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RESEARCH ARTICLE

The development of the Cognitive Assessment for Tagalog Speakers (CATS): A culturally and linguistically tailored test battery for Filipino Americans

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Abstract

INTRODUCTION: Filipino Americans are one of the largest Asian American and Pacific Islander (AAPI) populations in the United States (US). Previous studies suggest that Filipino Americans have one of the highest incidence rates of Alzheimer's disease and related dementias (ADRD) among AAPI subgroups. Despite the expected increase in Filipino Americans with ADRD, no studies to-date have validated neuropsychological measures in the United States for speakers of Tagalog, a major language spoken by Filipino Americans. A significant barrier to dementia care and diagnosis is the lack of linguistically and socioculturally appropriate cognitive tasks for Tagalog speakers. To address this need, we developed and piloted the Cognitive Assessment for Tagalog Speakers (CATS), the first neuropsychological battery for the detection of ADRD in Filipino American Tagalog speakers.

METHODS: Based on evidence-based neuropsychological batteries, we adapted and constructed *de novo* tasks to measure performance across 4 main cognitive domains: visual/verbal memory, visuospatial functioning, speech and language, and frontal/executive functioning. Tasks were developed with a team of bilingual English/Tagalog, bicultural Filipino American/Canadian experts, including a neurologist, speech-language pathologist, linguist, and neuropsychologist. We recruited Tagalog-speaking participants of age 50+ through social media advertisements and

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recruitment registries for this cross-sectional study. We present the CATS design and protocol.

RESULTS: To-date, the CATS battery has been administered to 26 healthy control participants (age 64.5 ± 7.8 years, 18F/8 M) at an academic institution in Northern California, United States. The development and administration of the CATS battery demonstrated its feasibility but also highlighted the need to consider the effects of bilingualism, language typology, and cultural factors in result interpretation.

DISCUSSION: The CATS battery provides a mechanism for cognitive assessment of Filipino Americans, a population that has been underrepresented in AD RD research. As we move toward the treatment and cure of AD RD, linguistically and socioculturally appropriate cognitive tests become even more important for equitable care.

KEYWORDS

Alzheimer's dementia, bilingualism, cognitive assessment, cross-linguistic studies, cultural diversity, Filipino Americans

1 | BACKGROUND

The Asian American population is now the fastest growing racial group in the United States (US), comprising about 7% of the population. This number is expected to nearly quadruple to 46 million by 2060.¹ As the Asian American, Native Hawaiian, and Pacific Islander (AANHPI) population age 65 and older increases, the incidence of Alzheimer's disease and related dementias (AD RD) in this group is expected to triple between 2008 and 2030.² However, compared to White individuals, Asian Americans are less likely to receive the elements of an AD RD diagnostic evaluation and a timely dementia diagnosis.³ They remain underrepresented in clinical research, with merely 0.17% of the National Institutes of Health (NIH) budget focusing on AANHPI participants.⁴ In US-conducted AD RD clinical trials, Asian Americans encompass only 1% of study participants.⁵⁻⁷ Additionally, in a systematic review of dementia prevention trials reporting race, ethnicity, and language of intervention, only 6 of 26 trials included Asian Americans, and none incorporated screening in Asian languages.⁷ These numbers demonstrate that Asian Americans are underrepresented in both AD RD clinical research and dementia prevention trials.

Filipino Americans are the third largest (19%) Asian American subgroup, with a population of over 4 million.⁸ They are the largest Asian American population in nine US states and second or third largest in 28 other US states.^{8,9} Few studies detail dementia prevalence within AANHPI subgroups. One study based in Northern California compared dementia incidence among Chinese, Filipino, Japanese, and South Asian subgroups as well as Whites. Filipino Americans had the highest dementia incidence rate in Asian American subgroups, with a 20% increased rate compared to Chinese Americans, even after accounting for vascular risk factors.¹⁰ The cause of this high incidence rate is unclear and likely multifactorial, including greater rates of dementia risk factors,¹¹⁻¹⁴ less knowledge of cognitive health factors,^{15,16} and AD RD stigma.^{2,10,17}

Despite the expected increase of AD RD in Filipino Americans, no studies to-date have validated neuropsychological measures in the United States for speakers of Tagalog (Filipino), one of the major languages spoken by Filipino Americans and the fourth most widely spoken language in the United States.¹⁸ While most Filipino Americans do speak English, over half speak a language other than English at home, and 20% have limited English proficiency.¹⁸ Filipino Americans have varying levels of acculturation and enculturation to the ways of life in the United States, which influences their attitudes toward mental health, clinical treatment, and diet¹⁹⁻²⁶ and affects their performance on cognitive testing.²⁰ Therefore, Filipino Americans have different linguistic and sociocultural experiences from both Filipinos residing in the Philippines and White, monolingual English-speaking populations in the United States.

