

Smartphone Applications for Private Practice Audiologists

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Disclosures

- Clinical Audiology Advisor, Fuel Medical
- Adjunct Professor, A.T. Still University
- Editor, Audiology Practices
- Editor, Hearing News Section, HHTM



Disclosures

- Founder and CEO of Hearing Tracker, Inc, which manages HearingTracker.com



Agenda

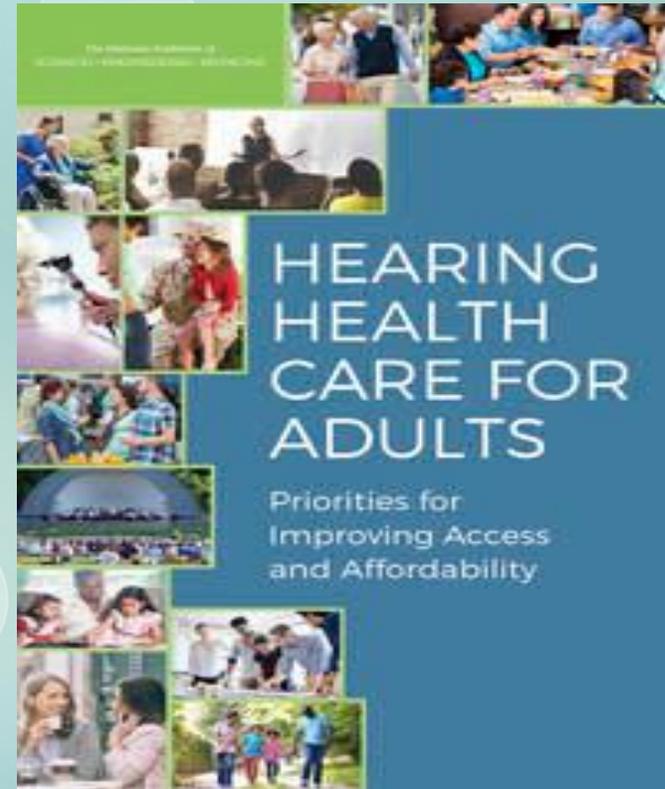
- What is a smartphone app?
- Why smartphone apps will be a significant part of how audiology is practiced in the future (mHealth)
- Overview of Audiology Apps
 - Hearing Screening
 - Remote programming, adjustment & counseling
 - Amplification
- What does the future hold?
(Getting started with apps in your practice)

The Burden of Modern Healthcare

- Make it Accessible
- Reduce the Cost
- Improve the Quality

June 2016 NASEM Report

- 12 Recommendations
- #4: Empower Consumers and Patients in their use of Hearing Health Care.
- #5: Improve Access to Hearing Health Care for Underserved and Vulnerable populations
- #10: Evaluate and Implement Innovative models of Hearing Health Care to improve access, quality and affordability



“There’s an app for that.”

- A software application designed to run directly on a smartphone or tablet computer
- Apple – App Store
- Android – Google Play



Mobile Health: Consumer-Driven & Personalized

- Smartphone
- App
- Broadband wireless internet connection
- Low cost attachments



Low Cost Attachments

- Cupris Medical in UK
- \$150
- Photograph TM and email to healthcare professional



Smartphone as Hub

- Medical records
- Personal health history
- Diet and fitness regimen
- A record of lifestyle, physical environment and location



Apps in Healthcare

- Ultrasound scans
- Measurement of vital signs
- Execute lab tests
- Photo of tympanic membrane
- Hearing testing



hearscreen.com

The future of healthcare

“In five years’ time, smartphones will take the burden away from the limited number of human specialists we have. People will get really intelligent triage that’s personalized to them from their phones, or be empowered to look after their own chronic conditions, like diabetes, via home monitoring.” - Dr. Keith McNeil, CIO, NHS (Jan. 2017)

