

Test Language Effects On Nonverbal CCAB Performance In Spanish Speakers

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Introduction

US Latinos are 1.5x more likely than non-Latino white adults to develop Alzheimer's disease and related dementias (ADRD), and prevalence is projected to increase sevenfold by 2060.

Accurate cognitive assessment in Spanish-speaking populations is critical for reducing disparities in ADRD detection and monitoring. The California Cognitive Assessment Battery (CCAB) is an automated, tablet-based battery with a validated Spanish-language protocol (CCAB-Español) for remote cognitive assessment.

However, whether performance differences between Spanish- and English-language administrations reflect genuine cognitive differences or testing-context effects remains unclear.

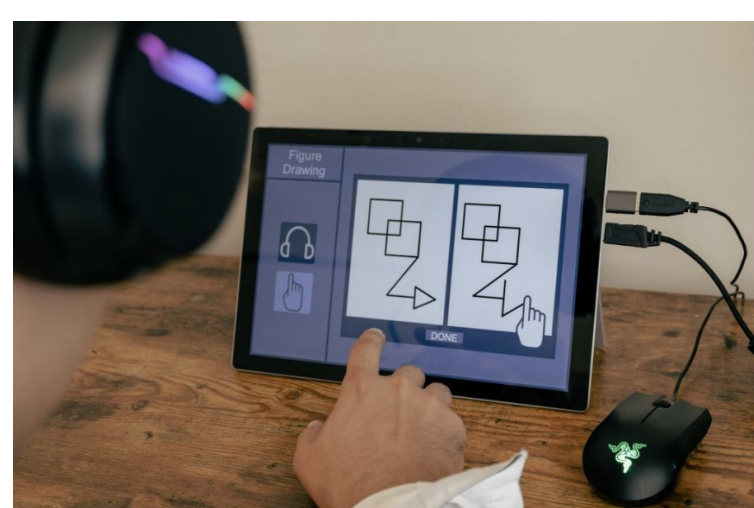
Methods

Participants: The California Cognitive Assessment Battery (CCAB) was administered to 169 healthy adult native Spanish speakers during ongoing normative data collection. Participants completed a range of cognitive tasks, including verbal response tasks. 1:1 nearest-neighbor matching from an English speaking Latino cohort on age, education, gender, and vocabulary yielded 169 matched pairs (Spanish: M age=47.1, SD=13.8, 59.8% female; English: M age=46.8, SD=13.6, 59.8% female; all $p > .41$).

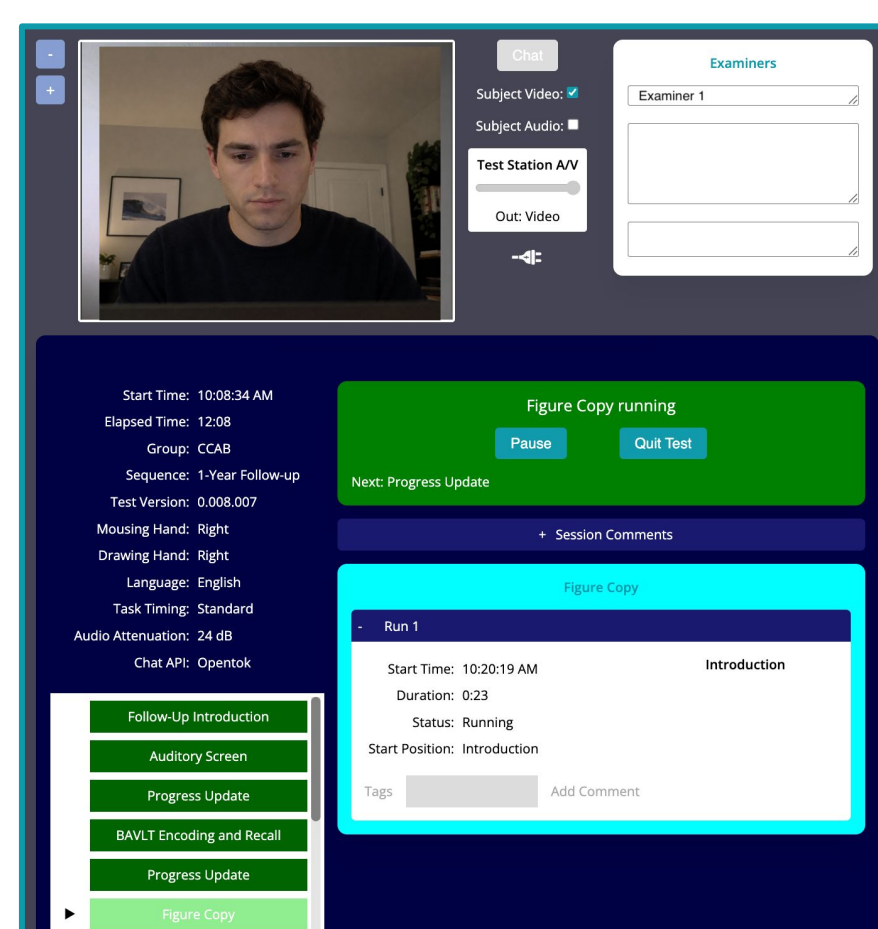
Technology: Participants were tested using a tablet computer with circumaural headphones and a head-mounted microphone. Instructions and stimuli were delivered using text-to-speech (TTS) with intensities adjusted to the participant's auditory threshold. Non-verbal responses were recorded via the tablet's touch screen at a variable sample rate from 30 to 60 hz. Select tests were performed with a calibrated usb mouse. An examiner remotely monitored participant performance over audio and visual feeds.

