Hearing Loss is Associated with Decreased Mobility in US Adults

Henry H. Joo BS [1], Emily Y. Huang BS[1], Desi Schoo MD[2], Bryan K. Ward MD[3], Jenny X. Chen MD EdM[3]

[1]Johns Hopkins University School of Medicine

[2]Department of Otolaryngology – Head & Neck Surgery, The Ohio State University College of Medicine

[3]Department of Otolaryngology – Head & Neck Surgery, Johns Hopkins University School of Medicine

INTRODUCTION

- 29 million (16.1%) US adults have hearing loss.
- Limited physical mobility is associated with interference with daily activities, depressive symptoms, and diminished quality of life.
- The association between hearing health and physical mobility remains under-investigated, particularly among younger adults.
- We conducted a cross-sectional analysis of the **2021 National Health Interview Survey (NHIS)** to investigate the **association between self-reported hearing and mobility difficulties** among US adults.

METHODS

Survey

- The NHIS is a nationally representative survey of **29,467 adults** (response rate = 50.9%)

Analysis variables

- Hearing difficulty: Respondents were asked, "Do you have difficulty hearing [even with hearing aids]?"
- Mobility outcomes:
  - Difficulty walking 100 yards
  - Difficulty walking up or down 12 steps
  - History of a fall that caused injury within the past 3 months
- Demographics:
  - Sex (male, female), race/ethnicity (Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, other), the ratio of family income to federal poverty threshold (<1.00, 1.00-1.99, ≥2.00), and age group (18-39, 40-64, 65+)
- Medical history:
  - Visual difficulty
  - Self-reported general health
  - Comorbidities (binned into 0, 1-2, or 3+): coronary heart disease, myocardial infarction, hypertension, stroke, cancer, diabetes, chronic obstructive pulmonary disease, arthritis, and dementia

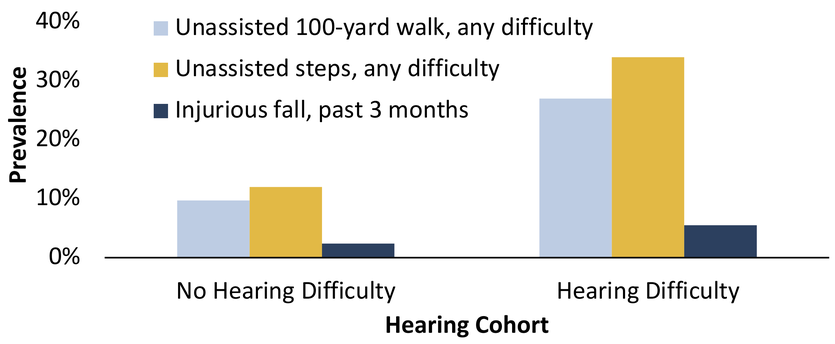
Statistical Analysis

1. X^2 analysis comparing hearing cohorts
2. Multivariable Logistic Regression
3. Interaction Effects Analysis
4. Age-stratified Multivariable Regression

RESULTS

- Hearing difficulty is significantly associated with mobility issues and injurious fall history (p<0.001).

Figure 1. Prevalence of mobility issues by hearing



- Regression results suggest that hearing difficulty is an independent risk factor for mobility issues and injurious falls.

Table 1. Multivariable logistic regression

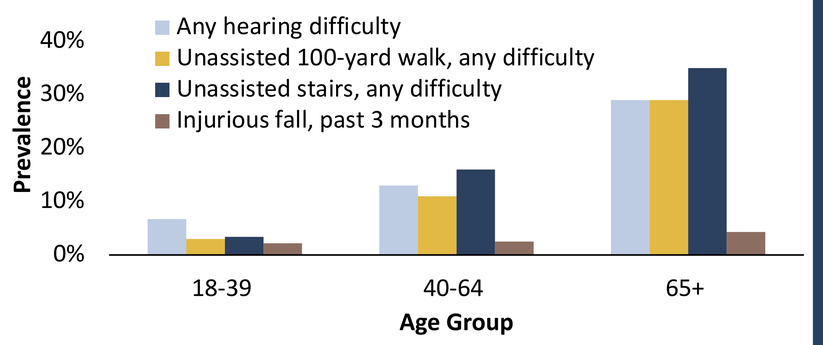
Characteristic	Any difficulty walking 100 yards		Any difficulty walking up/down steps		Injuries from fall, past 3 months	
	OR (95% CI)[1]	p-value[2]	OR (95% CI)[1]	p-value[2]	OR (95% CI)[1]	p-value[2]
Any hearing difficulty	1.55 (1.38 to 1.74)	<0.001***	1.72 (1.54 to 1.91)	<0.001***	1.55 (1.27 to 1.89)	<0.001***
Any visual difficulty	1.83 (1.64 to 2.04)	<0.001***	1.88 (1.69 to 2.08)	<0.001***	1.66 (1.37 to 2.00)	<0.001***
Race/Ethnicity						
White	[Reference]		[Reference]		[Reference]	
Black	1.23 (1.05 to 1.45)	0.009**	1.14 (0.99 to 1.31)	0.070	0.74 (0.57 to 0.97)	0.027*
Hispanic	0.90 (0.75 to 1.08)	0.2	0.99 (0.85 to 1.14)	0.8	0.60 (0.45 to 0.79)	<0.001***
Asian	0.67 (0.53 to 0.86)	0.002**	0.60 (0.47 to 0.77)	<0.001***	0.50 (0.28 to 0.89)	0.019*
Other[3]	1.11 (0.79 to 1.55)	0.6	1.18 (0.87 to 1.60)	0.3	1.59 (1.01 to 2.51)	0.045*
Sex						
Male	[Reference]		[Reference]		[Reference]	
Female	1.58 (1.43 to 1.75)	<0.001***	1.80 (1.64 to 1.98)	<0.001***	1.62 (1.36 to 1.93)	<0.001***
Age						
18-39	[Reference]		[Reference]		[Reference]	
40-64	1.84 (1.51 to 2.25)	<0.001***	2.41 (2.08 to 2.79)	<0.001***	0.72 (0.57 to 0.89)	0.003**
65+	4.03 (3.31 to 4.92)	<0.001***	4.37 (3.72 to 5.13)	<0.001***	0.79 (0.62 to 1.01)	0.063
Ratio of income to poverty level						
≥2.00	[Reference]		[Reference]		[Reference]	
1.00-1.99	1.73 (1.52 to 1.96)	<0.001***	1.70 (1.51 to 1.90)	<0.001***	1.09 (0.87 to 1.37)	0.5
<1.00	2.07 (1.76 to 2.43)	<0.001***	1.93 (1.67 to 2.23)	<0.001***	0.93 (0.71 to 1.22)	0.6
Comorbidities						
0	[Reference]		[Reference]		[Reference]	
1-2	2.58 (2.23 to 2.97)	<0.001***	3.02 (2.66 to 3.43)	<0.001***	1.39 (1.11 to 1.73)	0.004**
3+	6.22 (5.24 to 7.38)	<0.001***	7.49 (6.43 to 8.73)	<0.001***	2.75 (2.10 to 3.61)	<0.001***
Fair or poor general Health	5.10 (4.58 to 5.67)	<0.001***	4.72 (4.23 to 5.26)	<0.001***	1.63 (1.33 to 2.00)	<0.001***