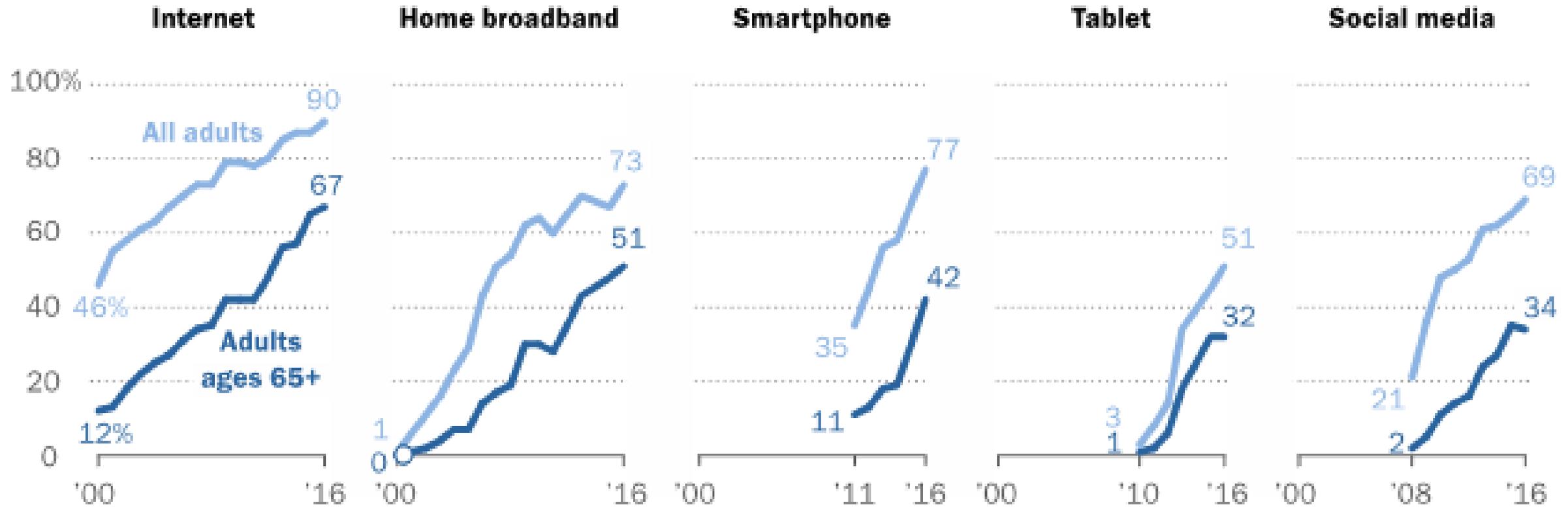


Common Question

“My typical patient is older than 65. Are these patients using smartphones and Wi-Fi ?”

Smartphone adoption among seniors has nearly quadrupled in the last five years

% of U.S. adults who say they have or use the following



Source: Survey conducted Sept. 29-Nov. 6, 2016. Trend data are from previous Pew Research Center surveys.

