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Original Article

# Tailoring implementation strategies for the healthy actions and lifestyles to Avoid Dementia *or Hispanos y el ALTo a la Demencia* Program: Lessons learned from a survey study

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ABSTRACT

*Background:* Healthy Actions and Lifestyles to Avoid Dementia Program (HALT-AD) *or Hispanos y el ALTo a la Demencia* is a recently-developed online educational platform to help individuals identify and modify their own dementia modifiable risk factors (MRF). In light of known challenges in recruiting and retaining diverse participants in research studies, there is a need to identify data-informed strategies that will contribute to effective outreach and tailored implementation of HALT-AD among its intended users of Hispanic and non-Hispanic midlife and older adults in the US.

*Objectives:* To identify factors (i.e, demographic, medical, psychosocial and environmental) that may facilitate or impede effective program enrollment and participation.

*Design:* Cross-sectional study

*Setting:* Data from an online and self-administered survey conducted between January and April 2023

*Participants:* Residents of California, predominately San Diego, who were 50 to 85 years old, with no dementia or Alzheimer's disease, proficient in English or Spanish and with enough technical ability to complete the survey electronically (n=157; 43% Hispanic).

*Intervention (if any):* none

*Measurements:* RedCap was used to capture answers to closed and open-ended survey questions. Mixed-methods analysis was used: For quantitative data, descriptive statistics, comparisons by group (Hispanic/non-Hispanic), and exploratory factor analysis were conducted in SPSS. Thematic analysis with open coding in Excel was used for qualitative responses.

*Results:* Independent of ethnicity, participants' most preferred method of reach for recruitment was through a conversation with their doctor or with a family member or friend. Their least preferred method was receiving a Facebook advertisement especially among non-Hispanics. Interest in program participation did not differ by sociodemographic characteristics or self-rated satisfaction with individualized MRFs. Instead, having higher confidence in one's ability to commit to behavior change was significantly associated with higher interest in program participation. While a common theme to motivate both groups to participate was the potential to decrease dementia risk, non-Hispanics were motivated by the premise of supporting research and having a positive user experience. For program implementation, Hispanics were more likely to be interested in participating if live sessions, either online or in-person, were provided to offer support with making lifestyle changes as adjunct to

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[1] https://www.adcs.org/halt-ad-study/.

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completing online courses independently. In both groups, participation may be further facilitated by offering wearable devices which provide participants with feedback on lifestyle change progress.

*Conclusions:* A "one-size-fits-all" approach to recruitment and implementation of HALT-AD may not be effective in enrolling and retaining participants in future studies or for clinical use. Instead, a tailored approach that accounts for personal and ethnically-dependent preferences may be more beneficial.

## 1. Introduction

Alzheimer's disease and related dementias (ADRD) affect almost seven million Americans over the age of 65, with numbers rising as our population ages, and this prevalence is higher in minoritized communities at higher disease risk including Latinos/Hispanics (hereinafter referred to as Hispanics), Asian Americans, and African Americans [1]. Current medications delay disease progression in some patients, or treat symptoms temporarily, but do not reverse disease course [2]. With the lack of a cure and the enormous economical and psychological impact of ADRD on afflicted persons and their families, as well as more societally, there is an urgent need to prevent or delay dementia onset. In the last two decades, a large body of scientific literature has documented modifiable risk factors (MRFs) that, if targeted separately or in combination with other risk factors (multidomain) through evidence-based interventions - such as targeting hypertension, sleep apnea and hearing loss - can decrease dementia risk [3-7]. According to the Lancet Commission, addressing MRFs across the lifespan would reduce approximately 45% of dementia risk at the population level [5]. To date, translating this knowledge into widespread action among individuals to identify and decrease their own dementia MRFs has been a challenge for several reasons including lack of awareness of what dementia MRFs are and how they can be addressed, insufficient knowledge of one's own MRFs, as well as lack of support systems to empower effective behavior change [8-10].

