

ARIC Manuscript Proposal # 2880

PC Reviewed: 11/08/11
SC Reviewed: _____

Status: _____
Status: _____

Priority: 2
Priority: _____

1.a. Full Title: A Randomized Pilot Trial of Hearing Treatment for Reducing Cognitive Decline: Results from the Aging, Cognition, and Hearing Evaluation in Elders Pilot (ACHIEVE-P) Study

b. Abbreviated Title (Length 26 characters): ACHIEVE-P

2. Writing Group:

(Alphabetical) Marilyn S. Albert, Michelle Arnold, Shrikant I. Bangdiwala, Theresa Chisolm, Josef Coresh (2nd senior author), Sonia Davis, Jennifer A. Deal (1st author), Ann Eddins, Adele Goman, Nancy W. Glynn, Frank R. Lin (senior author), Melissa Minotti, Thomas Mosely, George Rebok, Nicholas Reed, Elizabeth Rodgers, Victoria Sanchez, A. Richey Sharrett

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. _JD_ [please confirm with your initials electronically or in writing]

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3. Timeline:

Manuscript will be completed in 1 month.

4. Rationale:

Novel approaches are urgently needed to reduce risk of age-related cognitive decline, Alzheimer's disease (AD), and other dementias in older adults. In observational studies, hearing loss is independently associated with accelerated cognitive decline^{1,2} and incident dementia.^{3,4} Hypothesized mechanistic pathways underlying this association include the effects of distorted peripheral encoding of sound on cognitive load, brain structure/function, and/or reduced social engagement.⁵ Importantly, these pathways may be modifiable with comprehensive hearing loss treatment. Hearing loss in older adults is prevalent, affecting nearly 2/3 of adults over the age of 70.⁶ Although treatments carry essentially no risk, hearing aids remain grossly underutilized

(<20% of adults with hearing loss⁷). To date, there has never been a randomized trial to determine whether treatment could reduce cognitive decline and dementia in older adults.

As part of this proposal, we will present the results of the Aging, Cognition, and Hearing Evaluation in Elders Pilot (ACHIEVE-P) Study, a randomized pilot study of 40 cognitively intact older adults nested within the Atherosclerosis Risk in Communities (ARIC) Study, designed to test feasibility of a best practices hearing intervention (vs. successful aging intervention) trial in older adults with audiometric hearing loss, and secondarily, to explore for an efficacy signal on 6-month proximal and cognitive outcomes. This study sets the stage for the full-scale ACHIEVE trial (N=750, grant currently under review). If funded, ACHIEVE will be the first definitive randomized controlled trial to test the efficacy of a best practices hearing intervention (vs. successful aging intervention) on reducing cognitive decline in older adults with hearing loss.

5. Main Hypothesis/Study Questions:

The primary objective of this 40-person pilot study was to assess feasibility of recruitment, randomization procedures, retention and the implementation of study interventions. Secondarily, we assessed for an early efficacy signal of the intervention on proximal outcomes that may mediate downstream effects of hearing treatment on cognitive functioning, as well as cognitive outcomes gathered 6 months post-intervention.

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).

Study Design: Feasibility study of a 40-person 1:1 randomized controlled pilot trial of a best practices hearing intervention (vs. successful aging intervention) in cognitively-intact older adults with hearing loss

Participants: ACHIEVE-P participants were recruited from ARIC participants in Washington County, MD, and *de novo* from surrounding communities.

Eligibility criteria included: age 70-84 years, adult onset hearing loss [pure tone average (PTA) across 3 frequencies (0.5, 1, 2 kHz) ≥ 30 and <70 decibels hearing level (dB HL) in the better-hearing ear] without current hearing aid use, community-dwelling, fluent English speaker, plans to remain in the area, and free of cognitive impairment [Mini-Mental State Exam ≥ 23 if \leq high-school degree and ≥ 25 if some college or more].

Exclusion criteria included: dementia diagnosis, self-reported difficulty in ≥ 2 activities of daily living,⁸ medical contraindication to hearing aid use, untreatable conductive hearing loss, and unwillingness to regularly wear hearing aids.

Best practices hearing intervention: Developed and manualized at the University of South Florida, the hearing intervention consists of evidence-based best practices to address participant's audiological and lifestyle needs. Post-baseline and randomization, participants met with the study audiologist 4 times over 10-12 weeks. At the first visit, participants received binaural receiver-in-the-canal hearing aids which were fit to prescriptive targets using real-ear measures. Participants' hearing needs were assessed using the Client Oriented Scale of ImprovementTM.⁹ At each subsequent visit, hearing aids were adjusted to targets and/or participants' needs and rehabilitative counseling was provided to manage expectations and optimize technology use in real-world settings. Participants were offered assistive listening devices (e.g., devices to stream cell phones and television, remote controls to adjust hearing aids, and remote microphones to directly access other speakers in difficult listening environments).