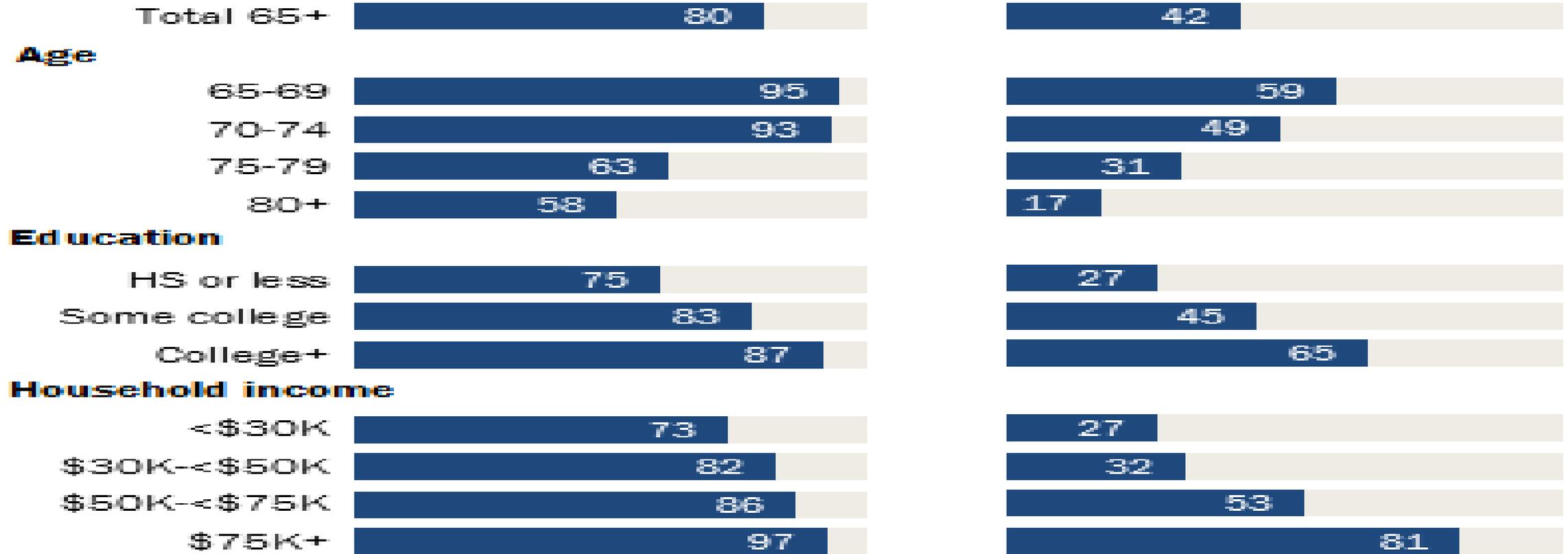
"Tech Adoption Climbs Among Older Adults"

Roughly four-in-ten seniors are smartphone owners

% of U.S. adults ages 65 and older who say they own the following ...

