Using the Vanderbilt Fatigue Scales to explore the effects of hearing loss and device use on listening-related fatigue in adults and children with hearing loss

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Introduction

- Mounting evidence suggests that adults and children with hearing loss are at increased risk for greater listening effort and long-term, listening-related fatigue[1,2,3,4]. Severe, long-term, fatigue can have significant negative effects on quality of life[5]. However, there are no measures designed specifically to assess listening-related fatigue. Such measures are essential for improving our understanding of, and developing interventions to reduce, listening-related fatigue and its consequences.
- To address this need we continue to refine a package of patient-reported outcome measures designed to reliably assess listening-related fatigue- the Vanderbilt Fatigue Scales for adults (VFS-AHL) and children (VFS-CHL) with hearing loss.[6]
  - The VFS-AHL has 10-item (unidimensional) and a 40-item (unidimensional) versions
    - The 40-item scale is more sensitive and allows for assessment of cognitive, social, emotional and physical fatigue (10-items/domain). However, across domains, item scores are well described by a unidimensional model.
  - The VFS-CHL is still being validated.
    - Currently we are assessing child, parent-proxy, and teacher-proxy versions.
      - The child and teacher versions are unidimensional.
      - The parent version loads on two distinct factors- cognitive and physical fatigue (See Table 1)
    - All scales will allow for Item Response Theory (IRT) scoring as well as using summed (on a 0-4 point Likert scale) scores.
- **Purpose:** In this poster we utilize data obtained in a validation study using the VFS-AHL-10 item scale and data obtained using a preliminary version of the VFS-CHL to describe the effects of hearing loss, and hearing aid/cochlear implant use, on listening-related fatigue.

Methods

- Data were collected from multiple sources using online and in person versions of the VFS-AHL and VFS-CHL.
  - Respondents self-reported their hearing loss as unilateral or bilateral and degree of loss as mild/slight, moderate, severe, or profound based on their perceived speech understanding difficulties.
- **Participants Characteristics: N=1458**
  - **Adults:** n=611 (385/221/5- HL/NH/No Response (NR))
    - Mean age ~50 (range 18-86) years
      - 433 /174/4- female/male/NR
  - **Children:**
    - Child respondents: n=201 (152/49/0- HL/NH/NR)
      - Mean age ~13 (range 7-17) years
        - 104/97/0- female/male/NR
    - Parent respondents: n=364 (277/87/0- HL/NH/NR)
      - Mean age ~11 (range 6-17) years
      - 179/183/2- female/male/NR
    - Teacher respondents: n=282 (203/58/21- HL/NH/NR)
      - Mean age ~10 (range 6-17) years
      - 126/156/0- female/male/NR

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VFS-AHL-10 Items	Never/ Almost Never	Rarely	Sometimes	Often	Almost Always/ Always
I feel worn out from everyday listening.	0	1	2	3	4
It takes a lot of energy to listen and understand.	0	1	2	3	4

VFS-CHL- Child Items	Never	Rarely	Sometimes	Often	Almost Always
After school, I'm so tired I don't want to talk to anyone	1	2	3	4	5
Listening at school wears me out	1	2	3	4	5

VFS-CHL- Parent Items	Never	Rarely	Sometimes	Often	Almost Always
Cognitive					
It is hard for my child to concentrate after listening for a long time	1	2	3	4	5
Physical					
My child is completely worn out after listening for a long time	1	2	3	4	5

VFS-CHL- Teacher Items	Never	Rarely	Sometimes	Often	Almost Always
When the student gets tired from listening he/she "checks out"	1	2	3	4	5
The student appears worn out after working hard to listen all day	1	2	3	4	5

Table 1: Sample items from the VFS-AHL and the VFS-CHL scales.

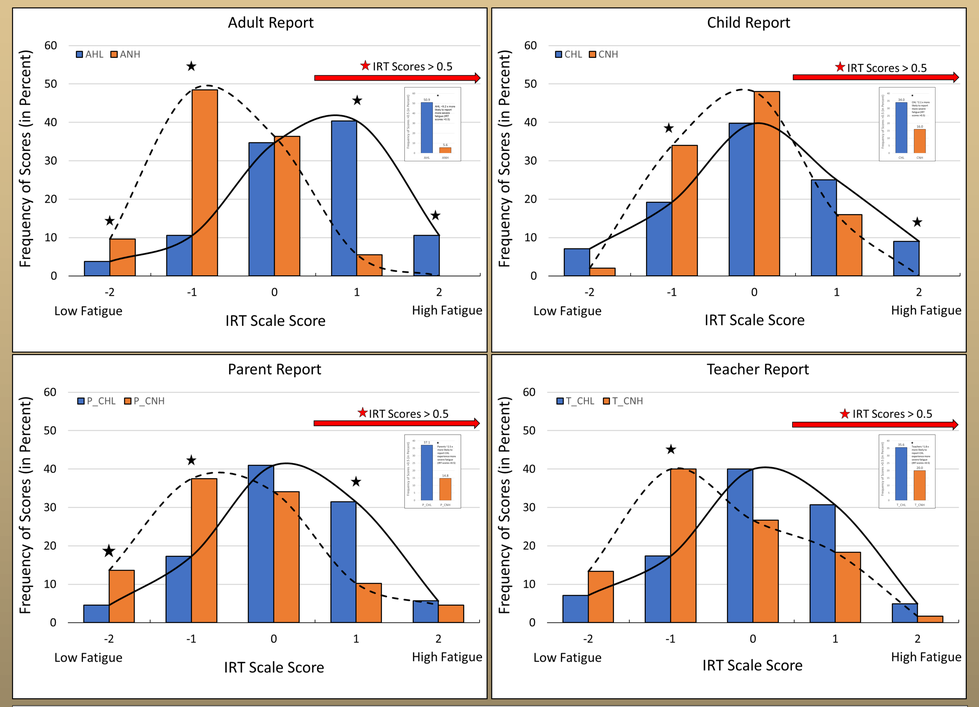

Figure I: Quintile histograms of IRT scores for those with (Blue bars) and without hearing loss (Orange bars) as self-reported by adults and children and via proxy-report for CHL by parents and teachers. Solid and dashed lines show estimate a continuous distribution. Black stars show significant differences between HL and no HL groups (Chi-Square > 3.84, p<0.05). Inset panel shows frequency of scores >0.5 (reflecting more moderate-severe complaints of fatigue) for each group. Note how across respondent groups, hearing loss increases risk for reporting more moderate-severe listening-related fatigue (IRT scores >0.5).

