



Vanderbilt Bill Wilkerson Center

Quantifying the Fatigue Factor: *Listening-related Fatigue in Adults and Children with Hearing Loss*

Hornsby, B., Camarata, S., Davis, H. & Bess, F.

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Disclosures

- All authors are employed by Vanderbilt University Medical Center (VUMC)
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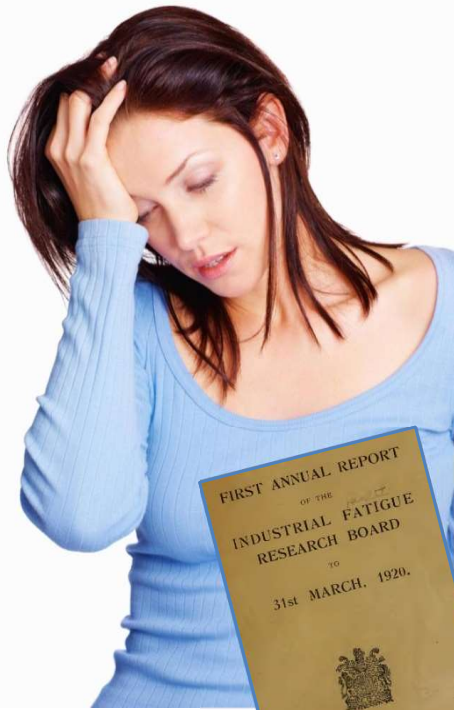
Acknowledgements

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What is fatigue?

See Hornsby, Naylor & Bess,
2016 for review



- No universally accepted definition exists
 - Occurs in the physical and mental domains
- **Subjective fatigue** is an ongoing “state”, a mood or feeling of tiredness, exhaustion or lack of energy, a reduced desire or motivation to continue a task
 - Quantified via questionnaires and survey instruments
- **Behavioral (Cognitive) fatigue** is an outcome, a decrement in performance
 - Quantified via changes in physical or mental performance over time
- **Physiologic measures** can be used as indirect markers of subjective and behavioral fatigue

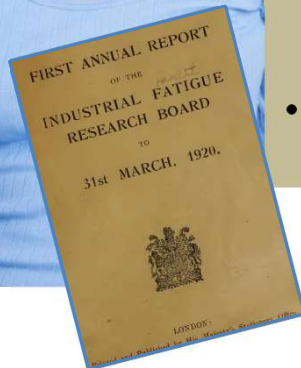
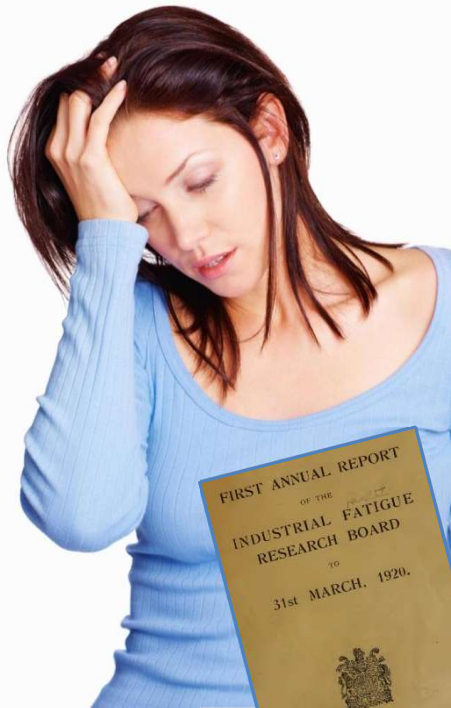
“[I recommend] that the term *fatigue* be absolutely banished

from precise scientific discussion”.  **VANDERBILT**
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---Muscio (1921)

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Consequences of fatigue



Adults—

- Inattention, lack of concentration, poor mental processing and decision-making skills
- less productive and more prone to accidents
- less active, more isolated, less able to monitor own self-care

Children w/ Chronic Illnesses—

- inattention, concentration, distractibility
- poorer school achievement, higher absenteeism

Amato, et al. 2001; van der Linden et al. 2003; DeLuca, 2005; Eddy and Cruz, 2007; Ricci et al. 2007

Who Has Fatigue?



- **Everybody!**-
 - Complaints of **mild transient** fatigue are common even in healthy populations
- **Severe, recurrent fatigue**- is NOT common in healthy populations but is common in many chronic health conditions
 - Cancer, HIV AIDs, Parkinson's, MS
- Very little work examining fatigue associated with hearing loss in adults or children

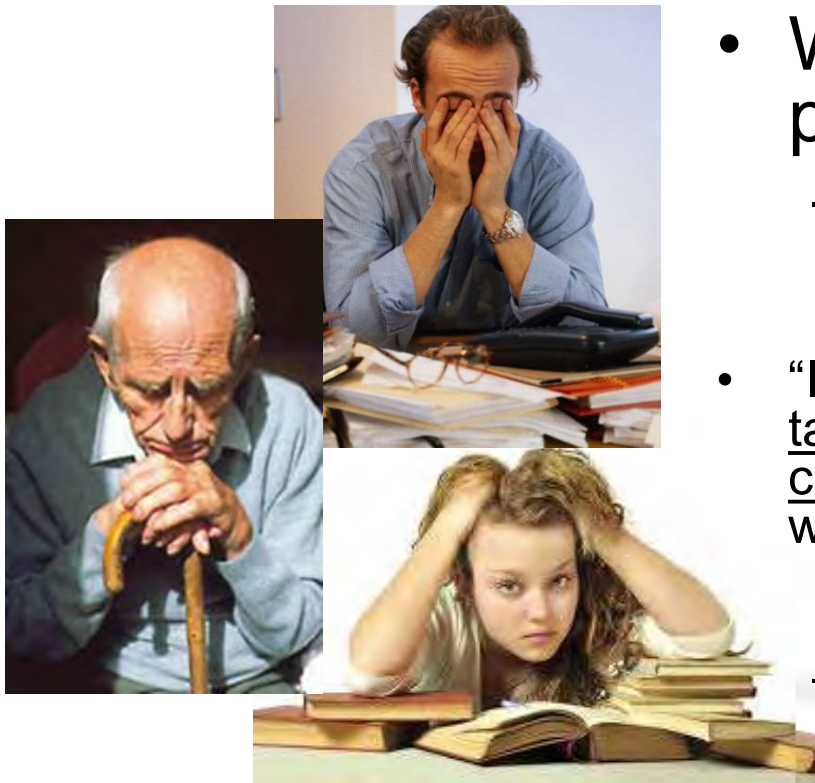
Is fatigue a problem for people with hearing loss?



“..... I can attest to the **FATIGUE** caused by prolonged intensive listening in noise through hearing aids.....”.