Some neuropsychological measures have been adapted for use in Tagalog speakers in the Philippines.²⁷⁻²⁹ Cognitive tests, cut-off scores, and norms developed for Western, English-speaking populations do not apply broadly to socioculturally and linguistically diverse populations,³⁰ and this was reflected in Philippine studies. For example, healthy control Tagalog speakers in the Philippines had a lower normal cutoff score on the Montreal Cognitive Assessment (MoCA);²⁷ took almost double the time for Trails A/B; scored 50% lower on the Logical Memory Test; and named fewer animals on a verbal fluency task.²⁸ Cultural aspects also contributed to score differences. On the ADAS-Cog,²⁸ cognitively normal Filipinos had difficulty naming the "ring finger," as this term is unnecessary in daily life, and wearing a wedding ring on the fourth finger is not a traditional Filipino custom.

Since Filipino Americans differ from their Filipino counterparts in terms of language use, acculturation/enculturation, immigration, and socioeconomic factors, it is very likely that Filipino Americans will perform differently on cognitive tasks.³¹⁻³³ Therefore, while cognitive tasks developed in the Philippines are a starting point, there remains a need to adapt, norm, and validate measures for Filipino

Americans. Furthermore, there is a lack of ADRD speech and language tasks tailored for Tagalog linguistic features. Accurate diagnosis of ADRD-spectrum disease is facilitated by the inclusion of syntax production/comprehension, repetition, and motor speech tasks,^{34,35} and to our knowledge, these have yet to be fully developed. This is also necessary since studies demonstrate that language typology affects speech and language symptoms of ADRD.^{36,37} The lack of suitable cognitive assessments for Tagalog speakers contributes to misdiagnosis and over/underdiagnosis of ADRD, and the need for these measures is becoming increasingly critical as the field moves toward treatment and cure.

To address these needs, we developed the Cognitive Assessment for Tagalog Speakers (CATS), a novel, comprehensive neuropsychological battery to detect cognitive deficits in Filipino Americans with ADRD. In this cross-sectional study, we developed and piloted the CATS battery with a cohort of healthy, older adult speakers of Tagalog in the United States. Specifically, we present the CATS battery design and protocol and discuss how we adapted them to be culturally and linguistically appropriate for the Filipino American population.

2 | METHODS

2.1 | Overall study design

The study design and study components are described in detail in the following sections. Our study conformed to the recommendations to increase representation of ethnic minorities in dementia research, including the use of bilingual and bicultural staff, translation of study materials in Tagalog, and collection and reporting of data (e.g., country of birth; languages spoken).³⁸ Briefly, we applied community-based participatory research (CBPR) principles to identify the needs regarding dementia care and evaluation in the Filipino American community. The CATS battery was then developed to address the lack of linguistically and socioculturally tailored cognitive assessments. Study participants were recruited through an established research registry for Asian Americans, targeted social media advertising, and word-of-mouth. The CATS battery and other study components were administered over telehealth or in-person. After the visit, the participants were offered a written visit summary and debrief (Figure 1).

2.2 | Study team

The study team consisted of bilingual English/Tagalog, bicultural Filipino American/Canadian experts, including a behavioral neurologist, speech-language pathologist, linguist, neuropsychologist, and study coordinators and staff. This was integral for creating a linguistically and socioculturally tailored test battery and for developing rapport with participants.

