

# Development of the Vanderbilt Fatigue Scale: Applications for Children with Unilateral Hearing Loss

Hilary Davis, Au.D., Benjamin W.Y. Hornsby, Ph.D., Stephen Camarata, Ph.D. & Fred H. Bess, Ph.D.  
Department of Hearing and Speech Sciences, Nashville, TN

## INTRODUCTION

Parents and teachers of children with hearing loss (CHL), even those with unilateral hearing loss (CUHL), have anecdotally reported that these children put forth greater effort to listen compared to peers with no hearing loss.<sup>1</sup> Recent findings suggest that CHL are at risk for atypical fatigue due to listening difficulties.<sup>2, 4</sup>

These findings have significant educational implications for a CHL. It is hypothesized that a child's ability to concentrate will be negatively affected by the additional cognitive load associated with difficulty listening and understanding in the classroom.

Because fatigue is a subjective experience, it is often difficult for an individual to quantify and describe. In addition to physical symptoms (e.g. sluggishness, sleepiness, etc.), anecdotal reports suggest that CHL also experience cognitive and/or emotional fatigue as a result of difficult listening.<sup>3, 4</sup> Although various pediatric fatigue scales exist, none, to our knowledge, include items weighted for listening-related fatigue and its potential negative effects.

## PURPOSE

The **overall study goal** was to construct and validate a clinical measure of listening-related fatigue in CHL for use in clinics and schools. Three versions will be created: 1) parent version, 2) child version and 3) school provider version.

In **phase one**, we sought to obtain subjective data from participants in moderated focus groups to provide a framework for a clinical measure of listening-related fatigue.

In **phase two** (currently ongoing), we are completing the preliminary item analysis on item lists as a precursor to the creation of the Vanderbilt Fatigue Scale for CHL.

## FOCUS GROUP PARTICIPANTS

Data were obtained in focus groups and one-on-one interviews with CHL and CHL who have an additional disability (CHL-AD), as well as their parents, teachers, and school service providers. Additional disabilities included reading disability, speech-language delay, and attention deficit disorder. Children were included in the study with the following criteria: 1) bilateral moderate or greater hearing loss and 2) ability to speak in 5-6 word sentences per parent report.

Focus groups consisted of 4-8 participants within the same participant group-type (e.g. parents, teachers, CHL). CHL and CHL-AD were more relaxed and more likely to respond in a one-on-one interview than within a group of peers; therefore, the majority of child participants were interviewed by an examiner.

Parent and child participants were recruited through the Vanderbilt Audiology clinic and school providers were recruited through local school districts. All participants received monetary compensation for their time and participation.

Although initial recruitment included children ages 7-17, CHL under the age of 10 typically struggled to communicate about the concept of fatigue, especially as it related to difficult listening situations. As a result, thirty one of the 41 child participants were 10 years of age or older.

Table 1: Number of participants by group type.

Group	# of participants
Parent of CHL	17
Teacher of CHL (general, special, and deaf educator)	17
Service Provider (SLP, audiologist, interpreter)	11
CHL (age 7-17)	25 (13 males)
CHL-AD (age 7-17)	16 (9 males)
<b>TOTAL</b>	<b>86</b>

## FOCUS GROUP METHODS

Younger child participants struggled to communicate their experiences with listening-related fatigue. It appears that the CHL is often unable to recognize that he or she does not understand all of what is being said and how much they are struggling to listen in difficult listening situations.



*"She struggles with her last class period each day. Usually [it] has some type of video aspect in it, that's when she'll come home with more of a headache, she will admit, it's just too hard to drown out everything else and listen to the video."*

—Parent of a middle-schooler with bilateral cochlear implants

Each focus group and interview was moderated by a trained audiologist or psychologist familiar with qualitative research design and data collection. A moderator's guide was created for each group-type aimed at examining the following themes:

- 1) characteristics of difficult listening situations that may result in fatigue;
- 2) physical, cognitive, and emotional manifestations of listening-related fatigue;
- 3) coping strategies following the experience of fatigue, and
- 4) temporal characteristics of the fatigue and coping time following fatigue.

Additional visual tools, games, and activities were used to further guide the discussion with children and adolescents. All groups were audio recorded and transcribed. Members of the research team reviewed the transcriptions to determine common themes related to listening effort and fatigue reported by each group type.

## FOCUS GROUP DATA ANALYSIS AND COGNITIVE INTERVIEWS

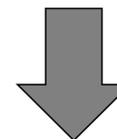
- Following the completion of the focus groups and interviews, the sessions were transcribed from the audio recordings. These transcripts provided rich, qualitative data that was used to create potential items for the fatigue scale. Items were written to capture multiple domains discussed during the focus groups, including emotional, cognitive, and physical fatigue symptoms.

- Over 500 unique items were written as a result of the focus group data. Following an iterative group process, the top 92 items were compiled for each participant group. These items were subjected to cognitive interviews where participants were asked to "think aloud" as they answered the questions. This process helped to eliminate unclear and poorly written items.

- Items were reviewed by a panel of experts to further refine the item list. Due to concerns regarding item list length, it was determined a total of 60 items would be needed for further statistical analyses (Item Response Theory). Phase 2, the preliminary review of the pediatric scale, is currently in progress with the 60 item lists for each sub-group.