To close this translational gap in knowledge uptake, most public health-level efforts in the US have focused on awareness building through governmental programs such as The Centers for Disease Control Alzheimer's Disease Program and through outreach via non-governmental entities including the Alzheimer's Association and medical centers around the country (i.e., educational talks, walks, fundraisers) [11,12]. At the individual level, educational programs are emerging within academic research settings to support individuals with learning about prevention and improving behaviors that may reduce dementia risk, such as the Canadian Brain Health Pro and the Dementia Risk Management and Prevention Program for Aboriginal Australians (DAMPAA), which also includes group exercises, yarning sessions, and medication reviews [13,14]. Our group has developed the Healthy Actions and Lifestyles to Avoid Dementia Program (HALT-AD) *or Hispanos y el ALTo a la Demencia*, an online personalized platform to educate and motivate participants to identify and modify their own MRFs [15]. The program offers educational and gamified modules that can be completed at a person's own pace and with the option to also participate in guided support group sessions. Following a community-based participatory research framework, we developed this program iteratively in both English and culturally-adapted Spanish using feedback from two community advisory boards (Hispanics and non-Hispanics) and using data from user testing pilot studies. The program, in its current form, is being tested as an adjunct clinical tool to facilitate educational efforts through primary care settings within a healthcare system. We are concurrently considering program implementation strategies that would support health equity and program access to all members of the community within and outside the healthcare system. Accordingly, the questions at hand are: What strategies can we use to inform the public about our program? And how can we best implement it to most benefit the communities we seek to serve, including Hispanics in California as a start and eventually nation-wide? We are interested in learning what drives outcomes including program uptake, knowledge improvement, self-efficacy building, and commitment to behavior change.

The latter question is embedded in the field of implementation research which defines implementation strategies as "methods or techniques used to enhance the adoption, implementation, and sustainment of a clinical program or practice" [16]. Evidence suggests effective outreach and implementation of a dementia risk reduction program may be achieved by tailoring strategies to address the needs and interests of its intended users, rather than using a "one-size-fits-all" approach. For example, higher Hispanic engagement in the UCSF Brain Health Registry was achieved when culturally-tailored advertisement was implemented: Facebook ads were created using family (La Familia) as a theme with common Latino interests presented in pictures (e.g. Latino music) and using colors reflective of the lifestyle, art, and history of Latinos in the US [17]. As an example of program implementation, educational programs were most effective among AAs when cultural tailoring strategies were used such as delivering content in the community's dialect/accent, integrating members' religious practices, and involving trusted members as educators (i.e, at barbershops) [18]. While we found limited examples for tailoring implementation strategies for a dementia prevention program, several therapeutic interventions for people affected by dementia and their caregivers have successfully been tailored for better implementation within and outside the United States [19,20].

The first step in selecting and tailoring implementation strategies is to conduct an assessment of the characteristics of the setting in which HALT-AD will be implemented, the characteristics and preferences of involved stakeholders (i.e, intended users, partnering organizations), and other potential barriers and facilitators [21]. In the San Diego context and the US at large, sociodemographic characteristics including ethnicity may be important factors that impact how people wish to learn about HALT-AD and how they'd prefer it implemented, as we know that ethnic characteristics related to one's beliefs, values, languages can affect engagement with and success of health interventions [22]. We speculate a myriad of factors may influence one's interest in participating in a program like HALT-AD, and these include: one's medical history related to MRFs, perceived knowledge about dementia, confidence in ability to commit to lifestyle modification, and access to an electronic device/internet. Yet little evidence exists in support of these speculations within the context of lifestyle modification for dementia prevention, with evidence mostly stemming from studies on cancer and cardiovascular disease prevention [23,24]. Better understanding these factors would not only help better tailor implementation of HALT-AD, but may also provide others with guidance in the design and implementation of other dementia prevention programs. In this study, we aimed to better understand interest, facilitators, and barriers to participation in HALT-AD among Hispanic and non-Hispanic healthy midlife and older adults primarily residing in San Diego, California.

