br>*P* = .118 | *F*-test = 2.167<br>*P* = .142 |
| | | **Memory composite scores⇑** | |
| ECog-12 Memory x Worry⇑ | *F*-test = 1.876<br>*P* = .171 | *F*-test = 0.913<br>*P* = .340 | *F*-test = 0.513<br>*P* = .474 |

**Notes:** Results are derived from survey linear regression models using data from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA). M1 Crude Model; M2 Demographic Adjusted Model; M3 Full Covariate Adjusted Model. Demographic adjustment incudes age, education, sex, and Hispanic/Latino background. Full covariates adjustment additionally accounts for hypertension, diabetes, hypercholesterolemia, current smoking status, Center for Epidemiologic Studies Depression Scale-10, and Generalized Anxiety Disorders Scale-7 scores. ECog-12 = 12-Item form of the Everyday Cognition Scale. ⇑ z-scores.

scale that measured current self-reported cognitive difficulties by asking five Yes/No questions,[22] whereas the ECog-12[31] consists of 12-items scored on a Likert-type scale asking participants to rate their cognitively mediated functional abilities compared to 10 years ago, reflecting self-report of cognitive decline rather than current cognitive difficulties. Although no gold standard questionnaire exists to reliably measure SCD in different populations, it is likely that research studies will report disparate findings based on the SCD scale used and the population to which it is applied. Research is needed to develop standardized SCD scales that are valid and reliable across different racial and ethnic groups.[8] Second, the sample in the previous study[22] consisted of older Hispanic/Latino adults ages 60+ years who presented to their community health provider for screening of cognitive complaints (mean age of 74 years), whereas the current sample comprises community-dwelling, probability sampled Hispanic/Latino adults aged ≥50 years (mean age of 63.2 years). Thus SOL-INCA was not affected by the selection bias present in the previous study. This sample was also considerably younger and more representative, which could explain the discrepancy in findings. For example, it has been reported that individuals who present with SCD plus (onset of SCD complaints within the last 5 years, have age of SCD onset at >60 years, experience worries associated with complaints, and report a feeling of worse performance than other people from the same age group) have faster progression from normal cognition to MCI within a 1-year follow-up.[6] Third, it is possible that SCD reports from those presenting to their health care provider with cognitive complaints may be more reflective of symptoms of depression than would be the case in a community-based sample, although SCD has also been associated with symptoms of depression in a large community-based sample comprised of mostly non-Hispanic Whites.[24] Because the current study included Hispanics/Latinos only, discrepant results may represent ethnic differences in SCD reporting.

As the SCD Initiative Working Group suggested,[4,8] individuals from clinical settings may have more worries associated with SCD reporting than community-based and target-area representative samples and

**TABLE 5** Estimated associations between subjective cognitive decline sub-scale scores (ECog-12) and objective cognitive composite scores stratified by report of worry or belief of problems with attention, concentration, or memory (PANEL A = No; PANEL B = Yes)

| PANEL A | NO (unweighted n = 2050) | | |
|---|---|---|---|
| | M1 | M2 | M3 |
| | β(SE) | β(SE) | β(SE) |
| | | **Global Cognition⇑** | |
| ECog-12 Global⇑ | −0.24*** (0.04) | −0.16*** (0.04) | −0.15*** (0.04) |
| | | **Executive Composite Scores⇑** | |
| ECog-12 Executive⇑ | −0.14** (0.05) | −0.10** (0.04) | −0.09* (0.04) |
| | | **Memory Composite Scores⇑** | |
| ECog-12 Memory⇑ | −0.11* (0.04) | −0.09* (0.04) | −0.09* (0.04) |

| PANEL B | YES (Unweighted n = 4,059) | | |
|---|---|---|---|
| | M1 | M2 | M3 |
| | β(SE) | β(SE) | β(SE) |
| | | **Global Cognition⇑** | |
| ECog-12 Global⇑ | −0.25*** (0.02) | −0.18*** (0.01) | −0.17*** (0.01) |
| | | **Executive Composite Scores⇑** | |
| ECog-12 Executive⇑ | −0.23*** (0.02) | −0.17*** (0.02) | −0.15*** (0.02) |
| | | **Memory Composite Scores⇑** | |
| ECog-12 Memory⇑ | −0.17*** (0.02) | −0.14*** (0.02) | −0.12*** (0.02) |

