

# Music Appreciation and Participation in Children who are Hard of Hearing

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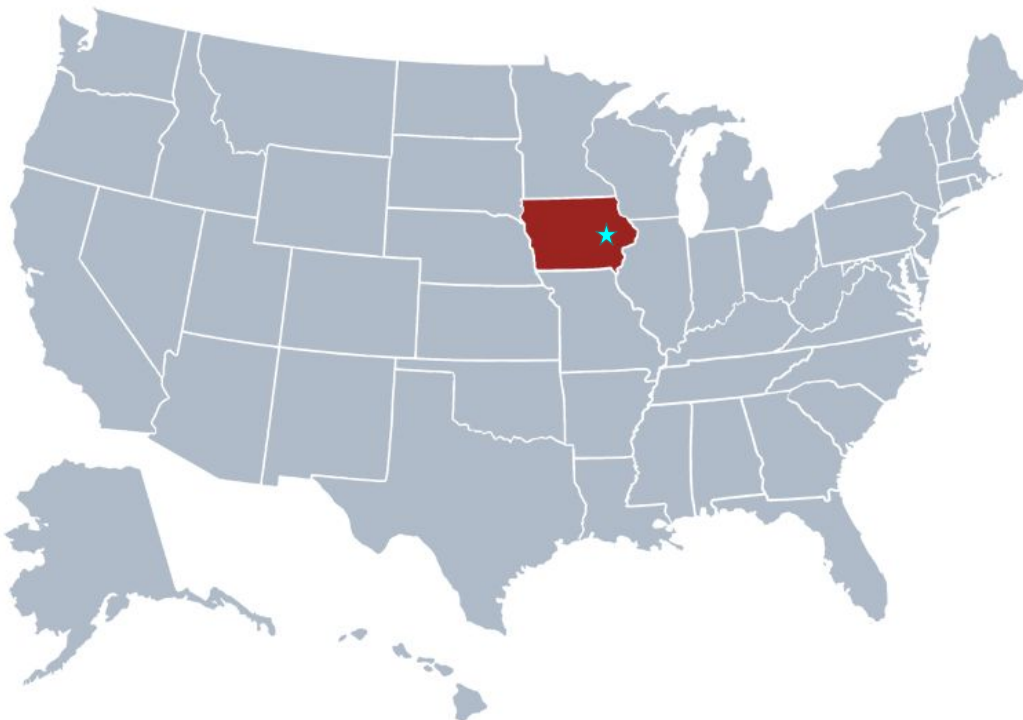
and

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Outcomes of School Age Children  
who are Hard of Hearing