## 2. Methods

In this cross-sectional study conducted between January and April 2023, we used an online and self-administered survey to collect information on interest in HALT-AD and to explore potential demographic, medical, psychosocial and environmental facilitators and barriers for effective program enrollment and participation among midlife and older adults (**Supplementary File 1 for survey**). We intentionally used a mixed-methods approach [25,26] with closed and open-ended survey questions to capture unknown potential facilitators and barriers through quantitative and qualitative data analysis. Informed by published literature on potential barriers and facilitators of effective behavior change

for disease risk reduction including ADRD [8-10,23,24] and guided by written feedback from two Hispanic and non-Hispanic HALT-AD community advisory boards [15], SM drafted the survey which was finalized with guidance from the co-authors. Inclusion criteria were being 50 to 85 years old, self-reported having no dementia or Alzheimer's disease diagnosis, proficient in English or Spanish and with enough technical ability to complete the survey electronically. Individuals who had previously participated in HALT-AD pilot research either as Community Advisory Board Members or as study participants were not eligible.

Participants were recruited through word of mouth, flyers posted on bulletin boards in public libraries, coffee shops, and 55+ community housing in San Diego, as well as online flyers (i.e, Facebook, Craigslist, Next Door App). Given the online and self-report nature of this research and to reduce risk of fraudulent participation as well as to ascertain eligibility, individuals interested in participating were required to complete a pre-screening telephone interview with a study coordinator. Individuals who passed pre-screening were then emailed a link to the survey in English or Spanish. The survey was administered via REDCap, and participants were compensated with a $10 online gift card. A study coordinator maintained a master spreadsheet to track and compare progress with survey completion against progress with pre-screening. Comparisons were also made between email addresses provided at enrollment and email addresses used to deliver the thank-you gift card to ascertain that a scenario where unscreened individuals received access to and completed the survey link was highly unlikely.

### 2.1. Statistical Analysis

Kolmogorov–Smirnov test was used to test the distribution of continuous variables expressed as mean ± SD if normal and as median (interquartile range; range) if skewed. Differences in continuous variables by ethnicity or by participation interest were analyzed by independent student t-test or by Mann-Whitney U test for normal and skewed data respectively. Categorical variables are expressed as frequency (%), and comparisons of categorical variables by ethnicity were conducted using Chi-Square test. Potential facilitators and barriers of participation that were investigated included participant sociodemographic characteristics, medical history, family history of dementia, as well as satisfaction levels with various health and lifestyle factors related to dementia risk reduction, perceived knowledge around brain health, confidence in one's ability to commit to behavior change, and finally access to an electronic device/internet to participate. Scores for the latter three variables were generated after exploratory factor analysis (EFA) with principal component extraction was conduct on relevant survey questions (**Supplementary Table 1**). Specifically, the three subscales were analyzed separately, with consideration of the item themes. Direct oblimin rotation of the items was utilized, and the Kaiser–Meyer–Olkin test indicated items could be factorable. Bartlett's Test of Sphericity was significant ($P < 0.001$), and Cronbach's Alpha demonstrated adequate to excellent reliability (0.900, 0.757 and 0.876 repectively). SPSS Software (Version 27 for Mac OS X) was used, and the level of statistical significance was set at $P < 0.05$ with Bonferroni adjustment when applicable.

For qualitative analysis, responses to the open-ended survey questions that were in Spanish were first translated to English then compiled in one dataset with those in English. Then questions were coded and thematically analyzed in Excel starting with open coding [25]. Responses were reviewed independently by two researchers (SM and CEA) who first identified themes separately then revised the themes together to reach consensus.

## 3. Results

### 3.1. Demographics, medical information, and satisfaction with one's health and lifestyle

All pre-screened individuals were eligible to participate (n=178) and survey completion rate was 93% (n=166). Participants who preferred not to report their ethnicity or reported ethnicity as unknown (n=9) were excluded resulting in=157 participants. Hispanics and non-Hispanic respondents differed in some sociodemographic characteristics, with Hispanics being slightly younger, with a lower % completing university, a higher % living in urban settings, and higher % not yet retired compared to non-Hispanics (Table 1). In both groups, more females than males completed the survey, accounting for more than two-third of the sample size. Of note, while the non-Hispanic group included mostly Whites, other races were reported including 22% as Native Asians and 6% as Native Hawaiian/Pacific Islanders; both being proportionally higher than the current racial demographic distribution in California.