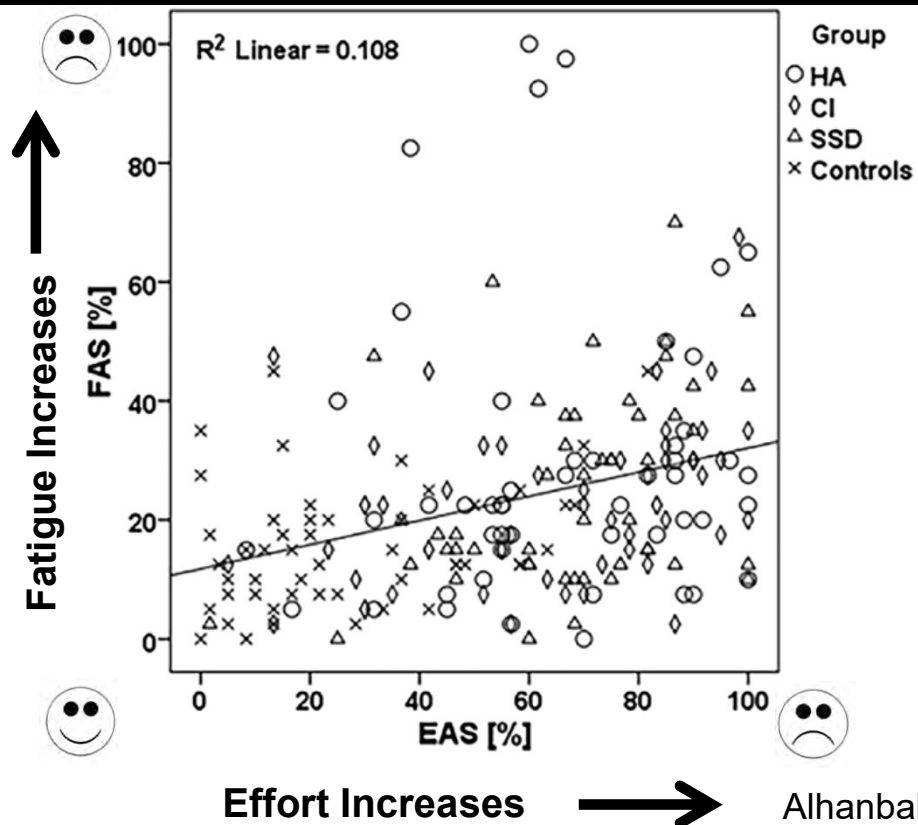
Mark Ross,
Pediatric Audiologist

Hearing Loss and Fatigue- Why the increased risk?



- Why would fatigue be a problem?
 - Active listening can be hard work!
- “I go to bed most nights with nothing left. It takes so much energy to participate in conversations all day, that I’m often asleep within minutes.”
 - <https://hearingelmo.wordpress.com/2008/06/17/fatigue-fear-and-coping/>
 - Some data also supports a link b/w effort and fatigue

Perceived effort and fatigue



- Four groups of adults (N=31) with:
 - Bilateral HAs
 - SSD
 - CIs
 - Control
- Rated subjective effort and fatigue experienced on a daily basis
 - Similar trends across all groups

Alhanbali et al., 2017

Is fatigue a problem for people with hearing loss?

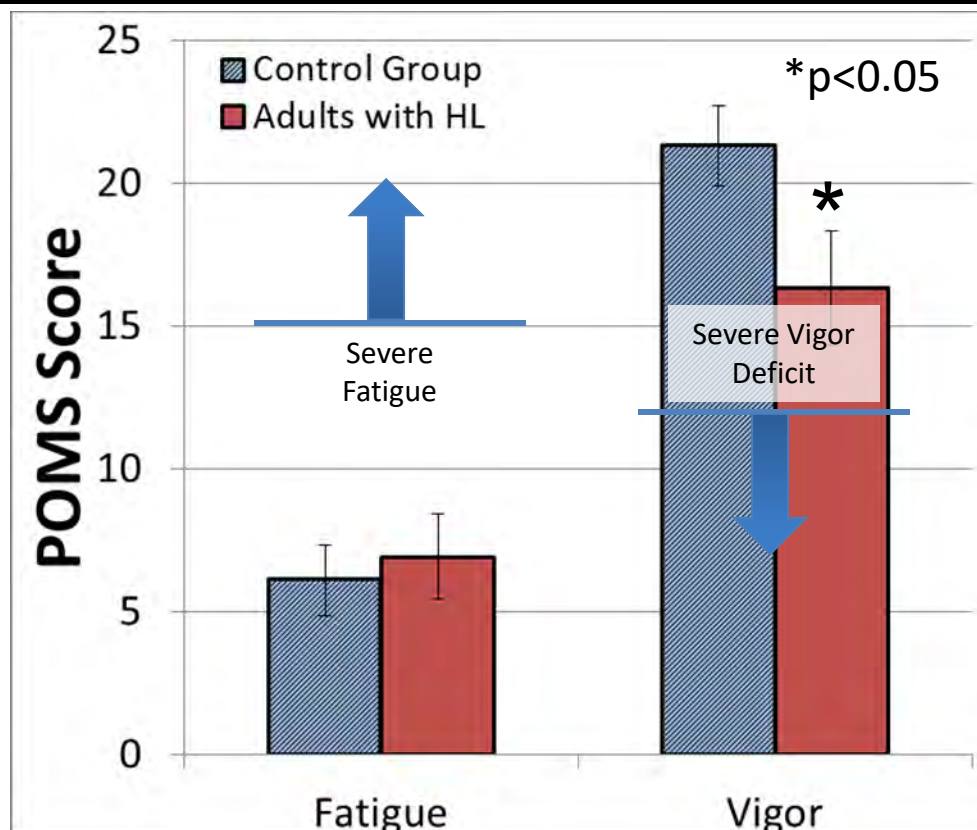


“..... I can attest to the **FATIGUE** caused by prolonged intensive listening in noise through hearing aids.....”

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- Do data to support these reports?

Subjective fatigue in Adults with HL



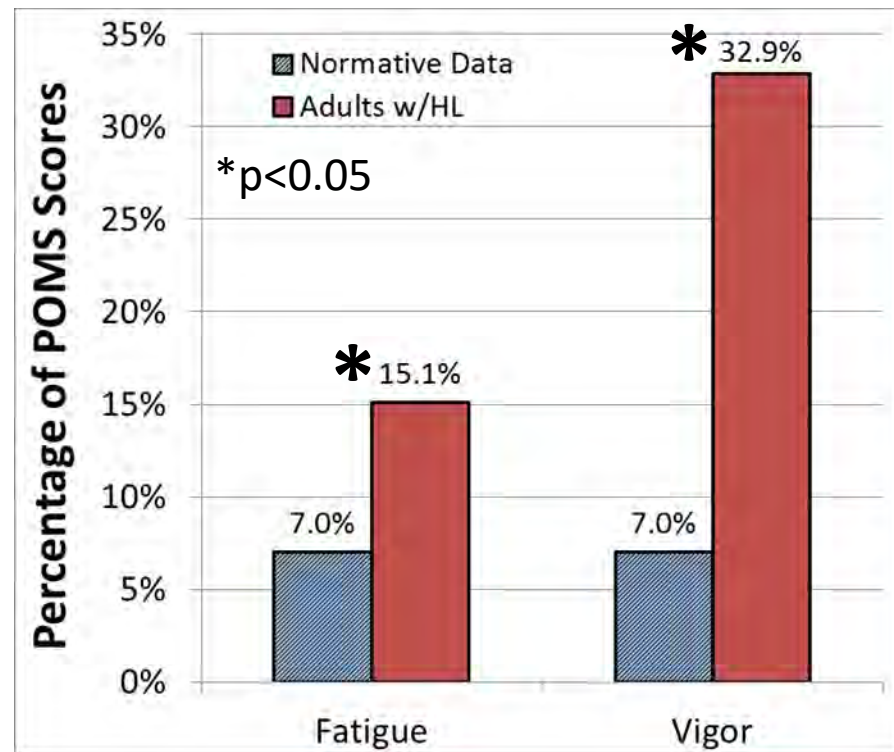
POMS= Profile of Mood States (McNair et al., 1971)