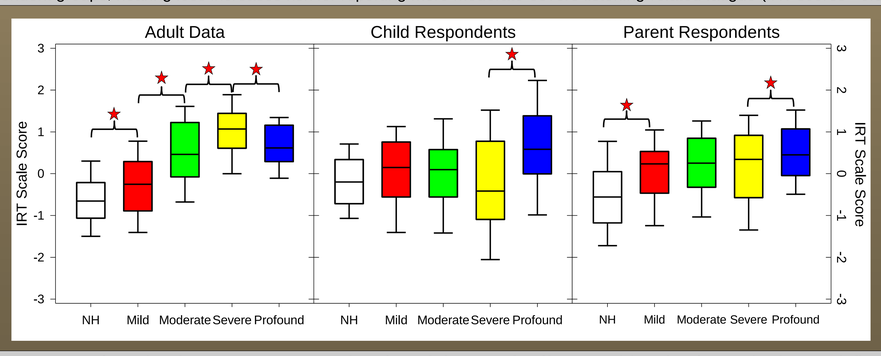

Figure II: Box Plots showing IRT scores as a function of degree of self-reported hearing loss. The boxes define the 25th and 75th percentiles, a line within the box shows the median and error bars show the 10th and 90th percentiles. Stars show significant differences (independent sample T-tests, p<0.05) between adjacent samples. Note wide variability, however, for adults fatigue increases systematically up to a severe loss and then decreases significantly for those with profound losses. No such pattern is observed for the child data (self or parent-proxy report).

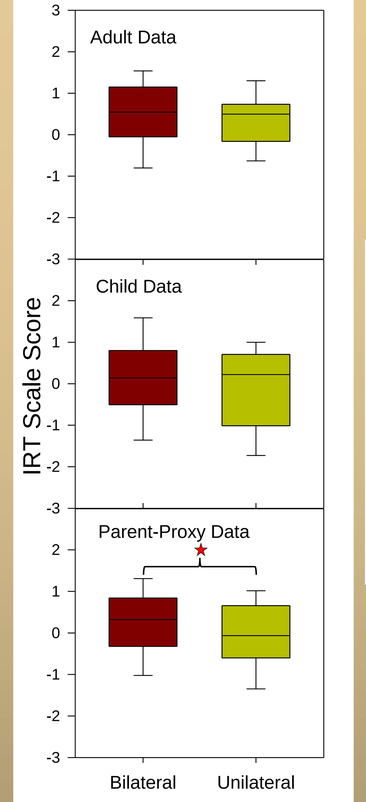

Figure III: Box Plots showing IRT scores of respondents with self-reported unilateral, bilateral hearing loss. The boxes define the 25th and 75th percentiles, a line within the box shows the median and error bars show the 10th and 90th percentiles. Note wide variability across groups and minimal differences in fatigue between unilateral and bilateral loss groups. The star shows a small (~0.29 points) significant difference (independent sample t-tests, t = -2.2, p = 0.027) between parent-proxy unilateral and bilateral groups. Otherwise no differences between groups were observed.

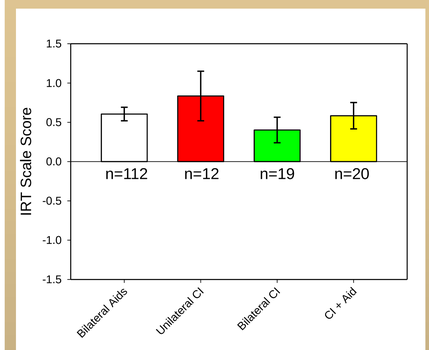

Figure IV: Mean IRT scale scores as a function of device type for adult bilateral hearing aid users and CI users. Error bars reflect 1 standard error. The number of respondents in each sample is shown below the bars. There was a trend towards lower fatigue ratings for the bilateral CI users but the difference was not statistically significant (p > 0.05), potentially due to the small sample size and large within group variability.

Primary Conclusions

- Listening-related fatigue in adults and CHL varies widely but can be reliably measured.
  - However, substantial overlap in scores of child respondents with and without HL, particularly compared to adult data, suggests children may be less able to reliably identify and describe their fatigue
- Moderate-severe fatigue (IRT scores >0.5) is much more common in adults and CHL (via self-report and parent/teacher proxy) than in those without hearing loss.
- In contrast to prior work using generic fatigue scales2, listening-related fatigue in adults increased with degree of HL up to the severe range then decreased for respondents with profound HL (see Figure II).
  - This may reflect decreased engagement in listening-related tasks or benefit from CI use for those adults with profound losses.
  - For **children**, fatigue ratings were unaffected by degree of loss until reaching the profound range.
- Highlighting the impact of unilateral HL, only minimal differences in fatigue ratings were observed between those with UHL & bilateral HL.
- Additional data are needed to evaluate the effect of unilateral versus bilateral device use.

Key References

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