Regarding medical history, most respondents in both groups reported not having cerebrovascular conditions or mental and sleep problems, as well as not smoking or depending on drugs or alcohol **(Supplementary Table 2).** More Hispanics than non-Hispanics reported having been advised by a health provider to lose weight (41% and 26% respectively, $P$=0.042). Although fewer Hispanics reported having a blood relative with dementia or Alzheimer's disease (29% and 48% respectively, $P$=0.017), there were no significant differences between the groups in the presence of memory concerns.

We also asked about satisfaction level related to one's health behaviors and conditions, as we speculated lower satisfaction may influence one's interest in participating in a lifestyle modification program like HALT-AD. In both groups, satisfaction was high (defined as >90% of participants reporting "moderately satisfied" or more) with one's mental health and was lower (<90%) for diet, sleep and physical activity **(Supplementary Table 3).** In both groups, physical activity was the health behavior with lowest levels of satisfaction. Among non-Hispanics only, high satisfaction was also found with social interactions, blood pressure, hearing and medicine use, with the latter being significantly less satisfactory among Hispanics ($P$=0.018).

### 3.2. Preferred outreach methods to inquire about HALT-AD

Fig. 1 summarizes the percentage of participants likely to inquire about HALT-AD if they were to learn about the program through a variety of outreach methods. For both groups, having a conversation with a doctor or a with a family member or friend were the most preferred method. Conversely, the least preferred method was receiving an advertisement through Facebook especially among non-Hipanics ($P$=0.012 for Facebook preference; $P$=0.032 for conversation with a friend/family). Second favorite for both groups was learning about HALT-AD through a flyer at one's doctor's office. Interestingly, receiving a text message from the HALT-AD research team seemed more preferrable among non-Hispanics than Hispanics ($P$=0.036).

Additionally, to better understand the potential usability of active outreach, such as a person actively recommending the program to its intended users, we also asked "How likely are you to give HALT-AD a try if it was recommended to you by a friend, family member, doctor, or community leader (separate question for each role)"? We found that independent of ethnicity, participants were more likely to try the program if recommended by their doctor, followed by family, friend and then finally community leader although Hispanics were more likely to follow a community leader's recommendation compared to non-Hispanics (48% and 39% respectively, $P$=0.042).

## 4. Interest in program participation, facilitators, and barriers

### 4.1. Results from quantitative data analysis

**First,** in exploring potential facilitators and barriers for participation, we found that higher confidence scores were significantly associated with higher interest levels of program participation (Fig. 2), suggesting there may be a need to incorporate confidence building interventional components within the program or even before program initiation

**Table 1**
Sociodemographic characteristics

| | Non-Hispanic (n=89) | Hispanic (n=68) |
|---|---|---|
| Age, years * | 66.0 ± 8.28 (50-82) | 61.8 ± 8.89 (50-85) |
| Race | | |
| American Indian or Alaskan | 0 (0) | 0 (0) |
| Native Asian | 20 (22.4) | 0 (0) |
| Native Hawaiian/Pacific Islanders | 5 (6) | 1 (1.5) |
| African American | 1 (1) | 0 (0) |
| White | 60 (67.4) | 5 (7) |
| Latin American | 0 (0) | 61 (90) |
| More than one Race | 2 (2) | 1 (1.5) |
| Not reported | 1 (1) | 0 (0) |
| Gender | | |
| Female | 59 (66) | 51 (75) |
| Male | 30 (34) | 17 (25) |
| Living environment * | | |
| Urban | 34 (38) | 49 (72) |
| Suburban | 53 (60) | 19 (28) |
| Rural | 2 (2) | 0 (0) |
| Living with * | | |
| Alone | 18 (20) | 5 (7) |
| Spouse or significant other only † | 61 (69) | 46 (68) |
| Children/grandchildren only | 3 (3.4) | 6 (9) |
| Other members of the family | 1 (1) | 9 (13) |
| Friend(s) only | 2 (2) | 1 (1) |
| Other | 4 (4.5) | 1(1) |
| Highest grade/level of school/degree * | | |
| Never attended school | 0 (0) | 0 (0) |
| Some primary/grade | 0 (0) | 6 (9) |
| Completed primary/grade school | 0 (0) | 0 (0) |
| Some high school | 1 (1) | 2 (3) |
| Completed high school | 5 (6) | 6 (9) |
| GED | 0 (0) | 4 (6) |
| Apprenticeship | 0 (0) | 3 (4) |
| Technical school or community college | 6 (7) | 8 (12) |
| Some university | | |
| Undergraduate degree at university | 11 (12) | 10 (15) |
| Some graduate (post-undergraduate) | 31 (35) | 14 (21) |
| school | 6 (7) | 3 (4) |
| Graduate degree at university | 29 (33) | 12 (18) |
| Current employment status * | | |
| Paid employment | 30 (34) | 43 (63) |
| Retired | 53 (60) | 18 (26) |
| Unemployed | 6 (7) | 7 (10) |