2.3 | Community outreach and recruitment

The study team engaged with the community throughout all stages of this study, implementing a CBPR approach.^{39–41} This strategy respects

RESEARCH IN CONTEXT

- 1. Systematic review:** The authors used traditional methods (e.g., Pubmed, government data) to search for and identify relevant information and articles for literature review. While some cognitive measures have been normed and validated for evaluation of Alzheimer's disease and related dementias (ADRD) in Tagalog speakers in the Philippines, none have been developed or adapted for Tagalog-speaking Filipino Americans. This is important because of the large population of Filipinos and Tagalog speakers in the United States and the high incidence of dementia in Filipino Americans.
- 2. Interpretation:** The Cognitive Assessment for Tagalog Speakers (CATS) is a socioculturally and linguistically tailored neuropsychological battery for Tagalog speakers in the United States. It includes cognitive tasks that have been adapted from existing measures as well as tasks that were created *de novo*. The study design also incorporates language background, mood, acculturation, and enculturation questionnaires to enable more accurate interpretation of testing results.
- 3. Future directions:** Future research will norm and validate the CATS battery, contributing to more accurate diagnosis and treatment of ADRD in Tagalog-speaking Filipino Americans.

and recognizes the strengths and assets of both the community members and researchers as they collaborate toward a common goal. CBPR has been used previously as a recruitment tool in ADRD research^{42,43} and in AAPI-focused research in other health conditions.^{44,45}

In line with a CBPR approach,^{39–41} the study team began discussions in the summer of 2020 with stakeholders about community needs regarding dementia. To promote dementia education and address hesitation in seeking care, community members commented on topics of interest and preferred modes of information (e.g., lectures, plays/drama, pamphlets). The CATS battery was developed to address the need for Tagalog cognitive testing. Community members gave suggestions on CATS study design, including suitable compensation for participants, and advised on recruitment methods, study advertisements, and ways to assure study retention. They also provided input on the appropriateness of certain test items for the CATS battery. For example, they gave opinions on item familiarity and relevance to the Filipino American context, and they informed how to best phrase instructions.

In order to adhere to fairness and authenticity criteria⁴⁶ while developing the battery, we also kept in mind several factors to maintain trustworthiness between the research team and community members, as utilized previously in CBPR.⁴⁷ To promote credibility, we (1) obtained audio and video recordings of testing sessions, assuring



FIGURE 1 CATS study design

reliable data for analysis; (2) met regularly for team debriefing about the study progress; and (3) elicited feedback from community members both informally during testing and in a formal session after completion of testing, which will be important for interpreting data and refining the battery. We maintained records regarding the levels of participant involvement and their willingness to participate in current and future research projects. We showed strong regard for the community voice through the involvement of Filipino American study staff and community stakeholders throughout the study design.

2.4 | Participants

Participants were recruited through (1) the collaborative approach for Asian Americans, Native Hawaiians, and Pacific Islanders Research and Education (CARE) Registry⁴⁵; (2) targeted social media advertisements (Facebook and Instagram); and (3) word-of-mouth (e.g., referrals from study team members, community stakeholders, or another participant). In consultation with community stakeholders, participants were offered \$100 to compensate for their time and effort.

Participants met the following inclusion criteria: age 50–80, residing in the United States, native Tagalog speaker (learned prior to age 7), CDR = 0, MMSE \geq 25, and no subjective cognitive symptoms. Exclusion criteria included severe visual/hearing impairment, other neurologic illness, or contraindication to study procedures.

2.4.1 | Consent statement

All participants provided informed consent in their preferred language (English or Tagalog) for this study, which was approved by the University of California, San Francisco, Institutional Review Board for human research.

2.5 | CATS battery design and development

The CATS battery was constructed to measure performance across four main cognitive domains: visual/verbal memory, visuospatial functioning, speech and language, and frontal/executive functioning (Table 1). The majority of tasks were adapted from existing evidence-based measures, and one task was created *de novo* by the study team. The tasks were chosen based on several considerations, including the

TABLE 1 CATS battery.

Domain	Tasks
General	Mini-Mental Status Exam ⁴⁹
Visual / verbal memory	Verbal Memory Task ⁴⁸ Figure Recall ⁴⁸
Visuospatial	Figure Copy ⁴⁸ Number Location Calculations
Frontal / executive	Digits Forward / Backward Stroop Naming/Interference Letter Fluency (B) Category Fluency (Animals)
Language	Bilingual Aphasia Test (BAT) (Part C) ²⁹ Connected Speech (Picnic Scene, Happy Event) ⁵⁰ Multilingual Naming Test (MINT) (32-item) ⁵¹ Motor Speech (including Halo-Halo Reading Passage) ^{52,53} Syntax Comprehension Syntax Production Sentence Repetition Spelling: Real Words and Pseudowords Reading: Real Words and Pseudowords Semantic Reading Task Phonemic Replacement Written Picture Description (adapted Cookie Theft) ^{54,55}

ability to differentiate between types of AD RD in other diverse populations and our clinical experience with Tagalog speakers.^{30,34,35,48} Another important factor, particularly for the selection and adaptation of speech and language tasks, was their ability to differentiate among variants of primary progressive aphasia (PPA), a group of AD RD syndromes characterized by prominent speech and language deficits.