**Notes**: Results are derived from survey linear regression models using data from the Study of Latinos-Investigation of Neurocognitive Aging (SOL-INCA). M1 Crude Model; M2 Demographic Adjusted Model; M3 Full Covariate Adjusted Model. Demographic adjustment incudes age, education, sex, and Hispanic/Latino background. Full covariates adjustment additionally accounts for hypertension, diabetes, hypercholesterolemia, current smoking status, Center for Epidemiologic Studies Depression Scale-10, and Generalized Anxiety Disorders Scale-7 scores. ECog-12 = 12-Item form of the Everyday Cognition Scale. SE = Standard error. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ⇑ z-scores.

displaying worry about SCD may increase the risk of developing MCI in the future.[6] Discrepant findings in community-based versus clinic-based based samples will be difficult to disentangle given the use of different SCD measures and assessments of cognitive function employed across research studies and clinical settings. That said, research suggests that SCD may be useful in both settings and members of the SCD Initiative Working Group provide detailed recommendations for clinicians evaluating patients who present with SCD.[46] In a clinical setting, SCD may alert the provider to screen for depression and other physical or psychiatric conditions that may affect cognitive performance and to monitor cognitive status to determine if referral to neuropsychological assessment is needed. If SCD is consistent over time, this may increase the likelihood of future decline.[36] In research settings, studying SCD in the context of biomarkers of AD can help elucidate its utility as a potential early risk marker to determine eligibility into prevention trials.

Recent findings in a community-based sample of older Mexican Americans (HABLE) found that, compared to non-SCD reporters, those expressing SCD scored lower on the MMSE; were more likely to have depression, anxiety, and worry; higher likelihood of diabetes diagnosis and elevated blood sugar; poorer performance on attention and executive function measures; and higher levels of inflammatory markers.[23] This indicates that cross-sectional differences can be observed between Hispanics/Latinos who report SCD and those who do not report SCD on factors typically associated with cognitive decline, which can potentially be modified via lifestyle interventions.[47,48] The current findings extend the limited literature by showing that SCD, measured with the ECog-12, may be a sensitive tool to screen for subtle cognitive deficits independent of important demographic characteristics, symptoms of depression and anxiety, and CVD risk factors in otherwise cognitively healthy community-dwelling Hispanic/Latino adults aged ≥50 years.

There are study limitations to consider. First, given its cross-sectional nature, a causal relationship cannot be established. Second, the ECog-12 was not developed to directly measure SCD, but rather to assess cognitively mediated functional abilities.[31] As such, it is difficult to disentangle the contributions of self-perceived changes in cognition versus self-perceived changes in cognitively mediated functional abilities. Third, given that in Hispanics/Latinos, co-morbid depression and diabetes significantly increase the risk for cognitive decline, MCI, and AD,[41,49,50] it is possible that they may over-endorse SCD as a reflection of difficulties with cognitively mediated abilities related to co-morbidity rather than actual perceived changes in cognitive abilities. In this study, however, the association of SCD with objective cognition persisted after adjusting for symptoms of depression and CVD risk factors (including diabetes). Valid and reliable instruments to measure SCD need to be developed to disentangle decline in performance of

cognitively mediated functional tasks from actual perceived cognitive decline. Fourth, administration of the ECog-12 took place after the cognitive assessment. This could have influenced the participant's reports of SCD. Future studies should carefully determine the order of administration to maximize unbiased SCD reporting. Finally, a limited cognitive battery was administered. Future studies should better characterize cognitive status to rule-out individuals with MCI and dementia and include more neuropsychological tests. Strengths of the current study include: (1) a large, well-characterized community-based and representative sample of diverse Hispanics/Latinos; (2) statistical adjustment of not only demographic characteristics and symptoms of depression and anxiety, but also thorough assessment of CVD risk factors; and (3) the use of the ECog-12, which is a widely used measure in studies of aging.

## 5 | CONCLUSION

In a large sample of diverse middle-aged and older Hispanics/Latinos, we found associations between SCD and objective measures of global cognitive function, memory, and executive function that were not explained by other salient factors (eg, demographic characteristics, depressive and anxiety symptoms, and CVD risk factors). Our findings indicate that use of the ECog-12 to measure SCD can be an indicator of concurrent objective cognitive function among middle-aged and older community samples of diverse Hispanics/Latinos living in the United States. Longitudinal studies are needed to determine the utility of SCD to predict changes in cognitive function and progression to MCI and dementia in Hispanics/Latinos living in the United States. Moreover, studies are needed to determine the neural and biomarker correlates of SCD in this population to characterize its possible role as a marker of pre-clinical AD.

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### CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

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## SUPPORTING INFORMATION

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