- Used a **generic measure** (POMS) & compared normative data to older adults seeking help for HL report
 - similar fatigue but
 - significantly lower vigor
- N= 116 adults (55-94 years old)

Hornsby, B. & Kipp, A. (2016)

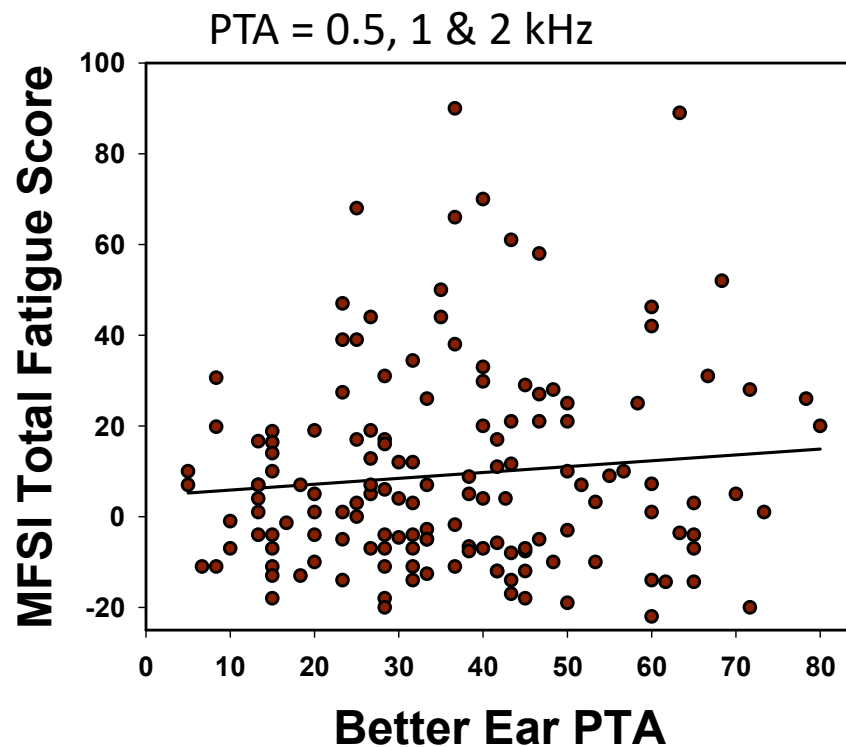
Adults with HL are at increased risk for severe fatigue and vigor deficits

- More than twice as likely to report severe fatigue and
- More than 4 times as likely to report severe vigor deficits!
- Severe = >1.5 st. dev. above normative mean



Hornsby, B. & Kipp, A. (2016)

But... fatigue was not associated with degree of hearing loss

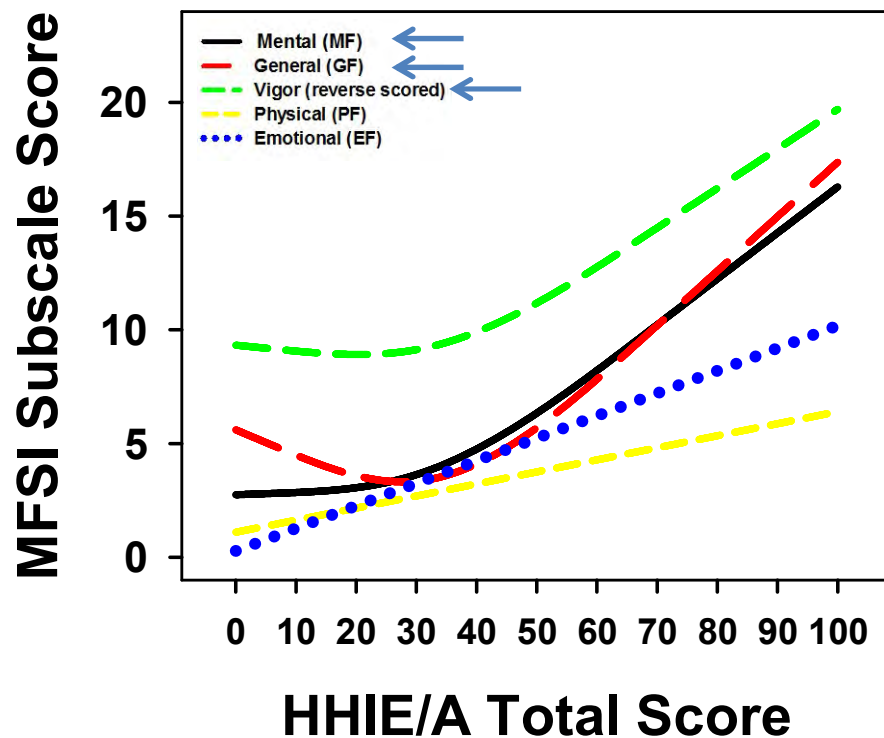


Hornsby, B. & Kipp, A. (2016)

- Surprisingly, **no association** bw degree of loss and any fatigue/vigor domain
 - Similar result for POMS data as well
- N= 143
- Age range: 22-94 years
- PTAs: 5-80 dB (Median: 33 dB)

MFSI= Multidimensional fatigue symptom inventory- short form

It was associated with hearing handicap

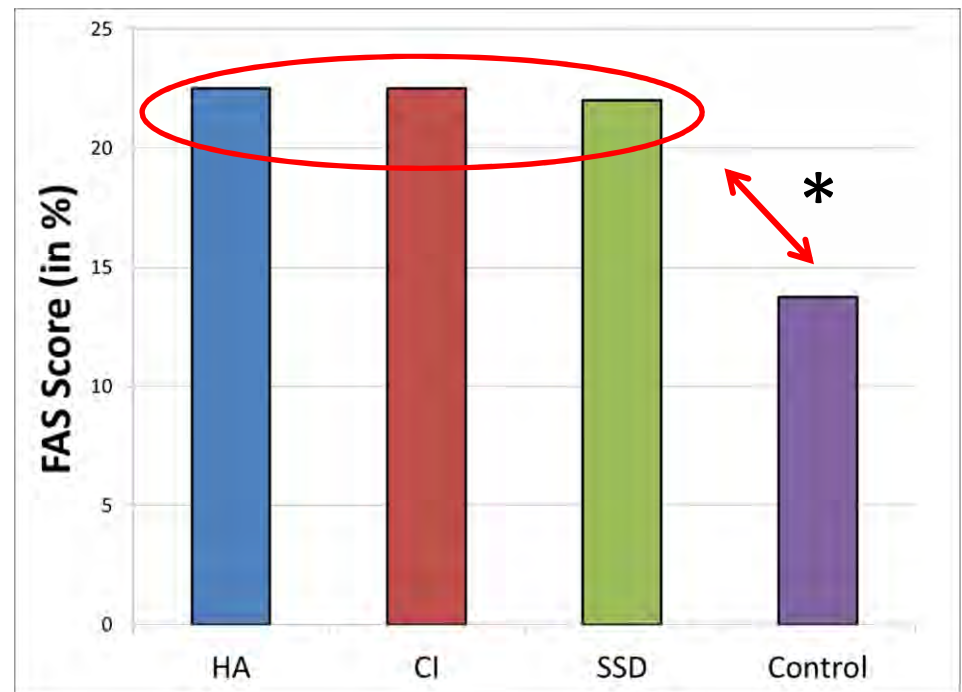


Hornsby, B. & Kipp, A. (2016)