* $P<0.05$;
† $n=20$ of those living with spouse also live with children/grandchildren, other family member or friend.

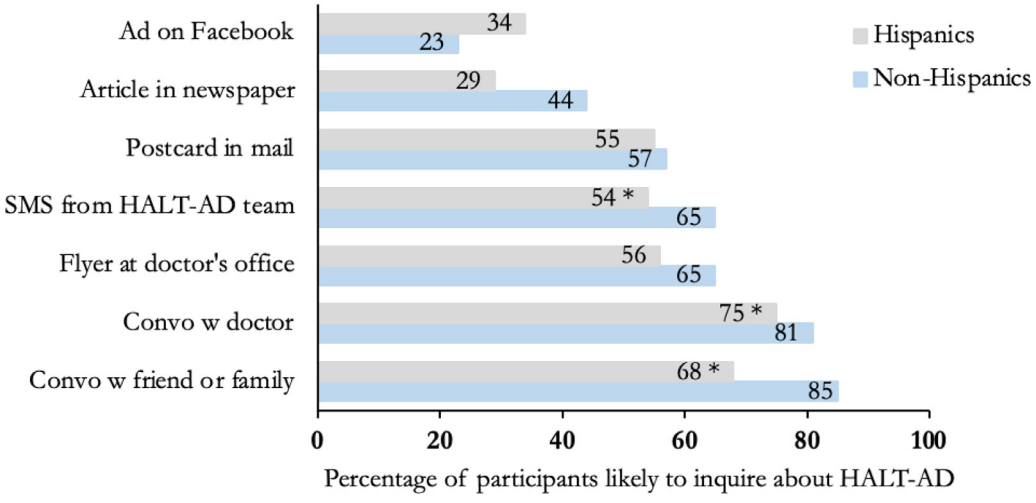


**Fig. 1.** Likeliness to inquire about HALT-AD by various outreach methods. *$P<0.05$

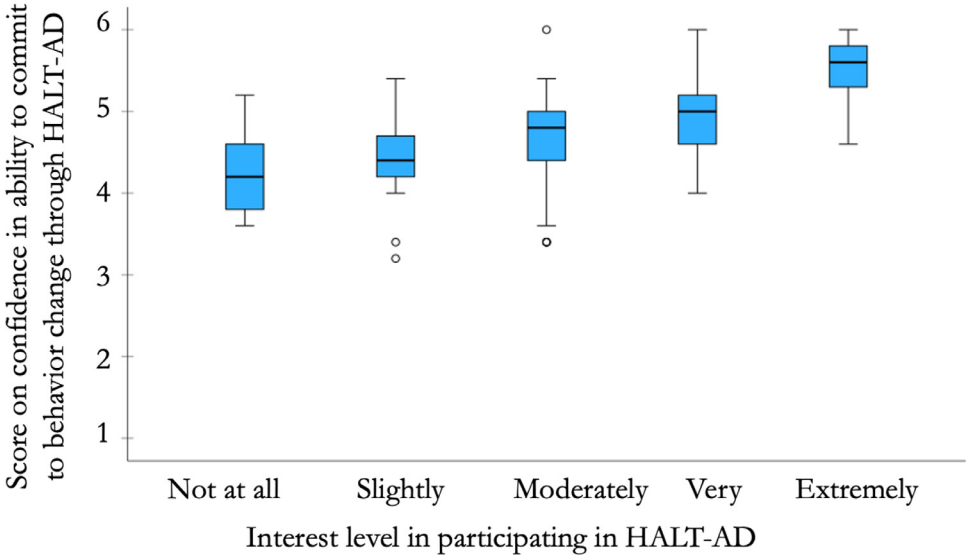


**Fig. 2.** Confidence in ability to participate and in getting results is different across interest categories.

to increase chances of its effectiveness. This tailoring possibility may be suitable to participants independent of their ethnicity since no significant between-group differences were found in confidence levels or in the level of perceived knowledge about dementia. **Second,** although interest did not differ by one's access to technology, significantly more Hispanics reported not having access to an electronic device or reliable internet to complete the HALT-AD program. **Third,** when offered three different options for how HALT-AD could be implemented, Hispanics were more likely to be interested in participating if live sessions, either online or in-person, were provided to offer support with making lifestyle changes as an adjunct to completing the online courses independently ($P$=0.013) (**Supplementary Table 4**). Similarly, Hispanics were more likely to be interested in participating in an intensive and in-person program at UCSD to receive hands-on training in lifestyle change ($P$=0.041), although interest for this option was generally low in both groups. Therefore, tailoring HALT-AD to offer a more personal component that provides lifestyle modification support may be a facilitator for participation especially for Hispanics. **Fourth,** participation may be further facilitated by offering wearable devices and providing participants with feedback on lifestyle change progress. More than 70% of participants across both groups reported interest in wearables. **Finally,** interest levels did not differ significantly by any of the sociodemographic characteristics or by satisfaction levels of the various MRFs.