Successful aging intervention: The successful aging control intervention followed the protocol and materials developed for the 10 Keys™ to Healthy Aging,¹⁰ an evidence-based, interactive health education program for older adults that was previously implemented in the Aging Successfully with Pain randomized study.¹¹ Post-baseline and randomization, participants met individually with a research nurse certified to administer the program for 4 visits over 10-12 weeks; each session focused on a “Key” chosen by the participant.

Primary outcomes (measures of communication and social function that may mediate downstream effects of hearing treatment on cognitive functioning): The Hearing Handicap Inventory for the Elderly (HHIE-S, screening version)¹² measures perceived handicap due to hearing loss. The 12-item Cohen Social Network Index (SNI)¹³ assesses participation in different types of social relationships (e.g., spouse, family members, friends, religious groups). Because the SNI was not developed to measure change over short periods of time, questions were adapted from asking about interaction “at least once every 2 weeks” to ask about frequency of interactions “over the past 2 weeks”. The 20-item UCLA Loneliness Scale measures subjective feelings of loneliness and social isolation.¹⁴ Depressive symptomatology was measured using the 11-item Center for Epidemiologic Studies Depression Scale (CES-D).¹⁵ Social, mental and physical function were assessed using the Short Form 12 questionnaire (SF12).¹⁶ To facilitate comparisons, all proximal outcomes will be standardized to z-scores.

Cognitive outcomes:

Consistent with previous work,² standardized cognitive test scores will be used to create summary cognitive domain scores in **memory** (Delayed Word Recall Test, Logical Memory A, Incidental Learning); **language** (Word Fluency, Boston Naming Test); and **speed of processing/executive attention** (Trail Making Test Part A, Trail Making Test Part B, Digit Symbol Substitution Test). A global composite score will be created by averaging the 3 domain-specific z-scores, scaled so that one unit equals one standard deviation of that score.

Randomization: Randomization procedures were designed and implemented by the study’s Data Coordinating Center at the University of North Carolina. Participants were randomized 1:1 to the best practices hearing intervention or the successful aging intervention in blocks within strata defined by hearing loss severity, defined as mild (PTA \geq 30dB and $<$ 40dB) or moderate (PTA \geq 40 dB and $<$ 70db); field center staff were masked to block size.

Statistical analysis: Distributions of baseline participant characteristics by treatment assignment will be compared. We will assess an early efficacy signal of the intervention on proximal outcomes of cognitive functioning using Mann-Whitney tests (continuous outcomes) or Fisher’s Exact test (categorical outcomes). The same methods will be used to study the effects of hearing treatment on cognitive outcomes gathered 6 months post-intervention. In secondary analysis, mean differences in baseline and 6-month proximal and cognitive outcomes will be compared using a paired t-test for each intervention group.

References:

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7.a. Will the data be used for non-CVD analysis in this manuscript?

Yes No

b. If Yes, is the author aware that the file ICTDER03 must be used to exclude persons with a value RES_OTH = "CVD Research" for non-DNA analysis, and for DNA analysis RES_DNA = "CVD Research" would be used? N/A

Yes No

(This file ICTDER has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript?

Yes No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER03 must be used to exclude those with value RES_DNA = "No use/storage DNA"? N/A

___ Yes ___ No

9. **The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status.** ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: <http://www.csc.unc.edu/ARIC/search.php>
 Yes ___ No

10. **What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?**

- 11.a. **Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data?** Yes ___ No

Aging, Cognition, and Hearing Evaluation Pilot Trial (ACHIEVE-P) (PI: Lin)

11.b. **If yes, is the proposal**

- A. primarily the result of an ancillary study (list number* 2015.10_)**
 B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)* _1999.01_ _____)

*ancillary studies are listed by number at <http://www.csc.unc.edu/atic/forms/>

12a. **Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.**

12b. **The NIH instituted a Public Access Policy in April, 2008** which ensures that the public has access to the published results of NIH funded research. It is **your responsibility to upload manuscripts to PUBMED Central** whenever the journal does not and be in compliance with this policy. Four files about the public access policy from <http://publicaccess.nih.gov/> are posted in <http://www.csc.unc.edu/atic/index.php>, under Publications, Policies & Forms. http://publicaccess.nih.gov/submit_process_journals.htm shows you which journals automatically upload articles to Pubmed central.