The study team's approach was closely informed by the International Test Commission's Guidelines for Translating and Adapting Tests.^{56,57} These guidelines were developed with the goal of improving test translation and adaptation, recognizing the necessity of comparing scores across linguistic and sociocultural contexts. The CATS battery maintained the cognitive constructs and test formats of previous tasks,

TABLE 2 Supplemental data collection.

Questionnaires
Bilingualism Questionnaire
Short Acculturation Scale for Filipino Americans ²⁵
Enculturation Scale for Filipino Americans ¹⁹
Center for Epidemiologic Studies Depression Scale Revised (CESDR) ⁵⁸
Beck Anxiety Inventory (BAI) ⁵⁹
Additional study components
Neurological exam
Clinical dementia rating (CDR) scale
MRI brain (<i>optional</i>)

while considering content validity and the linguistic and sociocultural context of Tagalog speakers in the United States. Task instructions were back translated to assure they reflected the intended purpose and were understandable to Filipino Americans.

2.6 | Supplemental data collection

We collected socio-demographic information, including age, sex, education, race, ethnicity, marital status, employment, city/state of residence, and immigration history. Each participant received a neurological exam with a behavioral neurologist; clinical dementia rating scale (CDR); and several questionnaires to support interpretation of the CATS battery scores, including (1) A Short Acculturation Scale for Filipino Americans²⁵; (2) the Enculturation Scale for Filipino Americans¹⁹; (3) the Center for Epidemiologic Studies Depression Scale Revised (CESDR)⁵⁸; and (4) the Beck Anxiety Inventory (BAI).⁵⁹ These measures have all been previously utilized in Filipino American populations.^{20,60–62} In addition, the participants completed the UCSF Bilingualism Questionnaire, which collects information on number of languages spoken, age(s) of acquisition, countries/regions where the individual has lived, and immigration history. For each language, the questionnaire asked for years of formal education in each language; previous/current amount of language use; language switching; perceived skill level in speaking, reading, and writing [rated on a scale from 0 (not well at all) to 6 (very well)]; and perceived communication difficulties. Structural MRI (magnetic resonance imaging) brain imaging was offered as an optional study component (Table 2).

2.7 | Study visit and debrief

The CATS battery was initially administered solely over secure telehealth due to pandemic restrictions. The Telehealth administration was closely informed by the Interorganizational Practice Committee (IOPC) telehealth testing guidelines.⁶³ As restrictions

eased, allowances were made for in-person visits based on participant preference. Recruitment communications, screenings, and the study visits were offered off-hours and on weekends to help decrease participant burden. The presence of bilingual study staff helped ensure understanding around all elements of the study visit and testing. This also created space for a more culturally sensitive visit, such as the use of honorifics (e.g., use of “*po*” and appropriate titles of respect) and increased attentiveness to Filipino verbal and nonverbal social cues. The visits were audio and video recorded. At the end of the study, to help maintain a strong level of transparency, the participants were offered a written visit summary as well as a debrief with the neurologist to review imaging results (if completed), receive education about brain health, give feedback about their experience and their thoughts on the battery, and ask questions about the study.

3 | RESULTS

3.1 | Descriptions of the CATS battery tasks

We described the overall CATS battery design and development in the Methods section. Here we present detailed descriptions of the tasks.

3.1.1 | General measures of cognition

Mini-Mental Status Exam (MMSE): We adapted the Filipino version of the MMSE (MMSE-P), which was validated for dementia screening in the Philippines.⁴⁹ For our version, we made modifications based on the information from community members. Participants could give the date in English or Tagalog, as we learned from Filipino Americans that they are less accustomed to providing the date solely in Tagalog. Instead of naming the season as wet or dry, CATS battery participants answered with one of the four US seasons. We replaced the street (or *barangay* as an alternative response) and country questions with county and state, which are more culturally appropriate for US residents. We adapted the three-step command for use over telehealth.

