Innovation at NAL: Creative Solutions to Difficult Problems in Hearing Health Care

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Connecting with NAL: Soundbites Webinar Series

- Over 30 webinars
- 3 different timezones
- 15-20 minute presentations
- By NAL researchers
- Q&A at the end
Connecting with NAL: Soundbites Webinar Series
Who Is NAL?

• Government-funded hearing research center
  – Supported by the Department of Health
  – In existence since 1942

• 40+ career scientists
  – Audiologists
  – Engineers
  – Speech pathologists
  – Neuroscientists
  – Psychologists

• Located in the Hearing Hub

• Hearing Australia Services
Why We Exist: NAL’s Mission

Lead the world in hearing research and evidence-based innovation to improve hearing health and transform the lives of people with hearing difficulties.
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How We Work

• Focused on impact
• Staffed by career scientists, not students
• Work with hearing industry partners
• Use innovation methodologies:
  – Design Thinking
  – Lean Startup MVPs
  – Agile
Industry Trends

Motivations and Decision Making

Tools & Technology Development

Outcomes with Devices
Self-fitting Hearing Aids and Hearables
Self-fitting hearing aids

- Device and controls
  - Form factor
  - Signal processing
  - User control interface

- Audiological specifications
  - Audiometric measurements
  - Fitting rationale

- Service delivery and support resources
  - User instructions
  - Personalised support

- Preferences, needs, and capabilities of the end user
  - Factors associated with successful self-fitting
  - Usability

Convery et al., 2013-2018
Self-test of Hearing Loss using App

HTLs right ear: 'normal' hearing category

Frequency (Hz)

HTLs right ear: 'hearing loss' category

Frequency (Hz)
Self-test of Hearing Loss using App

- **500 Hz**
  - Correlation coefficient: $r=0.89$  
  - Correlation coefficient: $r=0.81$

- **1000 Hz**
  - Correlation coefficient: $r=0.97$
  - Correlation coefficient: $r=0.89$

- **2000 Hz**
  - Correlation coefficient: $r=0.98$  
  - Correlation coefficient: $r=0.98$

- **4000 Hz**
  - Correlation coefficient: $r=0.99$
  - Correlation coefficient: $r=0.98$
Willingness of audiologists to use teleaudiology

95 Audiologists surveyed worldwide

• More willing with an assistant than without

• More willing for communication than testing and fitting

Chong-White et al., 2019
ReSound Remote Assist Evaluation

After using the App, how satisfied were you with the new settings you received from your provider?

Satisfied with settings programmed remotely

Convery et al., 2019
Industry Trends

Motivations and Decision Making

Tools & Technology Development

Outcomes with Devices
Big Data
Online Assessment of Hearing Ability and Beliefs

The Online Hearing Assessment includes a short questionnaire followed by an audio test to measure how well you hear and your attitudes toward hearing.

Please keep in mind that this assessment service is just one way to check your hearing. Different methods can give different results, and if you're worried about any aspect of your hearing, it's worth booking in for a personal assessment with a professional audiologist.

This assessment takes about 10 minutes to complete.

Can I take the assessment?

If you want to measure your hearing, you should take the assessment. However, it is not suitable for people who wear hearing aids or are fitted with a cochlear implant.

You indicated that you:

Thought that hearing aids definitely made people look older than they are. It's a concern that comes up quite regularly -- but research has shown that:

- The aging effect is less than a year on average (if hearing aids are actually noticed).
- Friends and family of people wearing hearing aids don't view them negatively.
- Only 10% of people who've worn hearing aids reported being mistaken as older.
- Hearing aid wearers have a better image of themselves than people their age who have hearing loss and don't wear hearing aids.
Predicting Hearing Aid Benefit

Benefit is related to:
• Uncomfortable loudness (p=0.03)
• Own voice quality (p=0.02)
• Physical comfort (p=0.01)
• Sound quality (p=0.002)
• Clinician interest (p<0.001)
Predicting Benefit

Benefit is related to:

- Uncomfortable loudness (p=0.03)
- Own voice quality (p=0.02)
- Physical comfort (p=0.01)
- Sound quality (p=0.002)
- Clinician interest (p<0.001)
Benefit versus perceived clinician interest

Dillon et al., 2018
Behavioral Economics
Behavioral Economics

- Definition
  - Understanding the irrational factors that affect human decision-making
  - “Nudging” influences decision-making behavior by understanding the behavioral economic principles at play and countering or reinforcing them
  - Can apply to hearing healthcare decisions
Hearing Aid Decision-making

• Problem
  – Why do most people choose the cheapest and least-capable hearing aids?

• Challenge:
  – Can we nudge people to choose better hearing technology to get better hearing outcomes?
Results

- Numerous insights were obtained that match Behavioral Economics heuristics
- Nudges identified to improve decision-making: choosing better hearing aids
- 5 major changes made to clinic visit

Number choosing better hearing aids more than doubled
Clinical Use of Cortical Measures

Problem:
When does an infant using hearing aids benefit more from CIs?
- < 60 dB HL: hearing aid
- > 85 dB HL: cochlear implant
- Between 60 and 85 dB HL: depends on speech discrimination ability

Solution:
Measure cortical representation of speech

Punch et al., 2016
Longitudinal Outcomes
Longitudinal Outcomes of Children with Hearing Loss (LOCHI)

- Follow children born with hearing loss through adulthood to determine the impact of hearing aids and cochlear implants on a full life set of outcomes
Findings:
- Early fitting -> early auditory access -> better language

![Graph showing the relationship between age at first fitting and global language score. The graph indicates that better language scores are associated with earlier fittings.](image-url)
Realistic Measurements
Real world vs Realistic listening conditions
Elizabeth Beach

Hearing Loss Prevention: Approaching the challenge from different angles

Friday May 29th 12 pm Sydney Time

Mel Ferguson

Adults (with hearing loss) Only: Making real-world connections

Thursday May 28th 9am London Time

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CONNECTING WITH NAL: SOUNDBITES WEBINARS

Week 2 Presenters

Teresa Ching

Tuesday, 2nd June
3 PM, Los Angeles time
LOCHI (TBC)

Jorge Mejia

Thursday, 4th June
9 AM, London time
Realistic listening situations (TBC)

Mel Ferguson

Friday, 5th June
12 PM, Sydney time
Smart-phone connected hearing aids (TBC)
Q&A

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