- Fatigue increased with increases in hearing handicap
- Esp. for “significant” handicap scores (HHIE/A scores >42)
 - Limited association for lower handicap scores

Type of hearing loss and fatigue

- Used a **generic measure** (FAS) to examine differences in fatigue b/w hearing loss groups
 - HA, CI, SSD (n=50 adults/group)
- No significant differences in fatigue b/w HL groups
 - But all HL groups reported more fatigue than NH controls



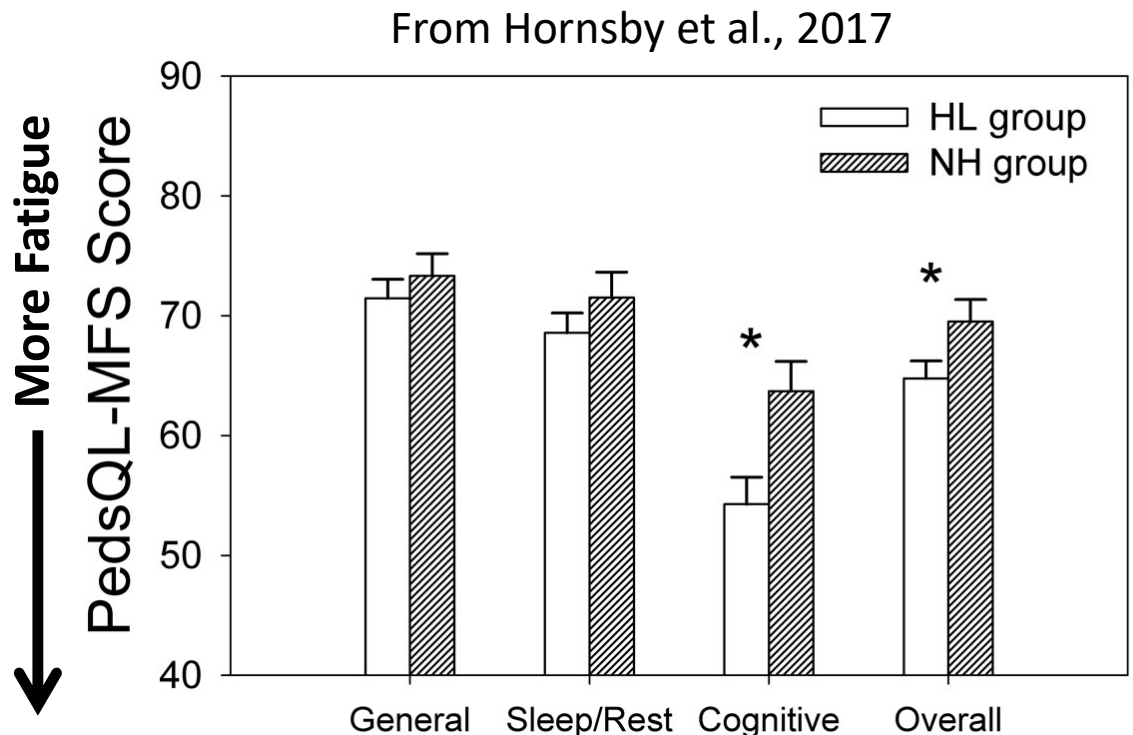
Modified from Alhanbali et al., 2017

- Fatigue measure- Fatigue Assessment Scale (FAS)

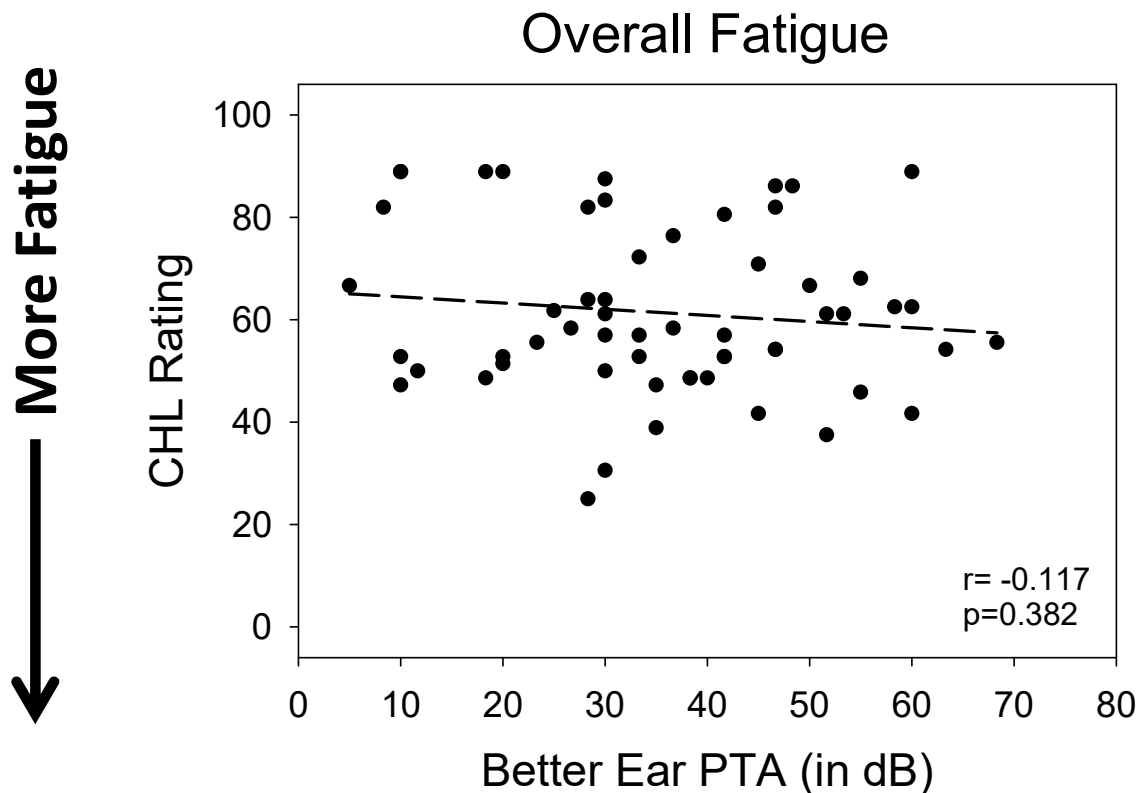
Similar findings in Children with HL (CHL)

- Using a **generic measure** (PedsQL-MFS) CHL report more overall & cognitive fatigue than children without HL

- CHL (n=60) and CNH (n=43)
 - 6-12 years olds
 - Bilateral, mild to moderately-severe HL



But... fatigue ratings in CHL are NOT associated with degree of hearing loss



- No association between degree of loss and fatigue
 - Regardless of domain, or PTA measure
 - Same as adult data

Take Home Points

- **Generic** fatigue measures suggest, in everyday settings adults & children with HL are at increased risk for fatigue,
 - Although fatigue magnitude varies across studies
 - Greatest risk is for more **severe** fatigue and vigor deficits
- The risk is ***not*** associated with the degree of HL or unilateral/bilateral differences
 - Do generic measures underestimate fatigue severity associated with HL?
- These findings highlight the need for a tool **specifically** designed to assess listening-related fatigue

Listening-Related Fatigue Scales: Current Work

- Vanderbilt Fatigue Scales:
 - Adult version (VFS-A)
 - Child Version (VFS-C) [10-17 years old]
 - Parent-Proxy Version (VFS-P) [6-17 years old]
 - Teacher-Proxy Version (VFS-T) [6-17 years old]

GOAL: create and validate measures to quantify fatigue with specific focus on listening-related issues relevant for individuals with hearing loss and other communication difficulties.