### *4.2.* Results from qualitative data analysis

When we asked about what people needed to know or have to be motivated to participate in HALT-AD a common theme in both groups was having more information about the program itself including **evidence of its effectiveness** in supporting behavior change. Among non-Hispanics, a **positive user experience** was commonly reported to facilitate behavior change. For instance, will the program be personalized, fun, motivating and rich in practical content? In both groups, a commonly reported near-future barrier to program participation was **time commitment** and interestingly, **health problems/disabilities** among the non-Hispanic group even though both groups had reported similar health conditions.

To better understand how to tailor incentives for program participation, we asked participants to report reasons why they would be interested in participating in a program like HALT-AD. Regardless of ethnicity, the most common theme was to **proactively prevent dementia.** We observed differences in themes across ethnicities whereby non-Hispanics were largely interested due to their **family history of dementia** (despite similar reported family history between the groups) and to **help with research,** while these themes were less common among Hispanics.

## 5. Discussion

This study was primarily conducted to identify useful strategies that could facilitate effective implementation of the HALT-AD program, with findings relevant and potentially applicable to the implementation of other dementia MRF reduction programs in communities with diverse ethnic populations. Using feedback from more than a hundred individuals representative of the program's intended users - healthy midlife and older adults without dementia- we share here lessons learned on two main topics: how individuals (Hispanics or non-Hispanics) may prefer to be reached to learn about HALT-AD and to successfully proceed with enrolling in the program; 2) what factors (personal, environmental and program-related) may influence interest in program participation.