[1]OR = Odds Ratio; CI = Confidence Interval

[2]*p<0.05; **p<0.01; ***p<0.001

[3]Includes individuals who provided original survey responses of Alaska Native, American Indian, Native Hawaiian, Pacific Islander, "some other race," and multiple races.

Figure 2. Prevalence of hearing and mobility issues by age

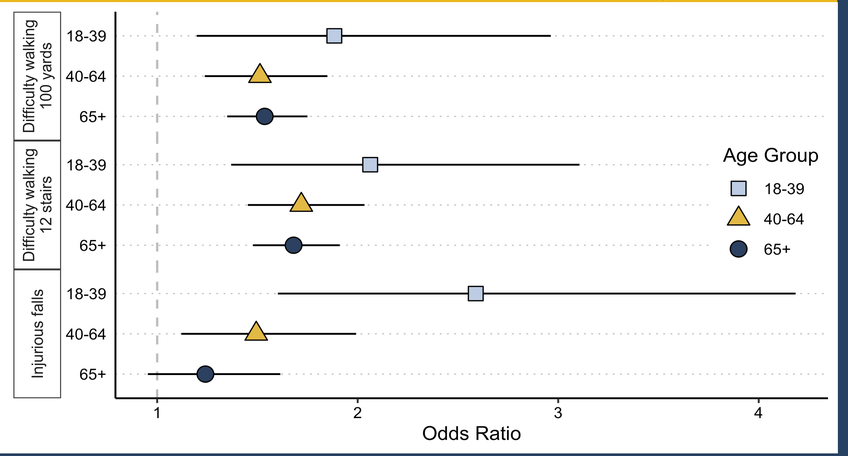


- While hearing difficulty and mobility issues are less prevalent in younger adults, the association between the two is at least as strong as in older adults.

A **significant interaction effect** suggested that the relation between hearing impairment and the incidence of injurious falls depends on a person's age group (p<0.05).

Figure 3. Age-stratified multivariable regression.

Symbols and error bars represent the odds ratios and 95% confidence intervals, respectively, of hearing difficulty and the associated mobility outcome variables displayed on the left. Covariates remained constant from the regression in Table 1.



CONCLUSION

- **Limitations** include reliance on self-reporting (i.e., lack of audiometry and vision testing) and the cross-sectional nature of the data.
- **Across all groups of adults, perceived hearing difficulty was associated with higher rates of mobility issues and falls that resulted in injuries.**
- These findings can help motivate public health efforts to decrease morbidity associated with hearing difficulty.

Contact

Henry H. Joo, Johns Hopkins University School of Medicine
Email: hjoo11@jhmi.edu

Acknowledgments

We want to thank Yuri Agrawal, MD, for her thoughtful feedback.

References

Agrawal Y, Platz EA, Niparko JK. Prevalence of hearing loss and differences by demographic characteristics among US adults: data from the National Health and Nutrition Examination Survey, 1999-2004. Arch Intern Med. 2008;168(14):1522-1530.

Blazer DG, Tucci DL. Hearing loss and psychiatric disorders: a review. Psychol Med. 2019;49(6):891-897.

Lin FR, Ferrucci L. Hearing Loss and Falls Among Older Adults in the United States. Archives of Internal Medicine. 2012;172(4):369-371.

National Center for Health Statistics. National Health Interview Survey, 2021. Public-use data file and documentation. 2022.