Development & Validation of the Vanderbilt Fatigue Scales (VFS)

- Phase I- Defining the problem
 - Focus groups and interviews
- Phase II- Item creation
- Phase III- Initial data collection
 - item analysis, item reduction and preliminary scale assessment
- Phase IV- Additional data collection for validation purposes using final scale versions

Sample VFS Items

Never/Almost
Never



Rarely



Sometimes



Often



Always/Almost
Always



- How often do you feel tired due to trouble hearing and understanding?

-Frequency Scale

Strongly
Disagree



Disagree



Neither Agree
nor Disagree



Agree



Strongly Agree



- Listening fatigue is a daily struggle.

-Agreement Scale



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VFS: Final Versions

- VFS-A versions
 - 40-item version
 - 10 items/domain
 - Physical
 - Mental
 - Social
 - Emotional
 - 10-item Unidimensional version
 - Scales allow for summed scores & Item Response Theory (IRT) scoring
- VFS-C/P/T versions
 - VFS-Parents
 - 12 items (7 & 5/domain)
 - Physical
 - Social-emotional-cognitive
 - VFS-Children
 - 10 items- unidimensional
 - VFS-Teachers
 - 8 items- unidimensional

VFS Validation

- Data collected (N=1526) using the final versions of the scales were used to assess reliability and validity.
 - VFS-A: 463 adults
 - 10-item version
 - VFS-C: 151 children
 - VFS-P: 399 parents
 - VFS-T: 363 teachers



VFS Validation

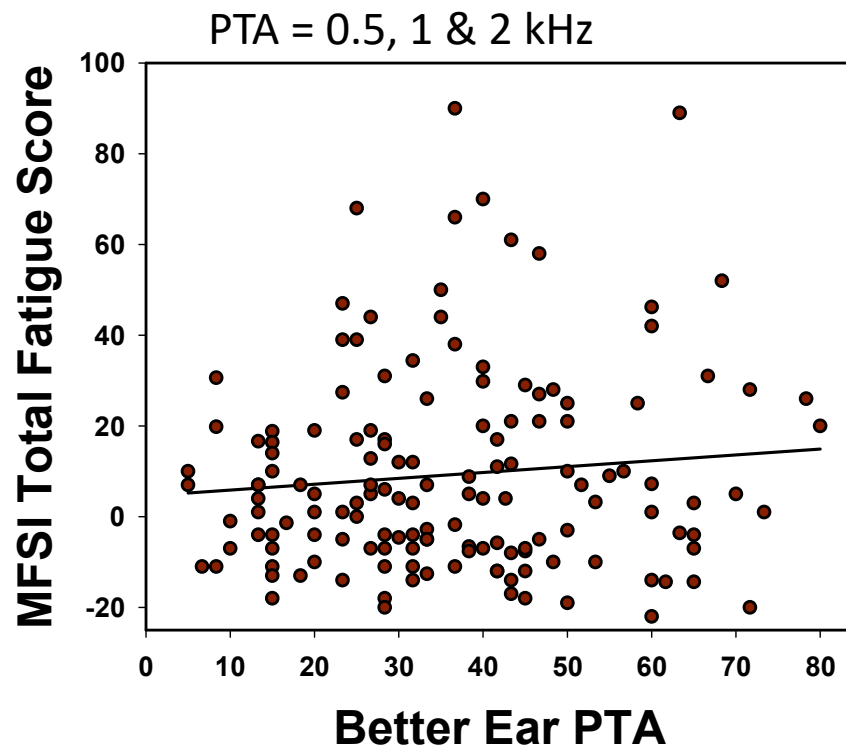
- Reliability
 - Good internal consistency (Cronbachs Alpha >0.93)
 - Good test-retest reliability ($R^2 = 0.54-0.82$)
- Validity
 - Good Content Validity
 - Based on development process
 - Good Convergent/Divergent Validity
 - Weak-moderate associations with other **generic** fatigue scales
 - Weaker associations with other distinct constructs (i.e., Depression)



VFS- Summary

- The VFS provides an ecologically valid and reliable measure of listening-related fatigue
 - Currently available for research purposes (contact me)
 - Clinical versions coming soon (check our websites)
 - <https://my.vanderbilt.edu/listeninglearninglab/>
 - <https://my.vanderbilt.edu/hearingandcommunicationresearch/>
- Are the scales sensitive to the effects of HL?

Using the VFS to Examine HL Effects



Hornsby, B. & Kipp, A. (2016)

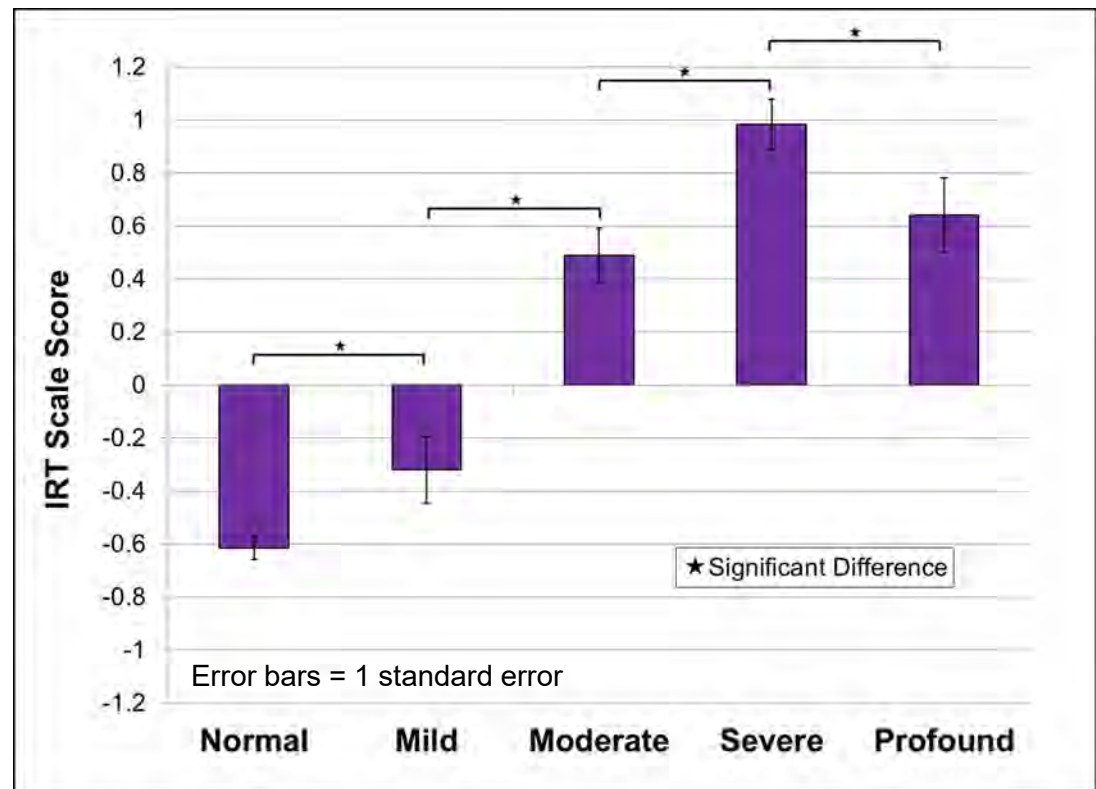
- Recall, no association bw degree of loss and any generic fatigue/vigor measure
 - POMS, FAS, or MFSI
- What about with the VFS?