# Overview

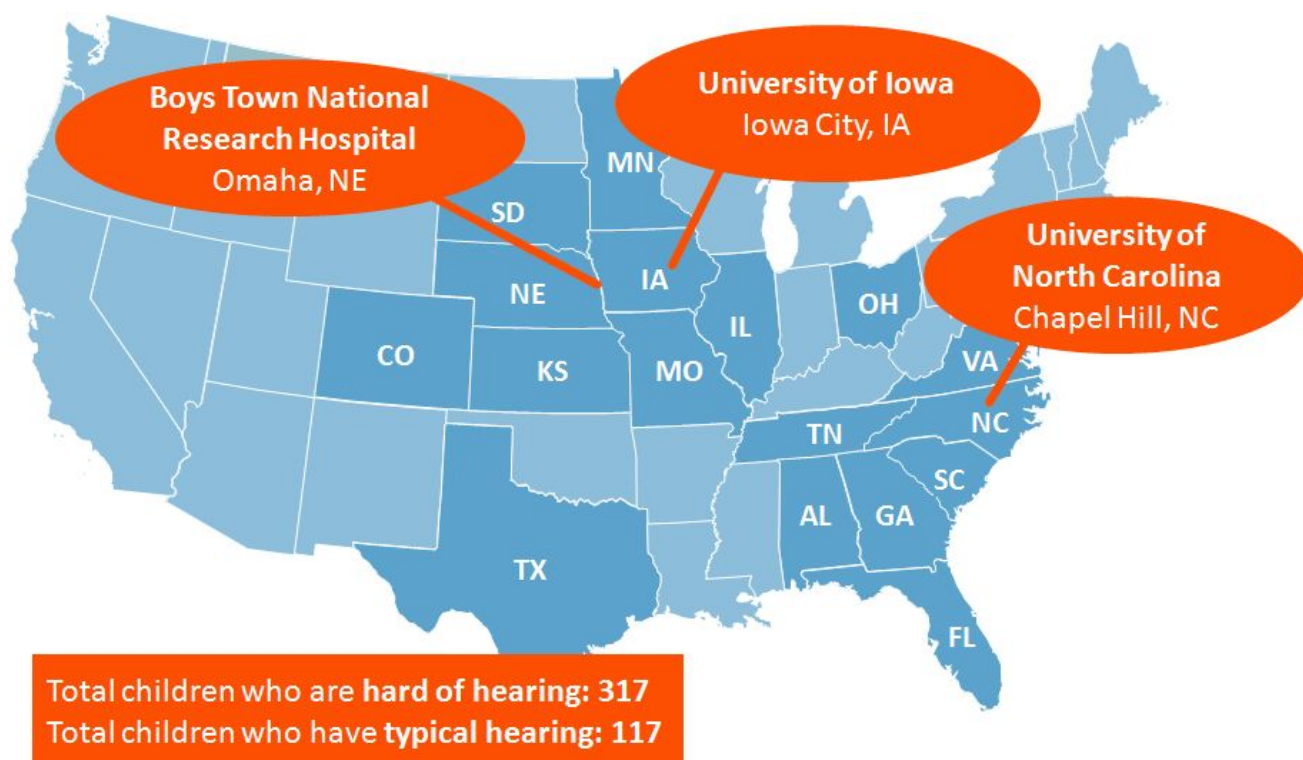
- A large body of work exists examining (primarily) adult cochlear implant users and music perception and appreciation.
- Some research exists on musical engagement in adults with hearing aids.
  - 70% of adults with hearing aids report listening to music is an important part of their lives and more than half listen to music everyday (Leek et al, 2008).
- We know of no studies that have attempted to examine musical engagement among children who are hard of hearing.
- Research question: **to what extent, and in what ways, does hearing loss affect a child's participation in and appreciation of music and musical activities?**

## Why?

- Music is important: cross domain benefits as well as music for music's sake.
  - Children who participate in music:
    - Show improved speech and language development (Gaab, 2005; Moreno, 2011; Zuk, 2013; Miendlarzewska et al, 2014; Kraus and Anderson, 2015; Kraus et al, 2014; Tierney et al, 2015).
    - Score significantly higher on standardized tests (Johnson and Memmott, 2007).
    - Have higher spatial intelligence (Gromko, 1998).
    - Develop a higher IQ and visual ability (Forgeard et al, 2008).
    - Have better speech perception in noise (Slater et al, 2015).
    - Have an overall larger growth of neural activity (Hyde et al, 2009).
    - Show a slower and less drastic cognitive decline in old age (White-Schwoch et al, 2013).
    - Have better neural processing of speech in old age (Parbery-Clark et al, 2012).
- Better understanding how children with hearing loss are engaging with music may inform hearing aid processing and programming as well as clinical recommendations and aural (re)habilitation.

## Methods: OSACHH Overview

- This project is a sub-study of the Outcomes of School Age Children who are Hard of Hearing (OSACHH) study, which is the second phase of the Outcomes of Children with Hearing Loss study (OCHL).
- OCHL was a groundbreaking three-site, five-year longitudinal study which examined a variety of outcomes in children who wear hearing aids.
  - See [www.ochlstudy.org](http://www.ochlstudy.org).
- OCHL/OSACHH study participants consisted of 317 children with mild-severe hearing loss and 117 normal hearing children from 17 states.