First and regarding recruitment and enrollment, we learned our efforts may be more effective if we create and mobilize program embassadors who can "pitch" the program one-on-one within medical offices and within the community. Medical doctors generally and those as one's own family member specifically, continue to be highly trusted when making health care decisions [27,28]. The challenge, however, in mobilizing doctors as ambassadors for HALT-AD or other preventive care programs during a patient visit is largely logistical: An average primary care physician (PCP) visit in the US only lasts 19 minutes for adult patients with a need to cover immediate health concerns, physical exam, and medication management of active problems [29]. During these short visits, PCPs are often unable to prioritize multidomain interventions for future brain health. Instead of using the patient visit itself as a setting to advertise for HALT-AD, alternative solutions could be: 1) incorporating HALT-AD information and the ability to consent to being contacted by a team member directly within the patient's health management electronic system before the visit occurs; 2) sending text messages from the health system targeting patients with known MRFs (e.g. patients with hypertension, with sleep apnea etc). The latter suggestion is in line with our findings that both Hispanics and non-Hispanics find text messages appropriate and engaging. Outside the health care setting, it is not unusual to seek preventive care advice from family and friends [30,31] which is consistent with our findings on preference to learn about HALT-AD and to enroll through a personal connection. At the UCSD Alzheimer's Disease Research Center and similar to other research groups, we and colleagues have been partnering with promotoras to specifically engage with Hispanic community members. Promotoras are trained members of the lay public who specialize in healthcare out-

reach. To expand this effort beyond promotoras and to include family and friends, we propose unconventional approaches for recruitment such as targeting young adults in colleges and community centers to learn and then educate their family members on dementia risk reduction and HALT-AD.

We also learned not to consider paid Facebook advertisements as our first choice of outreach independent of our target audience's ethnicity. Over the years, social media has become a game changer for clinical trial recruitment especially after the pandemic and when broader geographical targeting is of interest [32,33]. However, social media does not seem to be able to fully replace the benefit of person-to-person interactions especially in underrepresented communities. For example, the UCSF health brain registry benefitted from tailoring Facebook ads to increase engagement of Hispanics (i.e., clicking on the ad or liking it). Yet Facebook alone, even with cultural tailoring, was not enough to translate increased engagement into increased enrollment [17]. More recently, Facebook ads were found to be less effective than texting and calling to recruit older adults, 75 years and old, into the PRagmatic EValuation of evENTs And Benefits of Lipid-lowering in oldEr adults (PREVENTABLE) trial [34].

Second and regarding program interest facilitators at the personal level, we anticipated that lower satisfaction with lifestyle factors that affect dementia risk, such as sleep, diet and exercise, may be associated with higher interest in participating in HALT-AD and therefore could be used as an outreach tailoring approach. For example, one may consider including language or pictures depicting dissatisfaction with lifestyle to attract enrollment in HALT-AD. However, we did not find a link between health satisfaction and motivation to complete HALT-AD. Rather, self-efficacy or broadly "confidence to complete a task" in lay terms as presented in the survey was associated with program interest in our study. We know from previous work grounded in theory that knowledge and self-efficacy are important determinants of intention to commit to behavior change [35-37]. Therefore, one lesson learned from this survey is to consider tailoring HALT-AD's implementation to participant's level of self-efficacy. For instance, we speculate whether coaching select individuals who score significantly low on self-efficacy at baseline and before beginning their program may increase their interest levels and downstream commitment to program completion. Another consideration is to provide tailored tech support to individuals who report low confidence in using a computer rather than offering an all-or-none tech support feature, often limited by program budgets.

At the program level, we found important implementation preference differences by ethnicity whereby Hispanics were significantly more interested if we offered in-person or virtual sessions that provide support and guidance. This is not to assume that non-Hispanics would only prefer independent learning, but one lesson here is to ensure that when these sessions are provided, enough bilingual staff resources are allocated to accommodate Spanish-speaking users who may be more likely than others to opt-in session participation. We were also intrigued by the majority of participants, independent of ethnicity, being interested in using wearables to receive feedback on their behavior changes. Wearables, such as a Fitbit or Apple Watch, have become widely used and accepted and may motivate positive health behaviors among older adults, although likely not in isolation [37]. For example, older adults are more likely to continue using a wearable, not only when it is easy to use, but also when support structures are in place to foster motivation and encourage engagement such as when including peer-to-peer support [38]. An incentive for HALT-AD participation may therefore be receiving and keeping a wearable device as well as opting in to share wearable data (progress with change) among family and friends as part of community building.

