Innovations in Hearing Health Technology

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Innovation

What: Generating value from creativity

How: Identify unmet needs
Unmet Needs of People With Hearing Loss

- Improvements to:
  - Audibility
  - Loudness growth
  - Sound quality
  - Naturalness
  - Speech understanding
  - Feedback
  - Localization ability
  - Distortion
  - Listening effort
  - Ease of use
  - Reduced stigma
  - Reduced occlusion
  - Comfort
  - Source segregation
  - Auditory focus
  - Musical timbre
Restoring Audibility is Insufficient

Unaided

Aided

Humes, 2007
Hearing Aid Industry Has Developed Innovations to Address the Unmet Needs of Those With Hearing Loss

- Multiband compression
- Noise reduction
- Feedback Cancellation
- Wind reduction
- Fitting Algorithms
- Directionality
- Frequency Lowering
- Decision-making intelligence
- Datalogging
- Music-specific processing
- Patient self-fine-tuning
- Improved fidelity transducers
- More powerful DSPs
- Wireless Ear-to-Ear: beamforming, MVDR
- Rechargeable batteries
- Improved cosmetics
- Made for iPhone wireless
- Remote microphones and other accessories
- Tele-audiology
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EEG Measures of Change in Activation for Binaural Algorithm

Effect of improving Speech-to-noise ratio

Effect of binaural algorithm

Winneke et al., 2016
Technology Reduces Cognitive Load

Sarampalis et al., 2009

Desjardins and Doherty, 2014
Cognitive Ability Affects Hearing Aid Benefit

Lunner and Sundewall-Thorén, 2007
Hearing Industry Research Consortium

- Has provided $300,000 to academic researchers in each of the following areas:
  - Cognition and hearing aid interaction
  - Dynamic spatial listening
  - Neurodegeneration
  - Big data analysis of treatment and outcome
  - Auditory ecology and quality of life
Silicon Valley Innovation

• An ecosystem exists to support ideas that address unmet needs
Silicon Valley Innovation

- An ecosystem exists to support ideas that address patient unmet needs
Earlens

- 140 employees
- Over $120m invested to-date
FDA Hearing Aid Regulations

- Good Manufacturing Practices and Design Control are of little burden for a well-run company
  - Certainly does not impede the development of innovation
Summary

• Significant innovation by the hearing aid industry
  – Technology
  – Diagnostics
  – Outcome measures

• Innovation is alive and well for startups

• FDA is not a burden on innovation
References