## OCHL/OSACHH Inclusion Criteria

- Identified as HoH between 6 months and 7 years old.
  - Usually by UNBHS or clinician referral.
- Better ear PTA between 25 and 75 dB HL.
- No cochlear implant.
- English as a primary language.
- No significant cognitive or motor delays.

## Methods: Survey

- Developed with input from music survey experts, clinicians, parents of children with hearing loss, and a statistician.
- Delivered primarily through Qualtrics. Paper surveys were mailed to parents who preferred paper communication.
- 39 total questions; average completion time ~15 minutes.

## Methods: Survey

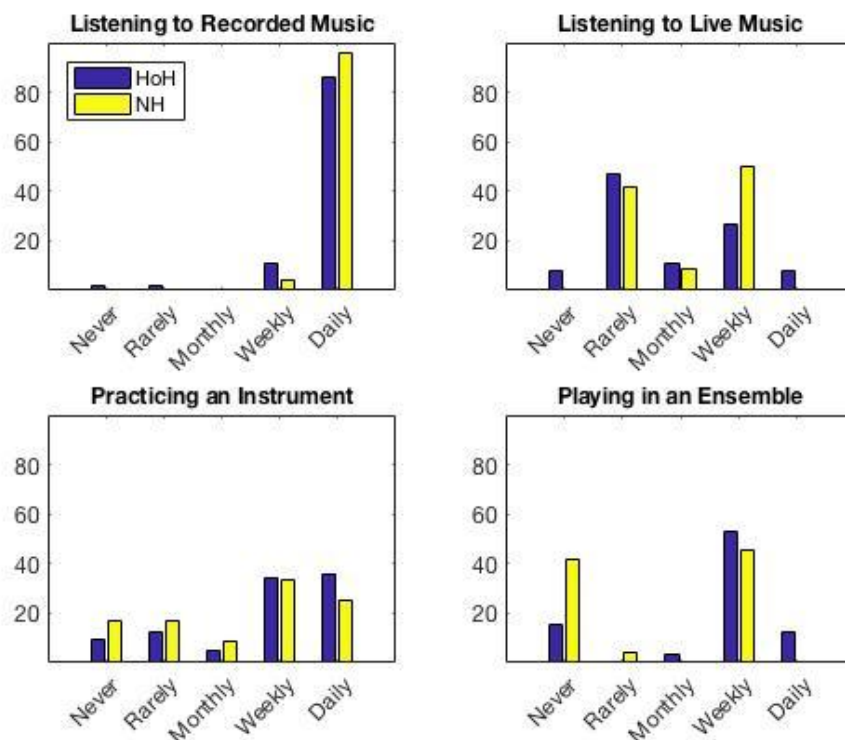
- 2 big questions:
  - Do children with hearing loss listen to music?
  - Do children with hearing loss play music?
- 5 major areas of interest:
  - How often?
  - How important?
  - What kinds?
  - Hearing aid use?
  - Influence of family?
- 3 primary domains:
  - Recorded music appreciation
  - Live music appreciation
  - Musical practice/performance participation

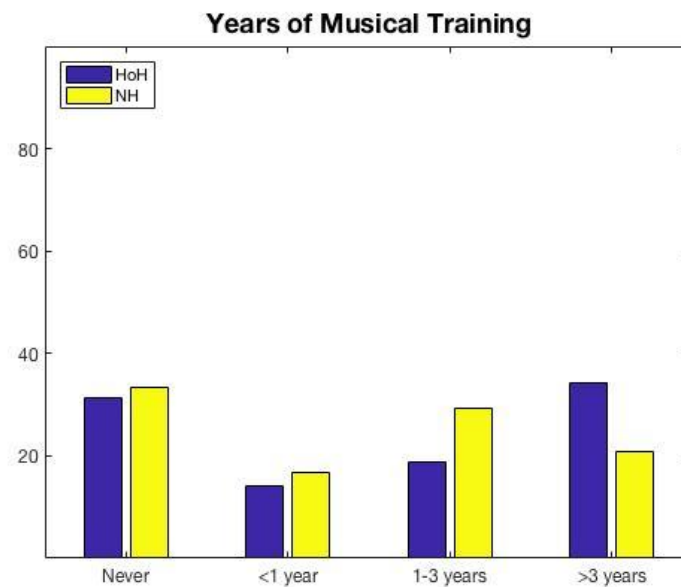
## Methods: Participants

- Music survey given to the parents of two cohorts of children finishing 5th grade.
  - Why 5th grade?
  - 88 surveys completed: 64 with hearing loss and 24 normal hearing.
- Possible demographic influences on survey data.
  - Maternal education level

