

## Significance

- Children with Down Syndrome (DS) tend to have a higher rate of the following than typically-hearing (TH) peers:
  - chronic and/or progressive
    - middle ear dysfunction<sup>1</sup>
    - hearing loss with a conductive component<sup>2</sup>
  - differences in facial/aural anatomical structures
    - more stenotic external auditory canals<sup>3</sup>
    - Limited evidence documenting smaller ear canal volumes (ECV)<sup>4</sup>
- More comprehensive evidence regarding typical tympanometric characteristics in children with DS would inform otologic medical decision-making
- Evaluation of tympanometric measures and any differences in their relation to hearing loss in this clinical population would be imperative for assessment of potential amplification need

## Purpose

Assessing **tympanometric characteristics** over time and their **relation to hearing** in children with DS. Findings would **inform clinical guidelines** to better support otologic management and amplification evaluation in this clinical population.

## Method

Retrospective chart review of all children with DS aged 5-10 years with at least one BCH audiology visit from May 2012 - August 2022 (n = 273). 10% of **quantitative** data were reviewed by a blind coder with >99% reliability. **Qualitative** data coding was decided upon by the authors based on BCH clinical practice guidelines. Difficult-to-interpret data was discussed as a group on a case-by-case basis.

## Results and Conclusions

Figure 1

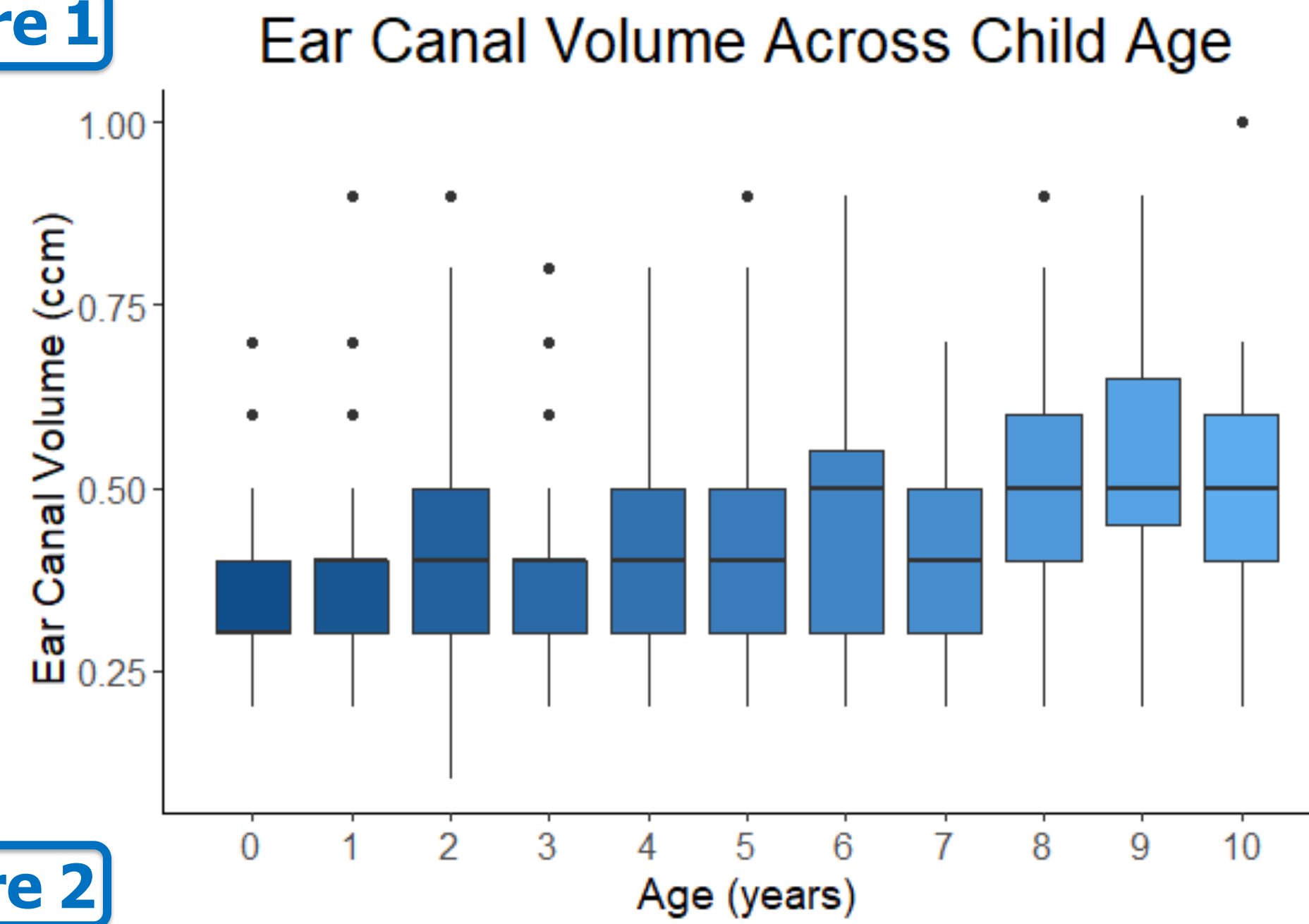
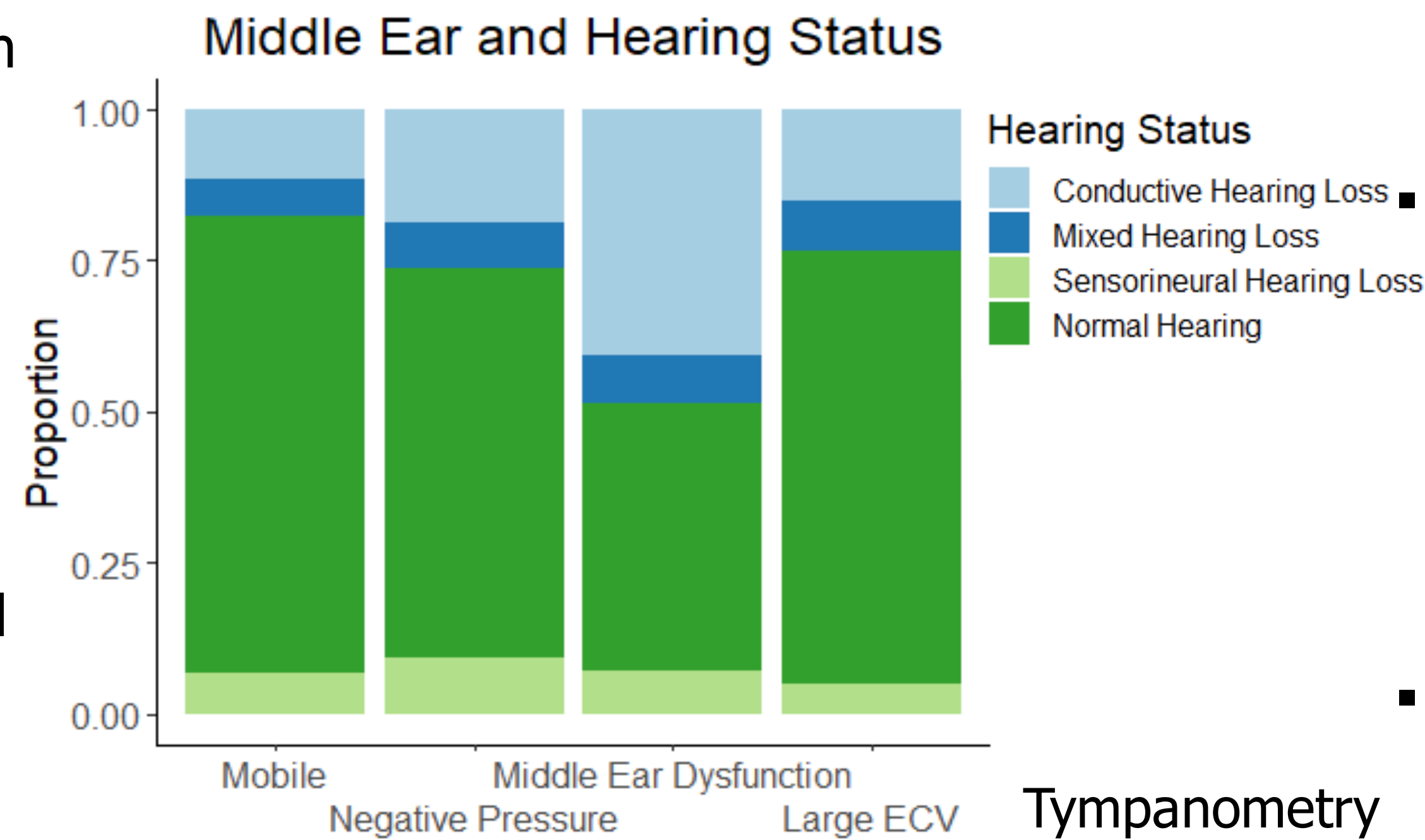