3.1.2 | Visual and verbal memory tasks

Verbal Memory Task: This task was adapted from the California Verbal Learning Test-Short Form (CVLT-SF).⁴⁸ We retained its overall structure, which presents a nine-item list over four learning trials with a 30-second and 10-minute delayed recall. However, since several of the items did not have Tagalog translations or were not familiar to community members, we substituted them for items that were culturally relevant and easily named in Tagalog by Filipino Americans.

Figure recall: As a test of visual memory, participants drew a modified Rey-Osterrieth figure from memory after a 10-min delay.⁴⁸

3.1.3 | Visuospatial tasks

Figure copy: Participants copied a commonly used modified Rey-Osterrieth figure.⁴⁸

Number location: This consisted of a 10-item version of the number location task, which tests space perception.⁶⁴

Calculations: Participants completed written arithmetic problems that varied in difficulty.

3.1.4 | Frontal/ executive tasks

Digit span forward/backward: Participants repeated a string of digits of increasing length. They then repeated strings of numbers in the reverse order of that presented by the examiner.

Stroop naming/interference: Participants named the color of the ink of strings of the letter “X.” Participants then named the color of the ink of words (*pula, asul, or berde*) that were incongruent with the printed word.

Letter fluency: Participants named words beginning with the letter “B” for 1 min.

Category fluency: Participants named as many animals as possible in 1 min.

3.1.5 | Speech and language tasks

Bilingual Aphasia Test (BAT) (Part C): We included the Tagalog-English version of the BAT Part C as an objective measure of language proficiency. The BAT was developed for use in individuals with aphasia and designed to be culturally and linguistically comparable in each language.²⁹

Connected speech measures: Participants described the picnic scene from the Western Aphasia Battery⁵⁰ and spoke for 1 min about a happy or important event. These connected speech tasks have been used in ADRD to evaluate speech rate, fluency, grammaticality, and lexical retrieval.⁶⁵ Because the Happy Event prompt asked participants to share information about their personal lives, which is not commonly discussed with new acquaintances in Filipino culture, we collected this toward the end of the visit after establishing rapport.

Multilingual Naming Test (MINT): Participants named the series of 32 black-and-white line drawings from the MINT, following the standard protocol of administration.⁶⁶ Potential alternative responses were discussed with community members, and a final list of acceptable responses was determined with the study team.

Motor speech tasks: To evaluate motor speech, we adapted tasks that included words of increasing length and repetition of short words,^{34,67,68} tailored for Tagalog phonemes, affixes, and morphology. We included the Halo-Halo Reading Passage,^{52,53} which contains Tagalog phonemes in all possible word positions and English phonemes that commonly occur in Tagalog loan words. It is socioculturally relevant, as it describes a common Filipino dessert.

Syntax comprehension and production: Previous work in PPA has shown greater impairment in complex versus simple syntactic structures in sentence comprehension and production tasks.^{69–71} Since Tagalog studies of syntactic deficits in ADRD remain scant, we based test items on the structural properties of Tagalog and deficits in agrammatic stroke aphasia.⁷² For sentence comprehension, participants pointed to one of two pictures that matched a spoken sentence. For sentence production, they were shown pictures of two figures performing an action and completed a sentence fragment from the provided uninflected verbs and/or nouns.

Sentence repetition: Sentence repetition tasks can help differentiate PPA variants.^{34,73,74} We created new sentences that differed in length, frequency, and meaningfulness, following the Bayles repetition task structure.^{73,74} Since multisyllabic words are more common in Tagalog, we employed longer sentences relative to English language paradigms. We ensured the socio-culturally appropriateness of the items. For example, we incorporated Tagalog expressions such as *bahala na*, a common expression expressing a fatalistic attitude to the unknown, in long meaningful sentences (e.g., *Bahala na kung anong mangyari dito*, roughly translated as ‘Come what may; whatever happens, happens’).

Spelling and reading tasks: Previous studies have differentiated among ADRD syndromes through individuals’ ability to spell and read regular words, exception words, and nonwords.^{75,76} We created spelling and reading tasks for these three categories, utilizing Tagalog phonemes, syllabic structure, and orthographic rules. In English, selective impairment in reading exception words (surface dyslexia) can signal semantic processing deficits.⁷⁷ Since exception words are rare in Tagalog, we included loan words from Spanish and English.