## How often?

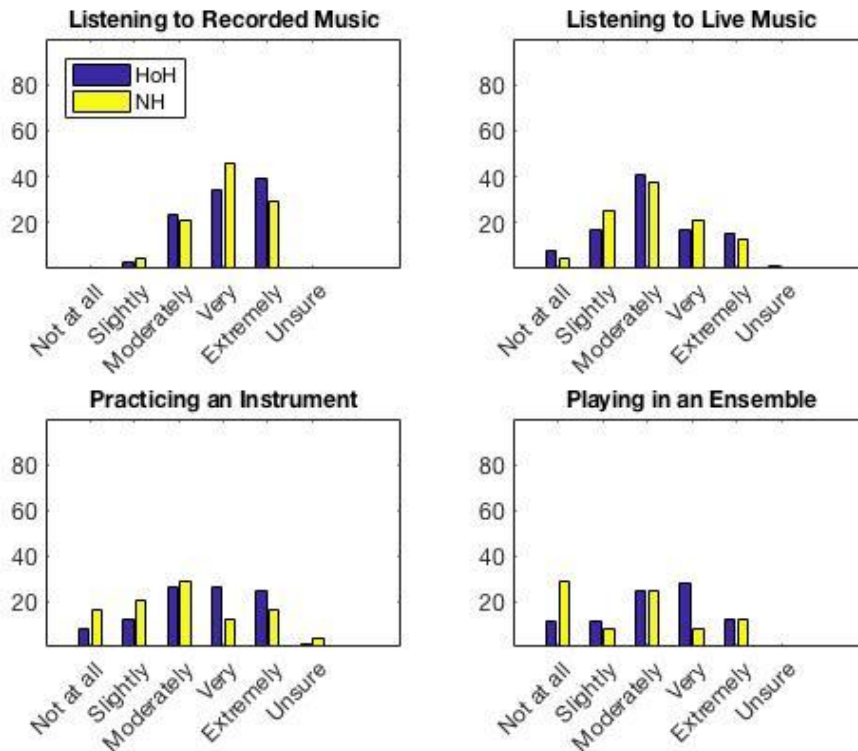
- Nearly all children listen to recorded music everyday.
- About half of all children regularly attend music performances.
- More than half of all children practice an instrument at least weekly.
- More than half of all children play with an ensemble at least weekly.
- A greater percentage of children who are HoH had >3 years of musical training (but not a significant difference).
- No significant differences in frequency of listening to or playing music between NH and HoH children were observed.





