

Supplementary Online Content

Lin FR, Ferrucci L. Hearing loss and falls among older adults in the United States. *Arch Intern Med.* 2012;172(4):369-371.

eAppendix. Audiometric Assessment and Other Study Variables

eTable. Demographic Characteristics of Participants Age 40-69 Years with Assessment of Audiometric Hearing and Fall History, National Health and Nutritional Examination Surveys, 2001-4

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix

Audiometric assessment

Audiometry was performed by a trained examiner according to established NHANES protocols. Briefly, air conduction hearing thresholds were obtained from both ears in a dedicated, sound-isolating room in the mobile examination center. Testing was conducted according to a modified Hughson Westlake procedure using the automated testing mode of the audiometer (Interacoustics AD226) and/or manually per the testing protocol. Quality assurance and quality control were established through daily calibration of equipment and monitoring of ambient noise levels using a sound level meter. The audiometric test room met or exceeded ANSI S3.1-1991 guidelines for maximum permissible ambient noise levels. Air conduction stimuli were presented primarily through supra-aural earphones (TDH 39P). Insert earphones (ER3A) were reserved for cases of collapsing ear canals or for a cross-over retesting protocol in cases of asymmetric hearing loss (masking was not performed). As an additional quality measure, thresholds were measured twice at 1 kHz in both ears, and audiometry was repeated if there was >10dB discrepancy between the threshold measurements.

We utilized hearing thresholds from 0.5-4 kHz, using the first threshold tested at 1 kHz and incorporating manual re-test thresholds as needed. Hearing loss was defined by a speech-frequency pure tone average (PTA) of thresholds at 0.5, 1, 2, and 4 kHz in the better hearing ear per the definition of hearing loss adjudicated by the World Health Organization. All hearing thresholds are reported as dB HL (ANSI, 2004).

Other Study Variables

Data on demographic variables and medical history were obtained from interviews. Self-reported race/ethnicity was grouped as Mexican-American/other Hispanic (Hispanic), non-Hispanic white (white), non-Hispanic black (black), or other race. Education was collapsed into a 4 level variable (less than high school, high school graduate, some college, or college graduate). Hearing aid use was based on whether an individual reported using a hearing aid at least once a day over the preceding year. Variables related to medical history included diabetes (based on self-reported diagnosis and/or current use of insulin or other diabetic medications), smoking (current/former/never), hypertension (told by physician on 2 or more visits about hypertension diagnosis), and stroke (self-reported history).

Objective vestibular balance testing consisted of test condition 4 of the Modified Romberg Test of Standing Balance on Firm and Compliant Support Surfaces which examines the ability of the examinee to stand unassisted under four test conditions (ordered in increasing level of difficulty). In test conditions 1, 2, and 3, participants are asked to stand making use of all sensory inputs that contribute to balance (proprioception, vision, and central vestibular system), with eyes closed (reducing visual input), and on a foam-padded surface (reducing proprioceptive input), respectively. Under test condition 4, participants are asked to stand with eyes closed (removing visual input) and on a foam pad (reducing proprioceptive input), and under this test condition, the subject's ability to balance is primarily dependent on the vestibular system. Because each successive test condition from 1 to 4 is progressively more difficult, only participants passing conditions 1-3 were tested under condition 4. Balance testing in Condition 4 was scored on a pass/fail basis in a 30 second trial, and participants were eligible for an initial test followed by one

re-test. Of the 2,017 participants undergoing balance testing, 1,684 (83.5%) passed conditions 1-3 and were tested under condition 4 (Table 1). We adjusted for vestibular balance function (condition 4) as a possible confounder in our analyses.

eTable Demographic Characteristics of Participants Age 40-69 Years with Assessment of Audiometric Hearing and Fall History, National Health and Nutritional Examination Surveys, 2001-4

Characteristic	Cohort (n = 2017)
Age, mean years (S.D.)	53.6 (8.7)
Hearing loss, mean dB (S.D)	15.5 (10.7)
Hearing loss category, n(%)	
Normal (≤ 25 dB)	1730 (85.8)
Mild (26-40 dB)	217 (10.8)
Moderate (41-70dB)	67 (3.3)
Severe (≥ 71 dB)	3 (0.2)
Self-reported difficulty with falling, n(%)	99 (4.9)
Sex, n(%)	
Female	1052 (52.2)
Race/Ethnicity, n(%)	
White	1031 (51.1)
Black	428 (21.2)
Hispanic	481 (23.9)
Other	77 (3.8)
Education, n(%)	
<12 th grade	566 (28.1)
High school graduate	442 (21.9)
Some college	565 (28.0)
College graduate	443 (22.0)
Smoking, n(%)	
Never	912 (45.3)
Former	603 (30.0)
Current	498 (24.7)
Hypertension, n(%)	635 (31.6)
Diabetes, n(%)	256 (12.7)
Stroke, n(%)	65 (3.2)
Vestibular balance testing, failure, n(%)	533 (31.7) ^a
Hearing aid use, n (%)	16 (0.8)

^a Vestibular balance testing (Condition 4 in the Modified Romberg Test of Standing Balance on Firm and Compliant Support Surfaces) was only performed in the 1,684 study participants who passed the 3 prior easier test conditions.