Tasks: Participants performed seven nonverbal tasks spanning executive function, processing speed, visuospatial ability, and working memory, in addition to other verbal tasks and non-verbal tasks. Digitized CCAB versions of the following tasks were administered: Trails A/B, Design Fluency, Spatial Span, Hidden Patterns, Identical Pictures, and Figure Drawing.

Participants complete CCAB tests on a tablet computer. An examiner remotely monitors the test via a web-based platform with A/V and video chat functionality. Tests are administered, run, and scored automatically.

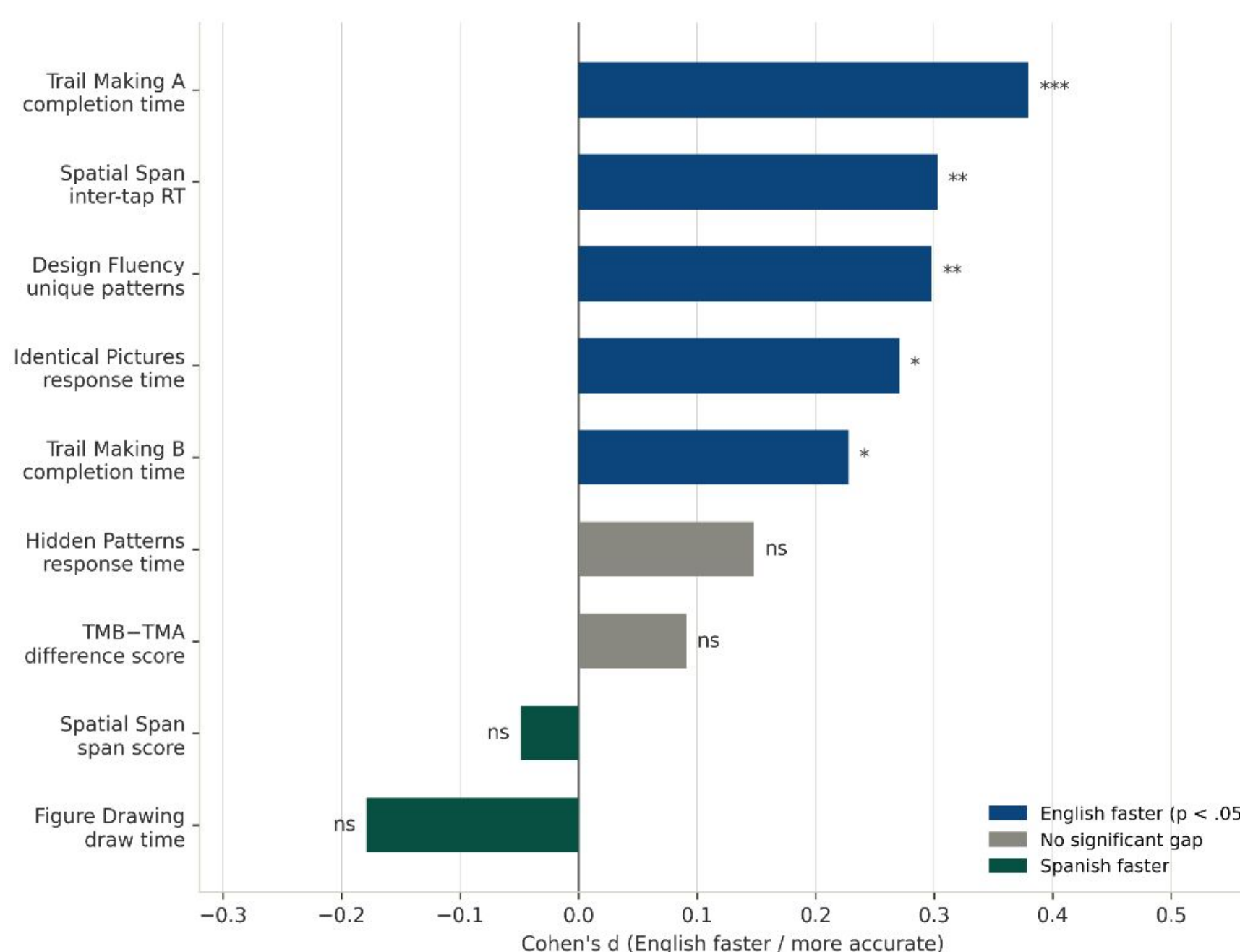


participant view



examiner view

Results



Task	Measure	Spanish M	English M	Cohen's d	p
<i>Speed-dominant</i>					
Trail Making A	Completion time	33,993	28,955	0.38	**
Spatial Span	Inter-tap RT	1,053	944.0	0.30	**
Design Fluency	Unique patterns	9.40	10.2	0.30	**
Identical Pictures	Response time	2,830	2,610	0.27	*
<i>Accuracy / demand-constrained</i>					
Trail Making B	Completion time	73,503	66,003	0.23	*
TMB-TMA	Difference score	40,050	37,453	0.09	ns
Hidden Patterns	Response time	2,582	2,461	0.15	ns
Spatial Span	Span score	6.20	6.10	-0.05	ns
Figure Drawing	Draw time	16,347	15,163	-0.18	ns

N = 169 matched pairs (age, education, gender, vocabulary; all $p > .41$). ** $p < .01$, * $p < .05$, ns = not significant.

Summary

Language-of-administration effects on CCAB performance were confined to speeded measures, not cognitive accuracy or control tasks. Spanish-language administrations were associated with longer response and completion times.

Response time differences were consistent across executive function, processing speed, working memory, and visuospatial domains, whereas accuracy remained equivalent across languages.

Figure Drawing, a task without a speeded response requirement, showed no English-language advantage, arguing against generalized motor or tablet-familiarity effects.

Results support the development of speed-adjusted CCAB-Español norms and caution against interpreting slower Spanish-language response times as evidence of elevated cognitive risk.

Discussion

Speed differences were largest on the least cognitively demanding tasks and diminished as task complexity increased, suggesting testing-context effects rather than domain-specific cognitive impairment.

As cognitive demands increased, task complexity became the primary constraint on performance, reducing the influence of language-related differences in response speed.

While the mechanisms underlying these effects cannot be determined from this particular data, factors such as stereotype threat, acculturation, or limited prior exposure to computerized testing may contribute to slower response times during speeded tasks without affecting accuracy.

These findings have important implications for equitable dementia screening in Latino populations, and support the implementation of language-and-population specific normative standards.

Future studies should directly assess acculturation, testing familiarity, and technology experience to better characterize the sources of observed performance differences.

References

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- [2] Alzheimer's Association (2023). Alzheimer's Disease Facts and Figures.
- [3] Manly & Espino (2004). Cultural influences on dementia recognition and management. Clinics in geriatric medicine 20.1 (2004): 93-119

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