## How important?

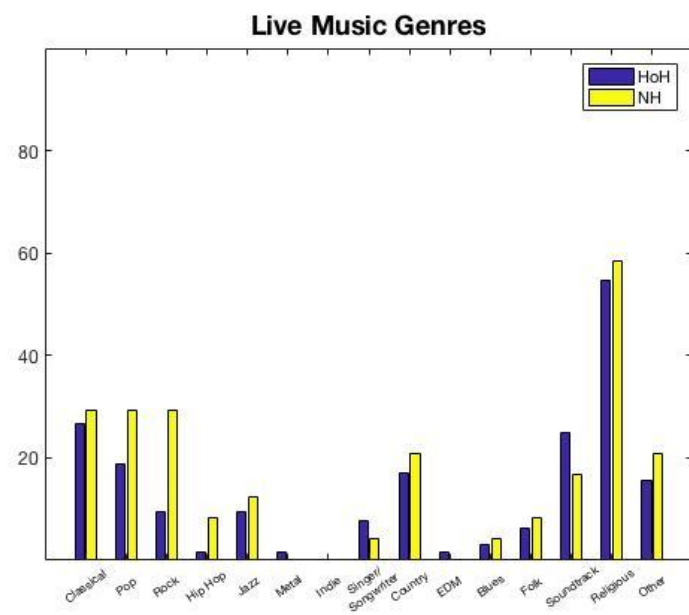
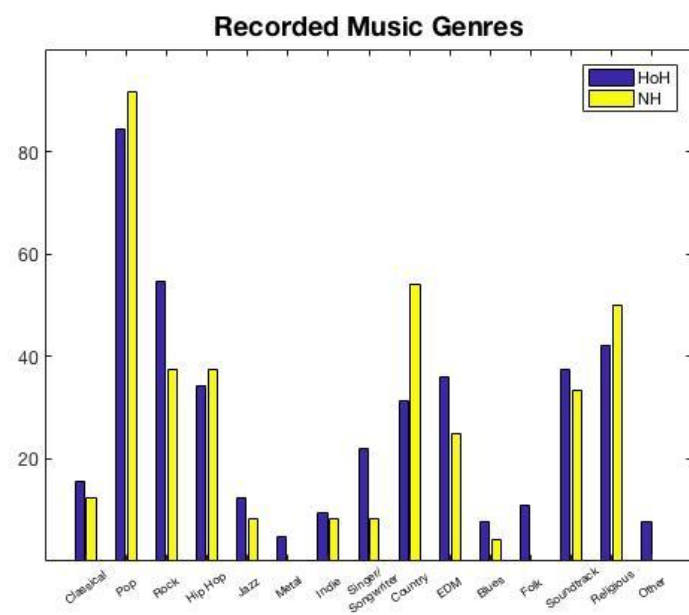
- Most children (75%) feel that listening to recorded music is very or extremely important.
- More than half of all children feel that attending live concerts is at least moderately important.
- Children who are HoH were nearly significantly more likely to consider playing an instrument to be very or extremely important ( $p=0.07$ ).
  - But effect size was small ( $\phi = 0.2$ )
- Children who are HoH were nearly significantly more likely to consider playing in an ensemble to be very or extremely important ( $p=0.09$ ).
  - But again, effect size was small ( $\phi = 0.2$ )



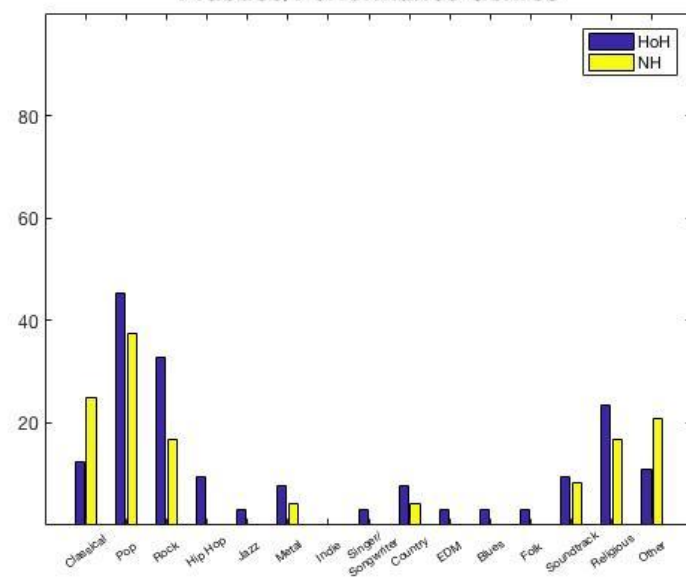
## What kinds?

- Children are listening to and playing a wide variety of musical genres (especially pop, rock, hip hop, electronic music, country, religious music, and musicals/soundtracks).
- However, children are particularly listening to and playing pop music.
- Children who are HoH appear to listen to a wider variety of genres, but difference is not significant.
- Live music tends to occur at religious services.