MFSI= Multidimensional fatigue symptom inventory- short form

Hearing Loss & listening-related fatigue

- Adult data:
 - VFS-10
- Sensitive to effects of **self-reported bilateral HL** on listening-related fatigue
 - Note significant **decrease** in fatigue as self-reported loss increases from severe to profound

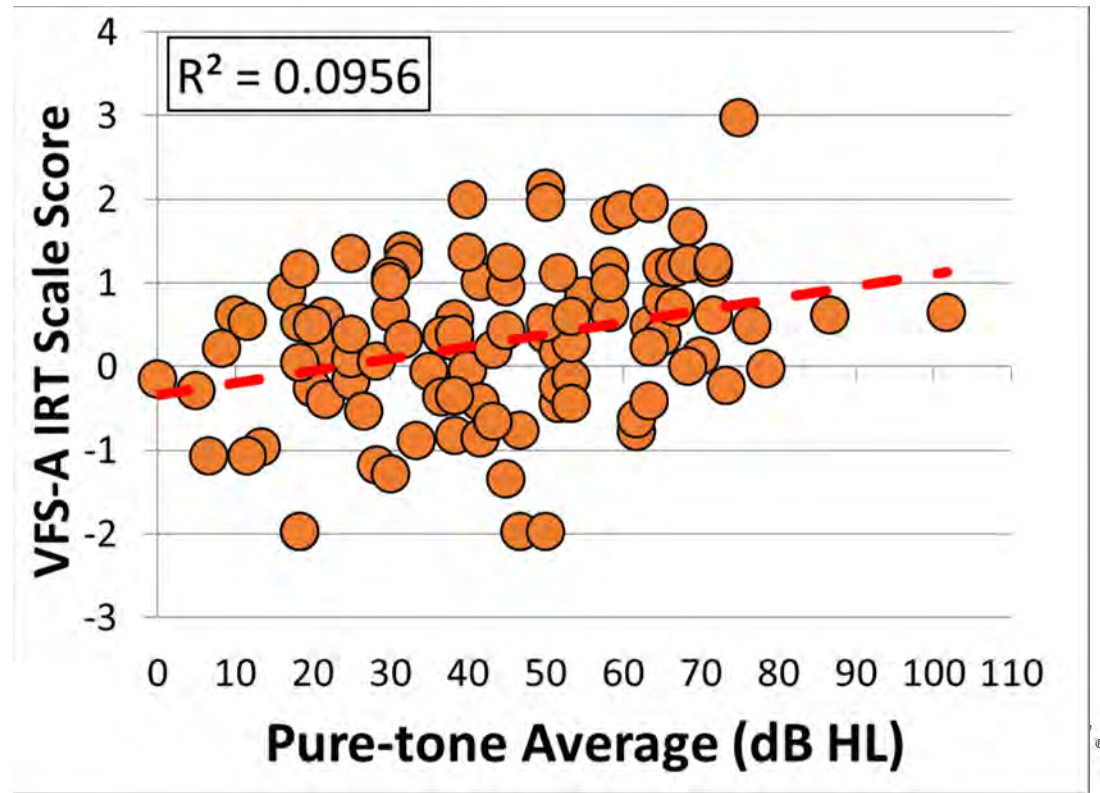
N=423 respondents



Hearing Loss & listening-related fatigue

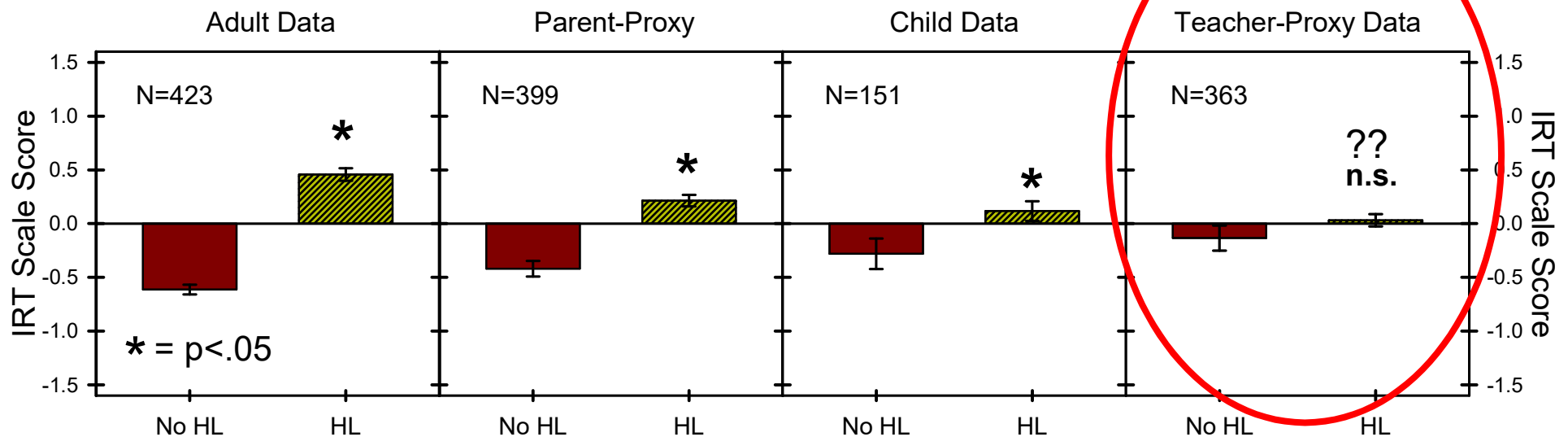
- Adult data:
 - VFS-10
- Weak (but significant) association b/w degree of hearing loss (PTA) and listening-related fatigue

Subset of n=99 respondents



Hearing Loss & listening-related fatigue

- Child data: Parent-proxy and child scales are sensitive to effects of self-reported HL on listening-related fatigue
 - Teacher scale was not



