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Common Fall Risk Factors Among Older Deaf Adults

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ABSTRACT

Falls are the leading cause of injury and death in older adults (CDC, 2022). Severe hearing loss and vestibular impairment increase fall risk (Tamaki, 2024), with factors including dizziness, postural instability, and anxiety (Axer, 2020). Key risk indicators include abnormal head-impulse tests (Agrawal et al., 2013), impaired vestibular-evoked myogenic potentials (Choi et al., 2024), slow timed-up-and-go (TUG >13 sec; Demirci et al., 2021), and reduced sit-to-stand performance (<10 reps; Vereek, 2007). Other risks include previous falls, polypharmacy, and neuropathy (Rubenstein et al., 2017).

We assessed 37 older Deaf adults (ages 51–88) using questionnaires and balance tests to identify common fall risk factors. Understanding these risks can help clinicians better prevent falls in this population.

METHODS

Methods

Participants (n=37; 28 female, 9 male):
Age range 51-88 years. 22 participants over 65yrs
Inclusion criteria:

- 50 years or older
- Community dwelling
- Fluent ASL user
- Able to walk 20ft independently.

12/37 (32%) reported a fall(s) in the past year

Self-Report Measures:

- **Fall Risk Questionnaire (FRQ):** Assesses individual fall risk (CDC).
- **Dizziness Handicap Inventory (DHI):** Evaluates dizziness impact (higher score = greater handicap).
- **Activities-Specific Balance Confidence Scale (ABC):** Measures balance confidence (higher % = more confidence).
- **PROMIS-Deaf Anxiety & Depression Subscales:** Assesses mental health in ASL, 4 items each (Kushalnagar et al., 2020).

Vestibular & Balance Assessments:

- **Vestibulo-Ocular Reflex:** vHIT (Interacoustics EyeSeeCam) in the lateral plane.
- **Otolith Function:** Assessed via cVEMPs and oVEMPs (IHS SmartEP) at 133 dB pSPL at 500 and 1000 Hz.
- **Postural Stability:** Evaluated with mCTSIB (eyes open/closed, firm/foam surface; Natus BalanceMaster).
- **Functional Mobility:**
  - **Timed-Up-and-Go (TUG):** Time to stand, walk 10 ft, turn, return, and sit.
  - **30-Second Sit-to-Stand (5xSTS):** Number of sit-to-stand reps in 30 sec without arm support.

Approximately 89% of older Deaf adults present with with one or more fall risk factors aside from age.

RESULTS

Figure 1. Proportion of participants who score within the at-risk range for each questionnaire. The cut off for fall risks are: ABC <67% (Powell, 1995); FRQ ≥4 points (NCOA); and DHI > 54 points (Jacobson, 2007).

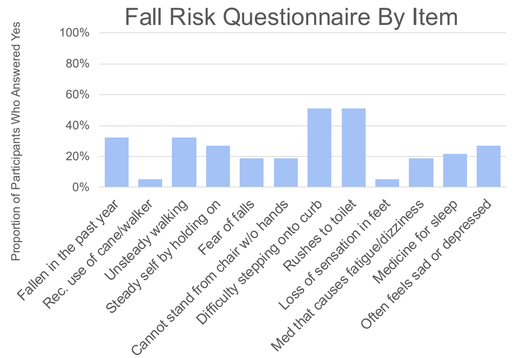

Figure 2. Proportion of Participants who reported each risk item in FRQ. Participants answered yes or no to 12 risk factor items. The question that participants answered yes to the most were having trouble stepping up onto a curb and having to rush to the toilet (19/37). 12/37 participants answered a yes to experiencing a fall in the past year.