Semantic reading task: We created a new task to probe semantic processing by evaluating participants’ sensitivity to phonemic stress, a feature that changes word meaning.⁷⁸ For example, the word *bukas* can mean ‘tomorrow’ or ‘open,’ depending on stress placement. In this new task, participants read a sentence pair that contains a word whose stress placement depends on the sentence’s semantic context.

Phonemic replacement task: Since phonological deficits are a feature of ADRD and PPA,⁷⁶ we developed the following subtests: (i) phoneme deletion, producing the remaining word/nonword after removing a sound from the original word/nonword; (ii) sound blending, producing a word/nonword that results after combining sounds that were initially in isolation; and (iii) phoneme replacement, producing a new word/nonword after replacing a sound from an original word/nonword.

Written picture description: This task used a revised Cookie Theft Picture^{54,55} with socio-culturally appropriate modifications, including a mother cooking rice and wearing a duster dress, which is commonly worn in the Philippines; an electric fan, suited for the Philippine tropical climate; and the child sneaking junk food and chips instead of cookies.

3.2 | Participant characteristics

The CATS pilot and feasibility study opened for enrollment on August 1, 2022. As of March 30, 2023, the study had enrolled 26 participants. The sample was 69% female with a mean age of 64.5 years (standard

TABLE 3 Socio-demographic characteristics of participants (N = 26).

Age	
Mean (years, SD)	64.5 (7.8)
Range (years)	52-79
Sex (male/female)	8 / 18
Education, years (SD), range	17.3 (1.8), 12-20
Employment status	
Disabled (N, %)	1 (4)
Full time (N, %)	10 (38)
Part time (N, %)	3 (12)
Retired (N, %)	9 (35)
Homemaker (N, %)	2 (8)
Prefer not to answer/no information (N, %)	1 (4)
Marital status	
Married/living with partner (N, %)	11 (42)
Single (N, %)	3 (12)
Separated/divorced (N, %)	3 (12)
Widowed (N, %)	7 (27)
Prefer not to answer/no information (N, %)	2 (8)
Region	
California	23 (88)
Non-California ^a	3 (12)
Nativity	
US-born (N, %)	0 (0)
Foreign-born (N, %)	25 (96)
Unknown	1 (4)

^aThese participants lived in Texas, Georgia, and Indiana.

deviation [SD]: 7.8, range = 52–79) and mean education of 17.3 (SD 1.8) years (Table 3). All participants identified as Filipino American and were foreign-born, and most (88%) resided in California. Most participants were employed full time (38%), part time (12%), or were retired (35%).

Twenty-four participants completed the UCSF Bilingualism Questionnaire (Table 4). They spoke an average of 3.1 (SD 1.2) languages, including a variety of Philippine and non-Philippine languages. The majority were simultaneous (33%) or early (63%) bilingual speakers. The majority reported speaking both English (75%) and Tagalog (75%) very well.

3.3 | Recruitment and visit characteristics

The participants were recruited through social media (42%), the CARE registry (31%), and word-of-mouth (27%). Most participants (77%) completed the CATS battery over telehealth, and the remaining participants (23%) completed in-person visits (Table 5). After completion of the study, most participants (88%) indicated a willingness to participate in future studies.

TABLE 4 Language characteristics from the UCSF Bilingualism Questionnaire (N = 24).

Number of languages spoken, mean (SD)	3.1 (1.2)
Bilingualism	
Simultaneous bilingual (N, %)	8 (33)
Early bilingual (learned L2 at age 7 or earlier) (N, %)	15 (63)
Late bilingual (learned L2 after age 7) (N, %)	1 (5)
Other languages spoken	
<i>Philippine languages</i>	
Hiligaynon (Ilonggo)	2
Ilocano	2
Kapampangan	2
Bikol	1
Bisaya	1
Ibanag	1
Pangasinan	1
<i>Other languages</i>	
Spanish	12
French	3
Arabic	1
German	1
Japanese	1
Mandarin	1
Russian	1
Vietnamese	1
Language proficiency^a	
<i>English</i>	
4 out of 6 (N, %)	1 (4)
5 out of 6 (N, %)	5 (21)
6 out of 6 (very well) (N, %)	18 (75)
<i>Tagalog</i>	
4 out of 6 (N, %)	2 (8)
5 out of 6 (N, %)	4 (17)
6 out of 6 (very well) (N, %)	18 (75)

^aParticipants were asked to rate their language proficiency on a scale from 0 (not well at all) to 6 (very well).