*"Yeah, you wanna give up. You just don't want to try anymore because you know you won't actually get what they're trying to say or sometimes you think it's just you. Maybe I need to try a little harder to listen but when you do try, you put all of your focus on what they're trying to say and you still can't hear them."*

—teen with bilateral hearing aids



I want to give up when I have a hard time listening.  
I have to put all of my focus on listening to others.

Figure 1: Example of item written from focus group quote

## VANDERBILT FATIGUE SCALE: ADULTS WITH HEARING LOSS

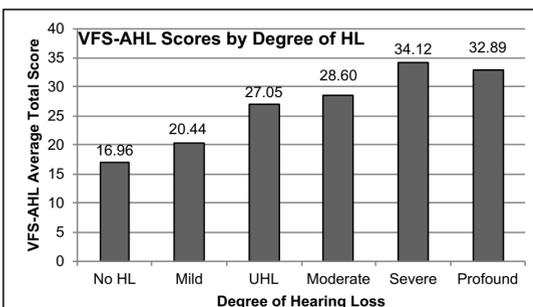


Figure 2: Average total VFS-AHL scores by degree of hearing loss.

The same process has been completed with adults with hearing loss (AHL) to create the Vanderbilt Fatigue Scale-AHL. Data collection was recently completed for Phase 3, the validation stage of the VFS-AHL. Participants completed the ten-item questionnaire, as well as several other fatigue-related questionnaires, including the POMS, FAS, and the HHIE/A. At this time, full statistical analyses have not been completed. A review of average total scores revealed that those with UHL were reporting more fatigue than those with mild HL and had, on average, scores similar to those with moderate HL.

In Figure 2, the average total scores per each degree of hearing loss, including UHL is depicted. Figure 3 shows the breakdown of number of participants per degree of hearing loss group. A total of 530 participants completed the VFS-AHL.

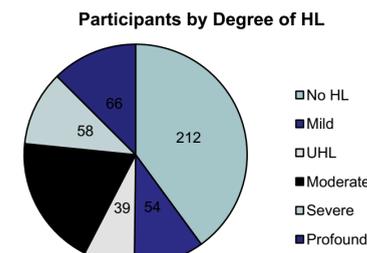


Figure 3: Number of Participants per Degree of Hearing Loss Group Type

## SUMMARY THEMES

This section provides a review of commonly reported behaviors noted in CHL following demanding listening tasks. These behaviors may be indicative of listening-related fatigue in CHL.

### BEHAVIORS AT HOME

- Taking a nap on the car ride home or immediately after school
- Feelings of anger or frustration after being in a noisy listening situation
- Asking to remove hearing assistive technology for a "listening break"
- Complaints of headaches
- Need for quiet time to recover from difficult listening situations

### BEHAVIORS AT SCHOOL

- Excessive zoning out
- Lack of motivation for auditory tasks
- Increased anxiety/stress about hearing information in class
- Difficulty with auditory tasks (including therapy) in the afternoon

### SOCIAL BEHAVIORS

- Withdrawing or avoiding crowds
- Feelings of frustration, sadness, or being "left out" following communication breakdowns
- Giving up or shutting down in a large group discussion

## BE ON THE LOOKOUT FOR FATIGUE!

Talk to your patients and their families about this issue and help educate others working with children with hearing loss. To be sure, this is a significant issue for at least a portion of CHL and it is important to identify those who are struggling in order to provide appropriate intervention.

## NEXT STEPS AND YOUR ROLE

### VANDERBILT FATIGUE SCALE: CHL

The next phase in scale development is a pre-test phase of the current list of items with individuals in the three study sub-groups: 1) CHL, 2) parents of CHL, and 3) school service providers of CHL. In order to obtain a range of responses, children with typical hearing, their parents and teachers will also be asked to complete the scale.

Following data collection, statistical analyses will be completed to further refine the scale to a 10-15 question measure. In Phase 3, the scale will be validated on a large sample so that the scale can be used in clinics and schools to identify CHL struggling with listening-related fatigue. It is the goal of this project to provide the scale and associated user manual free of charge online following its completion.

If you would like to participate in data collection for the current project, or for more information, please visit the Listening and Learning Lab's website at:

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

## KEY REFERENCES

- Bess, F.H. & Hornsby, B.Y. (2014). Commentary: Listening can be exhausting—Fatigue in children and adults with hearing loss. *Ear & Hearing*, 35, 592-599.
- Hicks, C.B., & Tharpe, A.M. (2002). Listening effort and fatigue in school-age children with and without hearing loss. *Journal of Speech, Language and Hearing Research*, 45(3), 573-584.
- Hockey, R. (2013). *The psychology of fatigue*. New York, NY: Cambridge University Press
- Hornsby et al., (2014). Subjective Fatigue in Children with Hearing Loss: Some Preliminary Findings. *AJA*, 23, 129-134.

## ACKNOWLEDGEMENTS

This research is supported by the Institute of Education Sciences (IES), U.S. Department of Education, through Grant R324A150029 to Vanderbilt University. The opinions expressed are those of the authors and do not represent the views of the Institute or the U.S. Department of Education.