Finally, the qualitative analysis of open-ended questions is a study strength because it brought to light nuances in how we may approach enrollment efforts by ethnicity. While important ongoing efforts elsewhere focus on normalizing participation in clinical trials among Hispanics and other underrepresented minorities, in the short term we may be more successful in enrolling Hispanic users if our messaging is not focused on "helping us with research", as very few Hispanic participants reported this as rationale for wanting to participate in HALT-AD. Instead, focusing messaging on the outcome itself (to prevent dementia) without necessarily reducing the messaging to individuals with a family history or demenia may be more effective.

Our findings should be interpreted with several limitations in mind. First, our focus was on comparing Hispanics and non-Hispanics because HALT-AD was culturally adapted in Spanish for Hispanics, but it is important in the future to break down the non-Hispanic group and better understand tailoring for other races e.g. Asian Americans compared to African Americans, not only for the implementation of HALT-AD but also for other educational programs reaching diverse populations. Second, medical data was self-reported and therefore should be interepreted with caution. We intentionally kept questions simple and broad such as "Do you have hypertension" to support easy survey completion and focus on the presence or absence of dementia MRFs at large. However, more nuanced questions in the future may provide more insight into participants' health if the approach needs to also be self-report. For example, questions may include "are you currently taking hypertension medication?" to capture participants who may not currently have high blood pressure because they are undergoing treatment. Additionally, our choice of sample size was driven by timeline restrictions and availability of resources to complete this research. A bigger sample size may be helpful to improve generalizability to other Hispanic and non-Hispanic communities. Also, a larger sample size will be necessary to provide convincing results on ethnically stratified analyses and to capture important participation data on less educated and socio-economically disadvantaged groups who were under-represented in our sample. While this manuscript focused on findings from an online survey which captured feedback from a predominately well-educated group of Hispanics and non-Hispanics, HALT-AD development and its implementation at large were also informed by feedback from two socio-economially and educationally diverse community advisory boards and two pilot study participants [15]. Finally, employing more complex statistical analysis would increase confidence in study findings: With a larger sample size, employing multivariate instead of univariate statistical analysis would account for potential confounders or effect modulators that may explain group differences (Hispanic/Non-Hispanic) in program interest and implementation preferences.

As a future direction and in line with participants' feedback requesting evidence of program effectiveness in decrease MRFs, we will be completing clinical trials that test HALT-AD's effectiveness with or without support group sessions, within and outside the health care system, in a culturally diverse sample representative of our local demographics. The effectiveness of HALT-AD in improving knowledge about one's own MRFs, self- efficacy related to behavior change, and actual change in a variety of MRF-related behaviors will be tested using a combination of approaches: within-subject and across-group changes in survey-administered knowledge and self-efficacy scores, as well as changes in select behaviors using wearable devices and data from the medical record. For example, the latter includes assessments of changes in physical activity levels, sleep quantity or quality, and number of specific medications prescribed. We will also be using the lessons learned from this study to tailor our outreach efforts by ethnicity when possible.

Overall, the relatively new knowledge that large numbers of ADRD cases could potentially be prevented or have a delay in their onset is an important public health message. Tailoring this messaging to those who can most benefit from it is also vital. Our hope is that this work will help others in designing and implementing effective programs to reduce dementia risk.

## Declaration of Generative AI and AI-assisted technologies in the writing process

No AI or AI-assisted tools were used in the writing process.

## Consent Statement

This was a survey study that the UCSD IRB approved as IRB-exempt without a requirement for signed participant consent.

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## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Sarah J. Banks reports financial support was provided by University of California San Diego. Sarah J Banks reports a relationship with University of California San Diego that includes: employment and funding grants. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## CRediT authorship contribution statement

**Sara Moukarzel:** Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Carlos E.E. Araujo-Menendez:** Project administration, Methodology, Formal analysis, Data curation. **Eliza Galang:** Data curation. **Zvinka Z. Zlatar:** Writing – review & editing, Investigation. **Howard H. Feldman:** Writing – review & editing, Supervision, Funding acquisition. **Sarah J. Banks:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.tjpad.2024.100053.

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