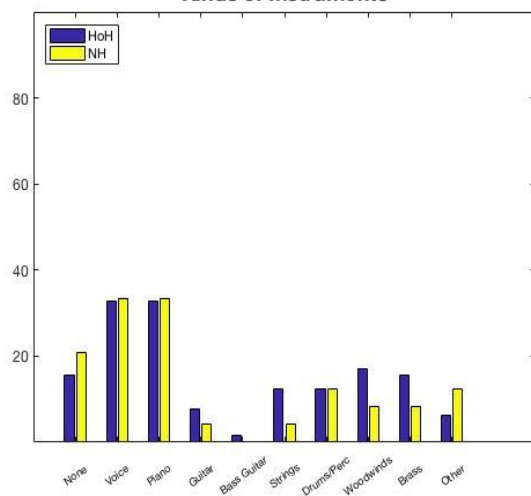




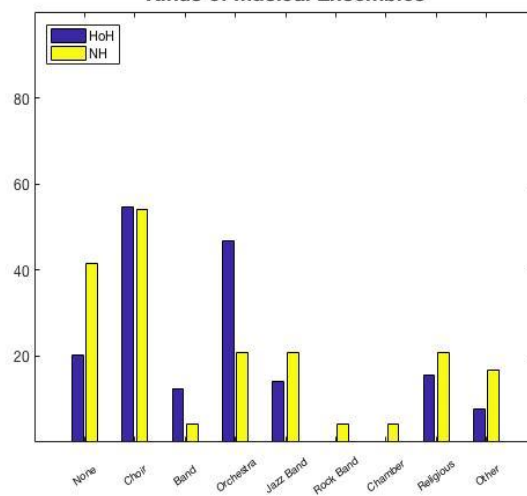
Practice/Performance Genres



Kinds of Instruments

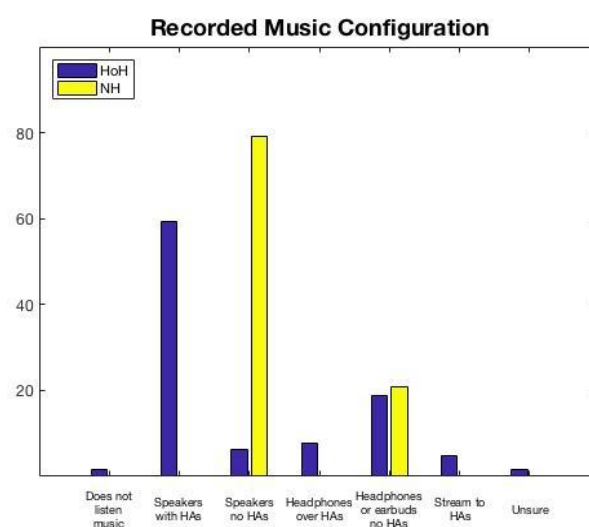
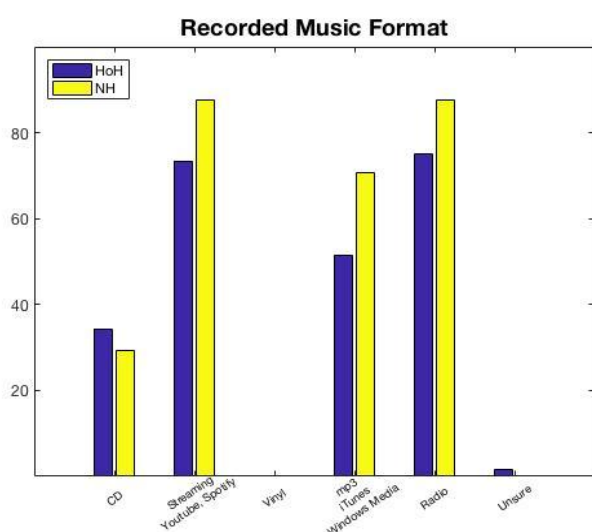