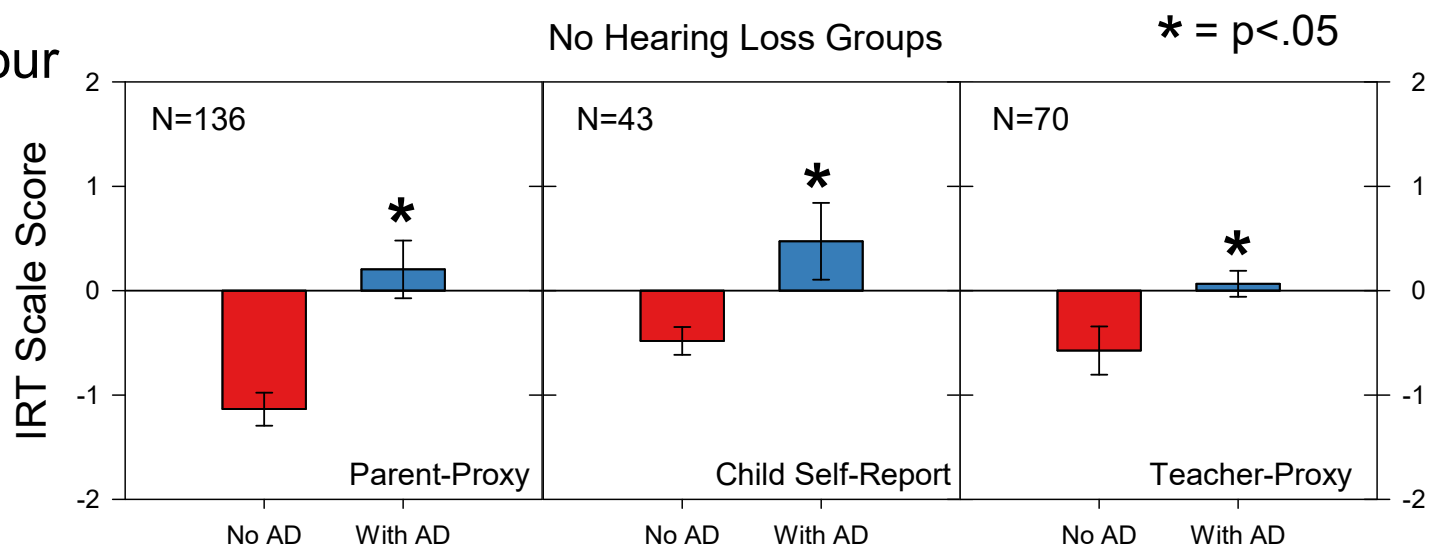
VFS and additional disabilities

- Disabilities other than HL may also increase listening-related fatigue
 - This may confound our results

Disability Types
Cognitive Disability
Visual Impairment
Behavioral/Emotional Problem
Physical Disability
Speech-Language Impairment
Genetic/Chromosomal Syndrome

VFS and additional disabilities

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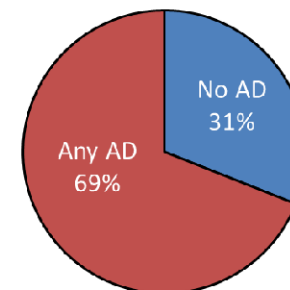
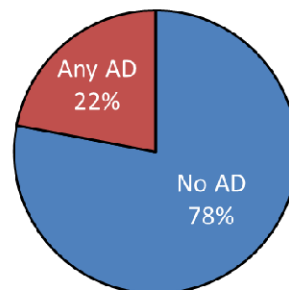
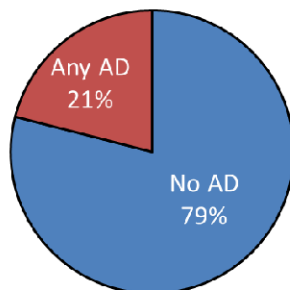


VFS and additional disabilities

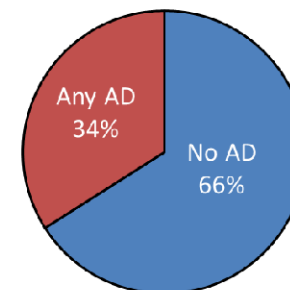
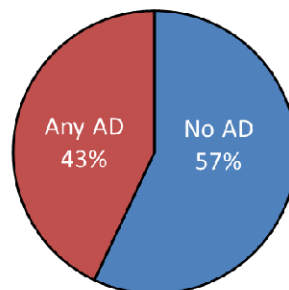
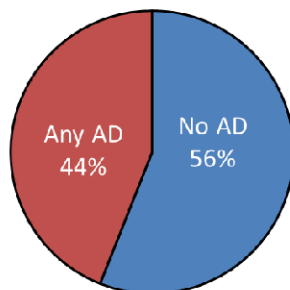
- Disabilities *other than HL* may also increase listening-related fatigue

– This may confound our results

- Note Teacher “No HL” sample has high proportion of additional disabilities



No HL Group



HL Group

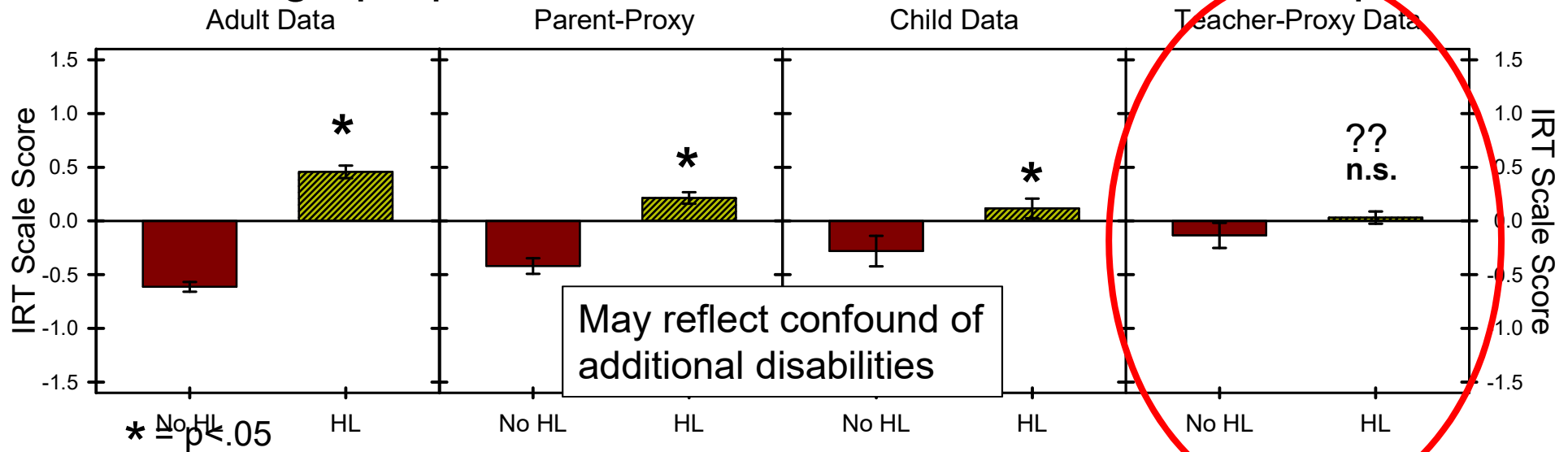
Child

Parent

Teacher

VFS and self-reported HL

- Apparent lack of sensitivity of Teacher scale may reflect the high proportion of disabilities in the “No HL” sample



Take Home Messages

- Adults and children with hearing loss have an increased risk for listening-related fatigue
 - Risk is NOT associated with PTA
 - But is associated with perceived hearing difficulties
 - Self-rated HL and HHIE
 - Disabilities other than HL also increase risk for listening-related fatigue in children
- The VFS provides a valid, reliable measure of listening-related fatigue
 - Clinical versions are nearing completion

Using the VFS Clinically

- What can you do with the scale?
 - Identify those with high levels of listening-related fatigue
 - Assess benefits of interventions on listening-related fatigue
- What Interventions?
 - Hearing aid use may reduce fatigue in adults with mild-moderate HL

