

# MY EARS ARE EXHAUSTED! DEVELOPMENT OF A FATIGUE SCALE FOR CHILDREN WITH HEARING LOSS

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## INTRODUCTION

- Anecdotal reports suggest that CHL may experience physical, cognitive and/or emotional fatigue as a result of difficult listening.<sup>1,2</sup> The higher levels of mental effort exhibited by CHL may lead to a listening-related fatigue which may have a negative impact on daily activities. Fatigue in children with other chronic conditions has been linked to school absences, reduced academic performance, sleep disturbances and negative changes in life quality.
- This poster describes our ongoing work to develop a pediatric fatigue scales with listening related items specific to hearing loss measure for CHL.

## METHODS PHASE I

- Defining the Issues:** Review literature and conduct focus groups/interviews to define the problem of listening-related fatigue from the perspective of the CHL, their parent's and the service provider's (teachers, SLPs, audiologists).

Table 1. Participant Breakdown

Group	Phase I		Phase II		Total
	CHL	CHL	CNH	CHL	
Parents	17	262	81	343	
Teachers/Service Providers	28	218	60	278	
Children (aged 7-17 years)	41	108	69	177	
<b>TOTAL</b>	<b>86</b>	<b>588</b>	<b>210</b>	<b>798</b>	

## RESULTS PHASE I (FOCUS GROUP)

- Focus group analyses:** Transcripts were coded and used to identify common themes and domains of listening-related fatigue. Examples are displayed below.

### School Providers:

"In the cafeteria, ... my one student, she sometimes just takes her implant off and even turns the volume down on her hearing aid and that's like her time to just sit and not have to listen."  
-Deaf education teacher

"At the end of the day, their ability to focus with their implants only becomes nearly impossible."  
-Elementary school SLP

### Parents:

"She struggles with her last class period each day. ...she'll come home with more of a headache, she will admit, it's just too hard to drown out everything else and listen."  
-Parent of a middle-schooler with bilateral CIs

"In a very hectic environment, and if things go really, really quick for her, I can tell it's a lot for her. She has to make an effort, and it wears her out."  
-Parent of a 10-year old with bilateral hearing loss

### Children:

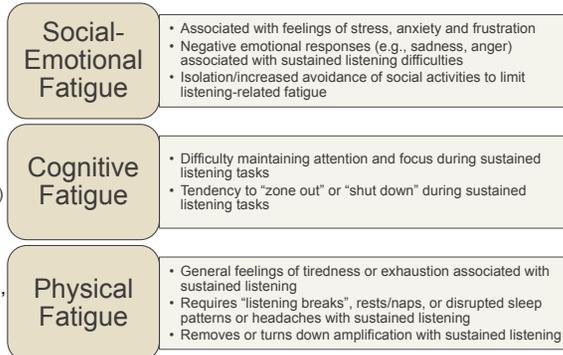
- CHL, especially younger CHL, often struggled to communicate their experiences with listening-related fatigue.
- They did not always recognize a relationship between trying to hear and understand in difficult listening situations and their fatigue.

"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."  
-Teen with bilateral hearing aids

## RESULTS PHASE I (LISTENING DOMAINS)

- Common factors influencing listening-related fatigue included:**
  - The listening environment (e.g., background noise)
  - The speaker/talker (e.g., loudness, speed, accent)
  - The listening situation (e.g., duration of listening)
  - Situational importance/motivation (e.g., importance of understanding)
- Results suggest listening-related fatigue has a multidimensional structure consisting of: Social Emotional, Cognitive, and Physical Fatigue (see figure 1)

Figure 1. Three different domains of listening related fatigue based on focus groups



## RESULTS- PHASE I (ITEM DEVELOPMENT)

- Item Development:** An iterative evaluation process was used to develop an initial pool of 60 test items per group based on quotes transcribed from focus groups. Examples of items are shown to the right
- These items targeted listening-related fatigue in three domains Social-Emotional, Cognitive, Physical displayed in figure 1 below (20 items/domain)

Table 2. Sample items and response options

Parent Items	Response Options				
	Social-Emotional	Never	Rarely	Sometimes	Often
My child prefers to be alone after listening for a long time	1	2	3	4	5
It is hard for my child to concentrate after listening for a long time	1	2	3	4	5
My child is completely worn out after listening for a long time	1	2	3	4	5

Teacher Items	Response Options				
	Social-Emotional	Never	Rarely	Sometimes	Often
The student withdraws when he/she becomes fatigued from listening	1	2	3	4	5
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

Parent Items	Response Options				
	Social-Emotional	Never	Rarely	Sometimes	Often
After school, I'm so tired I don't want to talk to anyone	1	2	3	4	5
My brain gets tired after listening all day	1	2	3	4	5
Listening at school wears me out	1	2	3	4	5



Figure 2. Multidimensional nature of listening-related fatigue based on focus group data

## METHODS PHASE II

- Preliminary Scale Analyses:** Responses were collected from over 500 participants with and without HL (Table 1). An exploratory factor analysis (EFA<sup>4,5</sup>) was used to examine the multidimensional nature of responses across groups.
- EFA model fit was evaluated using multiple indices (root-mean-square error of approximation index (RMSEA) <.06; root-mean-square residual (RMSR) <.08, comparative fit index (CFI) and Tucker-Lewis index (TTL) >.95)

## RESULTS-PHASE II

- EFA results suggest the multidimensional nature of listening-related fatigue varied across respondent groups.
  - For parents and teachers/service providers, a **two-factor** (Social-emotional-cognitive fatigue and physical fatigue) model provided a reasonable fit to our data
    - Parents: RSMEA = 0.07; RMSR=0.08; CFI=0.94; TTL=0.94
    - Teachers RSMEA = 0.074; RMSR=0.084; CFI=0.95; TTL=0.95
  - A **single-factor** model provided a good fit to the child data (Figure 3)
    - RSMEA = 0.052; RMSR=0.077; CFI=0.94; TTL=0.94

Figure 3. Multidimensional nature of listening-related fatigue based on EFA of parent and teacher responses

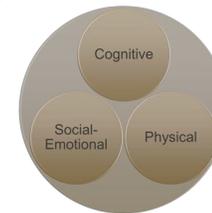


Figure 4. Unidimensional nature of listening-related fatigue based on EFA of Child responses

## CONCLUSIONS-NEXT STEPS

- listening-related fatigue was originally hypothesized to be a multidimensional construct consisting of Social-Emotional, Cognitive and Physical Domains based on data from focus group data from CHL, parents and teachers/service providers
- Preliminary analyses based on a 60 item scale suggests the factor structure varies based on respondent (Child, Parent, Teacher).
  - A unidimensional structure based on child report and multidimensional based on parent and teacher report.
- Data collection continues- additional data are required to:
  - confirm the tentative factor structure,
  - analyze item quality using Item Response Theory (IRT), and
  - select high quality, unique, items to create a scale, or scales, for research and clinical purposes.

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