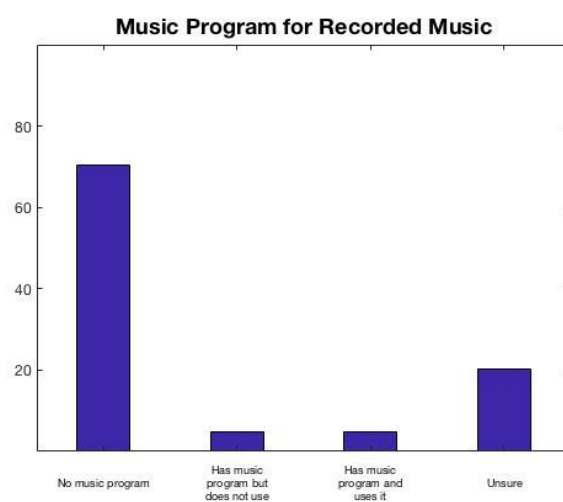
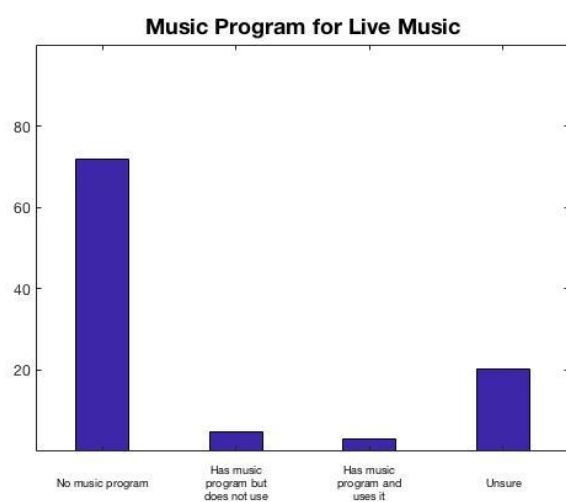
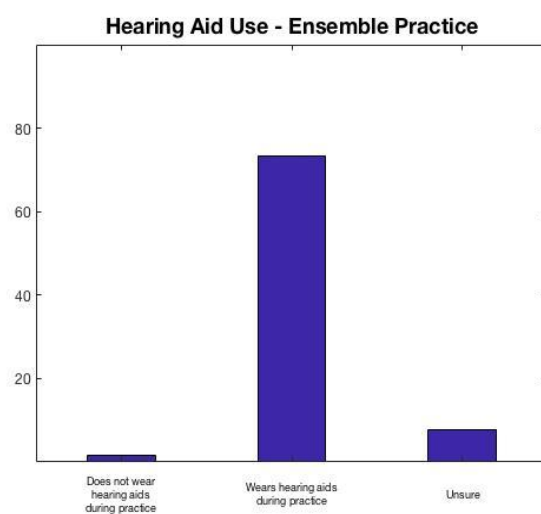
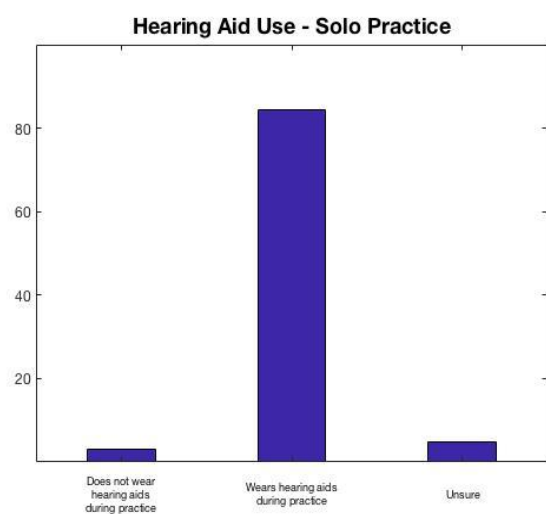
Kinds of Musical Ensembles