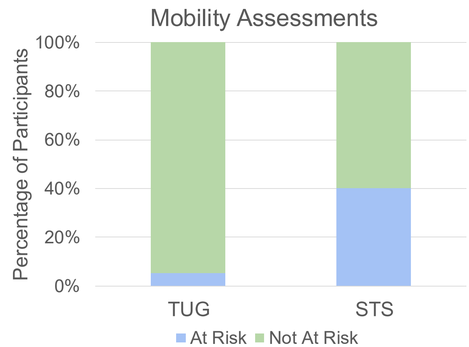

Figure 3. Proportion of participants who score within the at –risk range for each mobility assessment. TUG identified 2 out of 37 participants as at-risk with a cutoff of >13 second indicating them as at risk. STS has a cutoff of less than 10 reps making someone fall risk. 14 out of 37 participants were identified as a fall risk.

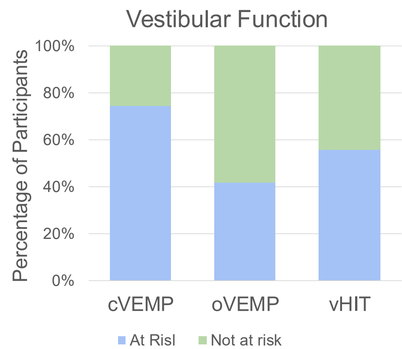

Figure 4. Proportion of participant who showed abnormal vestibular functions. VEMPs were collected from 37 participants; vHIT was available from 27 participants.

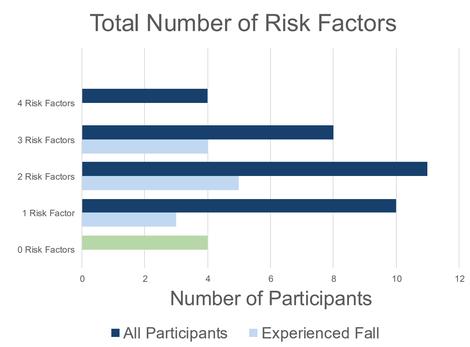

Figure 5. The number of risk factors per participant, in addition to age. Overall, 89% of participants reported one or more risk factors (FRQ score is considered as one risk factor) in addition to age.

Table 1. Statistical Comparison Between Fall and No Fall Groups

	Test Type	Statistic	df	p
Age	2-tailed t-test	0.817	34	0.210
Sex	Chi squared**	6.000	1	0.014
ABC	**Mann-Whitney U***	**61.00**	**1**	**0.032**
FRQ (w/o fall Q)	**Mann-Whitney U***	**73.00**	**1**	**0.008**
DHI Total	1-tailed t-test Fall > No Fall	1.218	34	0.116
DHI-Physical	Mann-Whitney U*	96.50		0.049
DHI-Functional	1-tailed t-test Fall > No Fall	0.768	34	0.224
DHI-Emotional	1-tailed t-test Fall > No Fall	0.749	34	0.229
PROMIS-Deaf Anxiety	**1-tailed t-test Fall > No Fall**	**2.573**	**34**	**0.008**
PROMS-Deaf Depression	1-tailed t-test Fall > No Fall	1.200	34	0.120
TUG	1-tailed t-test Fall < No Fall	-1.189	34	0.879
STS	1-tailed t-test Fall < No Fall	-1.13	34	0.133
cVEMP	Chi squared**	1.11	1	0.293
oVEMP	Chi squared**	2.50	2	0.287
vHIT	Chi squared**	0.49	1	0.484

*Nonparametric comparisons were made due to significant Levene's test of variance findings (p<.05).
**Nonparametric comparisons were made due to binary (male vs. female; normal vs. abnormal) results.
Bolded: Significant difference between groups (p<.05).

CONCLUSION / DISCUSSION

Over 85% of participants in this population identified with one or more risk factors beyond age. Aside from the 12-month fall history, commonly identified risk factors in this group were abnormal VEMPs and vHIT, rushing to the toilet, difficulty stepping up onto the curb, low ABC, high FRQ, and low STS. Poor performance in these areas suggest the need for counseling on fall prevention strategies, particularly around increasing lower extremity strengths and improving lighting and railing support on the paths to the bathrooms.

ABC and FRQ scores between those who have fallen and those who have not showed statistically significant differences, and has a potential as useful screening tools. Interestingly, while the DHI total score did not show statistically significant difference between groups, the Physical subscale did, and may serve as a useful screener.

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