Using the VFS to examine HA Benefit

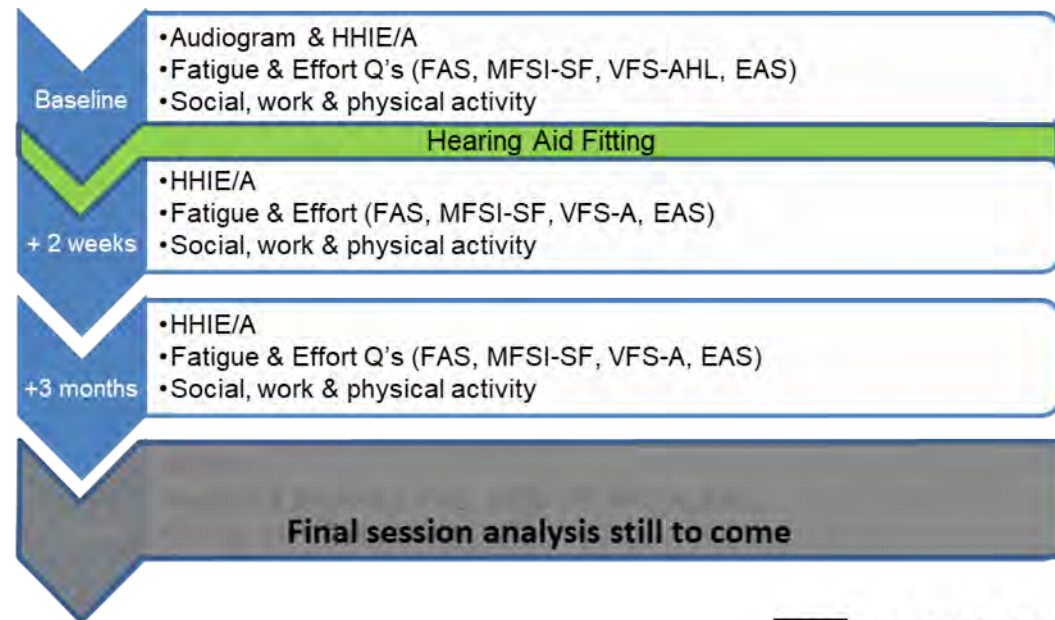
- Hearing aid use may reduce fatigue in adults with mild-moderate HL

- Participants

- 106 adults w/ Mild-moderate SNHL

- Two groups (n=53/group)

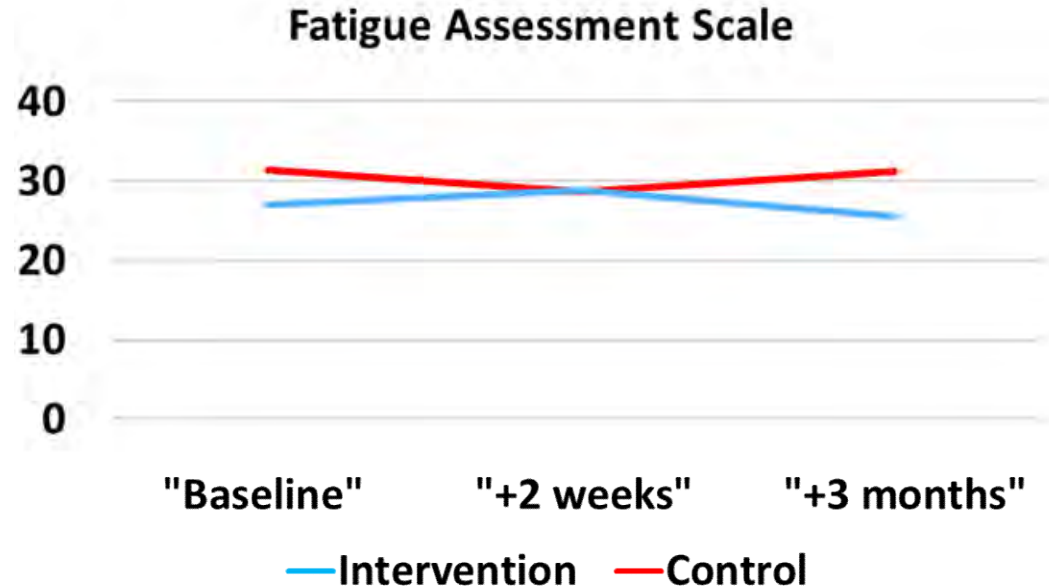
- Intervention group- 1st time hearing aid users
- Control group- referred, but did not get aids



J. Holman & G. Naylor (in preparation)

Using the VFS to examine HA Benefit

- No effect of hearing aid use on fatigue when measured using a **generic** scale

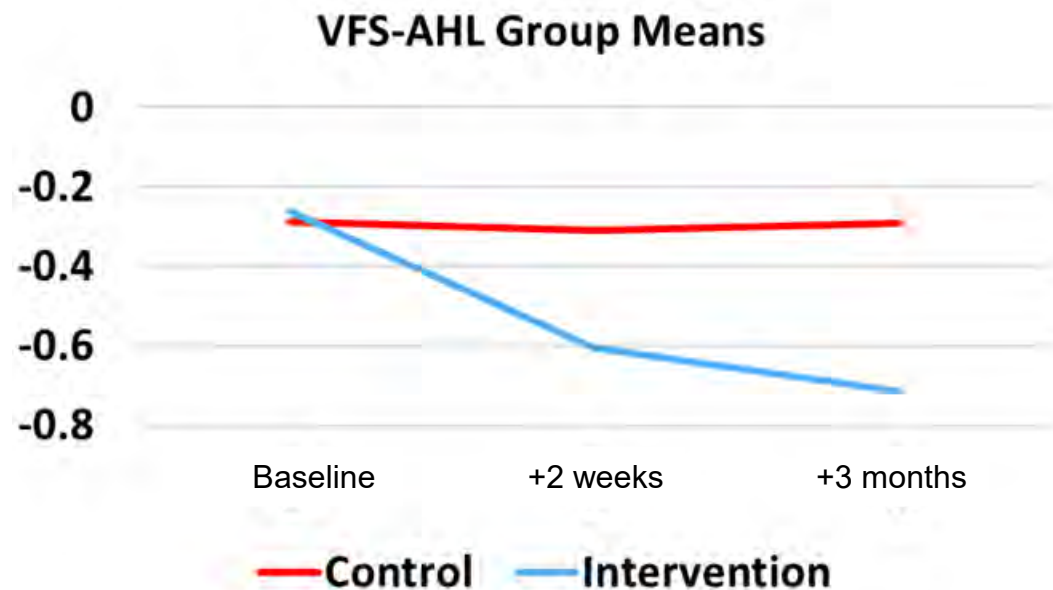


J. Holman & G. Naylor (in preparation)



Using the VFS to examine HA Benefit

- Significant decrease in fatigue following hearing aid fitting when measured using **VFS-A**
 - At least at ~3 months out



J. Holman & G. Naylor (in preparation)

Using the VFS- with Children

- Similar work in CHL is lacking, but potential interventions might include:
 - *Provide a space and/or scheduled break time for listening/quiet breaks*
 - Consider schedule of day and timing of auditory tasks, including therapies or other pull-out sessions
 - Consistent personal amplification and FM/RM system use
 - Preferential seating to potentially reduce listening effort
 - Visual information available in the classroom
 - Classroom acoustic modifications

See our lab website for more suggestions:

<https://my.vanderbilt.edu/listeninglearninglab/>



Thanks for
Listening!

Questions?

For more information
check out our lab
websites:

<https://my.vanderbilt.edu/listeninglearninglab/>

<https://my.vanderbilt.edu/hearingandcommunicationresearch/>



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