# Formats and Hearing Aid Use

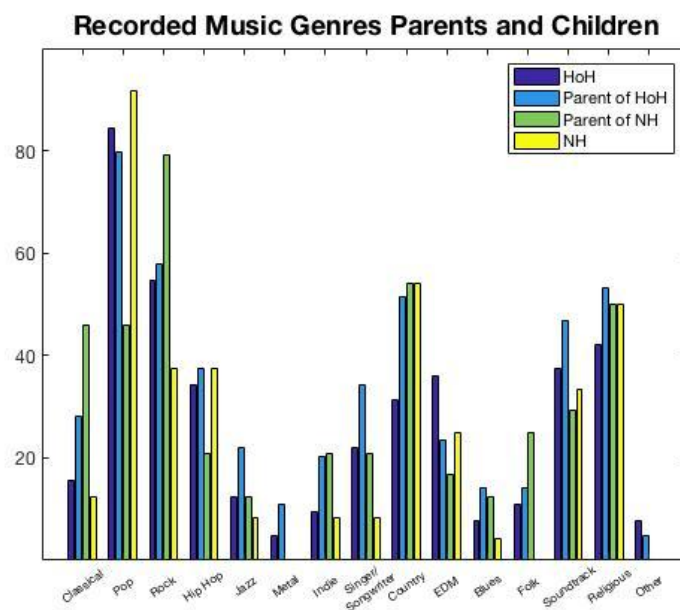
- Children listen to music in many formats.
- All children primarily listen to music through speakers.
- Children who are HoH typically listen to music through speakers while wearing their hearing aids.
- Very few children who are HoH stream music to their hearing aids.
- Children who are HoH wear their hearing aids to concerts, while playing their instrument, and while playing with an ensemble.
- Very few children who are HoH have a music program on their hearing aids.





# Family Influence

- Listening to music is significantly more likely to be important to the child if it's also important to the parent (all children,  $p < 0.001$ ).
- Children who are HoH are significantly more likely to play an instrument if a parent does play or has played in the past ( $p = 0.01$ ).
  - But not true for NH children.
- Children who are HoH are more likely to start playing an instrument younger if the parent currently plays an instrument ( $p = 0.02$ ).
  - But not true for NH children.
- Playing an instrument is significantly more likely to be very or extremely important to children who are HoH if it's also important to the parent ( $p < 0.001$ ).
  - But not true for NH children.
- Parents and children listen to largely the same types of music.



## Other Findings

- Most children do not use hearing protection.
  - 6% of children who are HoH and 16% of NH children use earplugs.
- Most children do not use volume limiting technology.
  - 17% of children use volume limiting.
- Most children who are HoH do not use assistive listening devices at concerts.
  - Less than 1% reported using an FM system. None reported using a loop, infrared, or other device.

## Summary of Findings

- Musical engagement does not appear to be an activity limitation among children who are HoH. Children who are HoH are listening to and playing music.
- Playing and listening to music is important to children who are HoH.
- Children who are HoH listen to and play all kinds of music.
- Family has a big influence on the role of music in a child's life, particularly for children who are HoH.
  - In particular, children who are HoH are more likely play music and start younger if their family is musical.
- While children who are HoH wear their hearing aids while listening to and playing music, they do not have music programs.

## Clinical Implications

- Consideration of music signals should be part of pediatric hearing aid fittings, counseling, and (re)habilitation.
- Music programs for children?
  - Most children in the US are fit with a mid-level hearing aid with one (omnidirectional) program.
  - Most hearing aids for high frequency losses have frequency lowering turned on by default, as it “doesn’t hurt.” But what about music perception?
  - Is it appropriate to give children a music program? At what age?
- Does it matter that children are primarily listening to pop (and other highly compressed) genres?
- Children who are HoH listen to a lot of music through devices but do not stream to their hearing aids. Should streaming be considered?
- Hearing protection counseling.

## Future Directions

- Continue to follow cohorts as they enter middle and high school.
- Examine influence of musical training on educational outcomes and interactions with degrees of hearing loss.
- Psychophysical testing of music perception to examine differences between normal and hearing loss, trained and untrained, and differing degrees of hearing loss.

# Acknowledgments

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