Figure 2



Audiometry  
Ear-specific only

- Normal hearing (NH)
- Conductive hearing loss (CHL)<sup>+</sup>
- Mixed hearing loss (MHL)<sup>+</sup>
- Sensorineural hearing loss (SNHL)<sup>+</sup>

<sup>+</sup>at least one frequency

<sup>\*</sup>Either 226 or 1000 Hz probe tone

Tympanometry

- ECV

Middle Ear Status\*

- Mobile
- Dysfunction
- Negative Pressure
- Large ECV\*\*

\*\*documented by audiologist or otolaryngologist, may be pressure-equalization tubes or tympanic membrane perforation.

Table 1

ECV (ccm)	0-1 (n=288)	1-2 (n=293)	2-3 (n=284)	3-4 (n=208)	4-5 (n=211)	5-6 (n=198)	6-7 (n=147)	7-10 (n=261)
Range	0.2 - 0.7	0.2 - 0.9	0.1 - 0.9	0.2 - 0.8	0.2 - 0.8	0.2 - 0.9	0.2 - 0.9	0.2 - 1.0
Median	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5
Mean (SD)	0.34 (0.10)	0.37 (0.11)	0.39 (0.12)	0.38 (0.13)	0.41 (0.13)	0.41 (0.15)	0.45 (0.14)	0.46 (0.15)
TH n, Mean (SD) <sup>5</sup>	36, 0.55*** (0.18)	43, 0.54*** (0.14)	12, 0.58*** (0.13)	15, 0.53* (0.16)	18, 0.57*** (0.13)	12, 0.61*** (0.12)	2, 0.68* (0.15)	-

\*p < 0.05, \*\*\* p < 0.001

- Children with DS demonstrated **smaller than average ECV** compared to TH peers of the same age<sup>5</sup> with a larger sample size than previous research<sup>4</sup>.
  - May be necessary to use **alternative normative values** to determine tympanic membrane perforations/patent ventilation tubes for this clinical population.
- Middle Ear and Hearing Status were significantly related  $\chi^2 (9, n = 576) = 69.7, p < 0.001$ . **Conductive hearing loss** was significantly **more** likely ( $p < 0.01$ ) and **normal hearing** was significantly **less** likely ( $p < 0.05$ ) with middle ear dysfunction than all other middle ear conditions.
  - Consistent with clinical expectations
  - Future research should investigate factors contributing to variability and individual trajectories over time
- Later work should also compare use of 226 Hz and 1000 Hz probe tones separately
  - Emerging evidence suggests that 1000 Hz may be more predictive for middle ear dysfunction in children with DS<sup>6</sup>

### Selected References

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