4 | DISCUSSION

To our knowledge, the CATS battery represents the first neuropsychological battery tailored for Tagalog speakers in the United States. Overall, study recruitment has been successful. Our center previously evaluated an average of only two Filipino Americans per year. We have enrolled 26 participants in the first 8 months of the study, even despite pandemic-related restrictions.

Our cohort was 69% female, similar to past recruitment registries and aging studies.^{43,45,79} All participants were foreign-born, and previous studies have demonstrated the importance of CBPR in engaging

TABLE 5 Recruitment and visit characteristics (N = 26).

Method of recruitment	
Social media (N, %)	11 (42)
CARE registry (N, %)	8 (31)
Word-of-mouth (N, %)	7 (27)
Visit characteristics	
Telehealth (N, %)	20 (77)
In-person (N, %)	6 (23)
Interested in future research participation	
Yes (N, %)	23 (88)
No (N, %)	0 (0)
Unknown/undecided/pending (N, %)	3 (12)

immigrant communities.⁸⁰ Half were employed part-time or full-time, pointing to the need for flexibility in study visit days and times. Relevant to this, 77% of study visits were performed over telehealth. While this was related to research restrictions and participant preferences during the coronavirus disease 2019 (COVID-19) pandemic, it will be important to continue to incorporate telehealth to accommodate participants' work and family responsibilities. Telehealth utilization can also broaden the geographical reach of research studies and mitigate travel costs, time burden, and lost wages that can accompany in-person research participation. The cohort's high degree of multilingualism (average of 3.1 spoken languages per participant) confirmed the need to account for the community's rich language and cultural experiences when interpreting study results.

Strengths of the study include the development and administration of the battery by a bilingual, bicultural team and participation of community stakeholders throughout the study stages. This collaboration was integral in curating study practices that encouraged participation and fostered a linguistically and culturally sensitive research experience. Additionally, the study protocol incorporates measures of bilingualism, acculturation, and enculturation, allowing for a more thorough understanding of future study results. These considerations are in line with current recommendations to increase representation of ethnic minorities in dementia research.³⁸

There are important study limitations and considerations. The cohort's high level of educational attainment (17.3 ± 1.8 years) reflects the Filipino population in the United States, with 50% holding a bachelor's degree or higher,⁹ but it will be necessary to ensure that the battery can be adequately utilized in a range of educational backgrounds and literacy levels. The pandemic dampened opportunities for in-person recruitment and outreach events. Resumption of these activities will likely allow for increased study enrollment, including in more diverse community members with a range of education and literacy levels. Finally, the overall length of the CATS battery could potentially limit its use. In particular, we note that there are a large number of speech and language tasks that require an extended amount of time to administer. We included a range of speech and language assessments because previous studies have shown that naming tasks alone may not be ade-

quate to differentiate among specific dementia variants.^{34,35} To our knowledge, these types of tasks have not yet been developed for Tagalog speakers, necessitating the creation of new test items that take into account the specific linguistic features of the language. In addition, it is not yet clear how speech and language deficits will present in Tagalog speakers with ADRD, and past studies have shown that language typology does affect ADRD symptoms.^{36,37} The overall length of the battery should be refined over time as we learn more about the sensitivity, specificity, and reliability of individual test items and subtests in identifying ADRD symptoms.

For the development and pilot phase of the CATS battery, our initial goal is the recruitment and assessment of 30 healthy control participants, which we expect to complete by the end of Summer 2023. We plan to perform item analysis and begin reporting of initial results from this cohort by Fall/Winter 2023. We will continue to refine the CATS battery as necessary. We expect to begin recruitment of patients with cognitive impairment in the Fall/Winter 2023, with a goal sample size of 30 cognitively impaired participants by end of 2024. Overall, we envision this work as the first steps of building a sustainable research and dementia education program for, and in conjunction with, the Filipino American community.

5 | CONCLUSION

In conclusion, we have presented the design and protocol of the CATS battery, a neuropsychological test battery for the detection of ADRD in Tagalog-speaking Filipino Americans. Piloting of the CATS battery now allows for the next stages of implementation, including item analysis, reliability assessments, and eventual norming and validation studies.

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CONFLICT OF INTEREST STATEMENT

None of the authors have conflicts of interest to declare. Author disclosures are available in the [supporting information](#).

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SUPPORTING INFORMATION

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