Cellphone of any kind

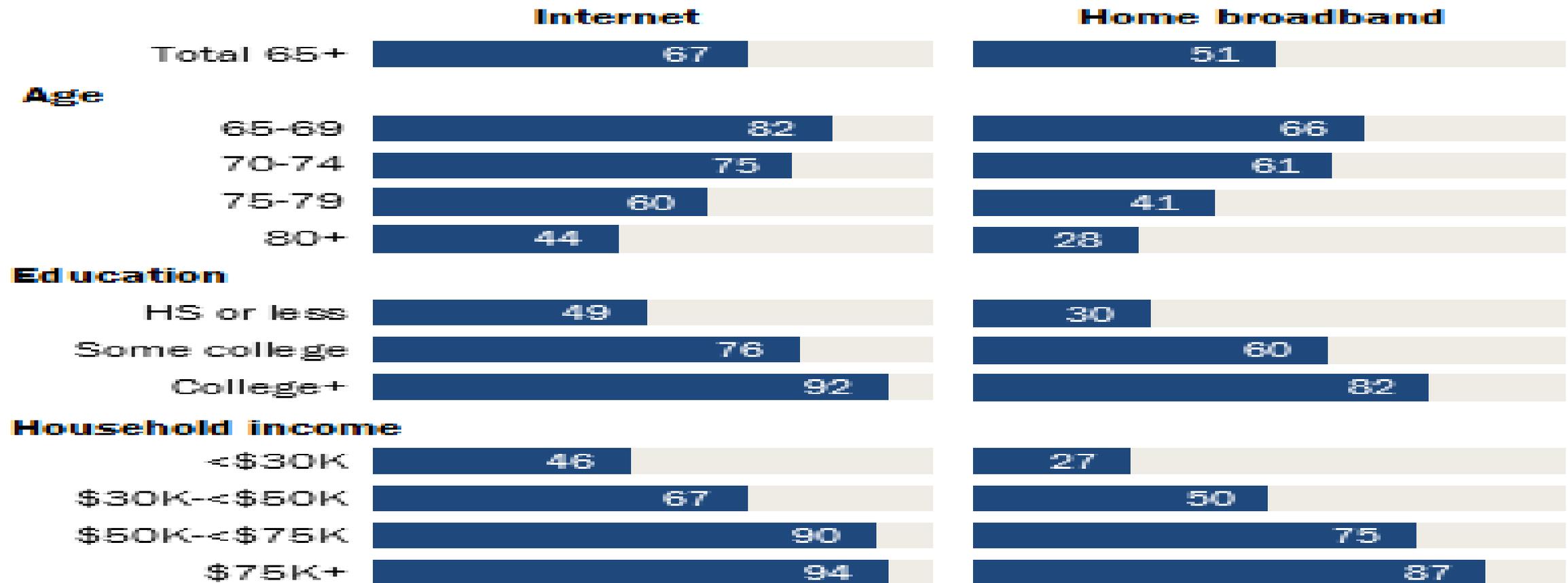
Smartphone



Source: Survey conducted Sept. 29-Nov. 6, 2016.
 "Tech Adoption Climbs Among Older Adults"

Internet use and broadband adoption among seniors varies greatly by age, income and education

% of U.S. adults ages 65 and older who say they use/have the following ...



Source: Survey conducted Sept. 29-Nov. 6, 2016. "Tech Adoption Climbs Among Older Adults"

mHealth Applications in Audiology

- **General App Categories**

- Hearing screening
- Audiometers and Kiosks
- Amplification
- Sound broadcast
- Sound Awareness
- Live Captioning
- Alerting
 - Tinnitus relief apps
 - Hearing loss simulation
 - Aural Rehab / Listening

- **Manufacturer apps**

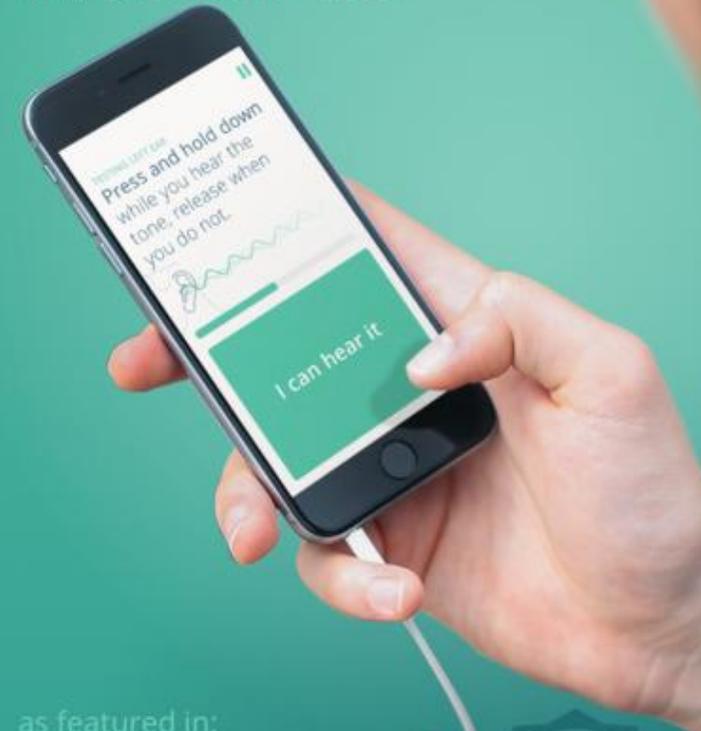
- Hearing aid control
- Accessory control
- Informational
- Made For iPhone
- Remote care
- Apps that fit in most of general app categories

Hearing Screening Apps

Mimi Hearing Test

- CE Certified Medical Device in EU
- Tests 100 – 12kHz
- Tracks changes to hearing over time and reminds users to re-check their hearing
- “Audiogram” export
- Calibrated for Apple EarPods and others
- “Earprint” can be used for mimi music, but currently not available for live amplification

Ever wondered
how well you hear?
Find out in 6 minutes.



as featured in:

Psychology Today engadget

WIRED Forbes

Rated
4.5 stars!

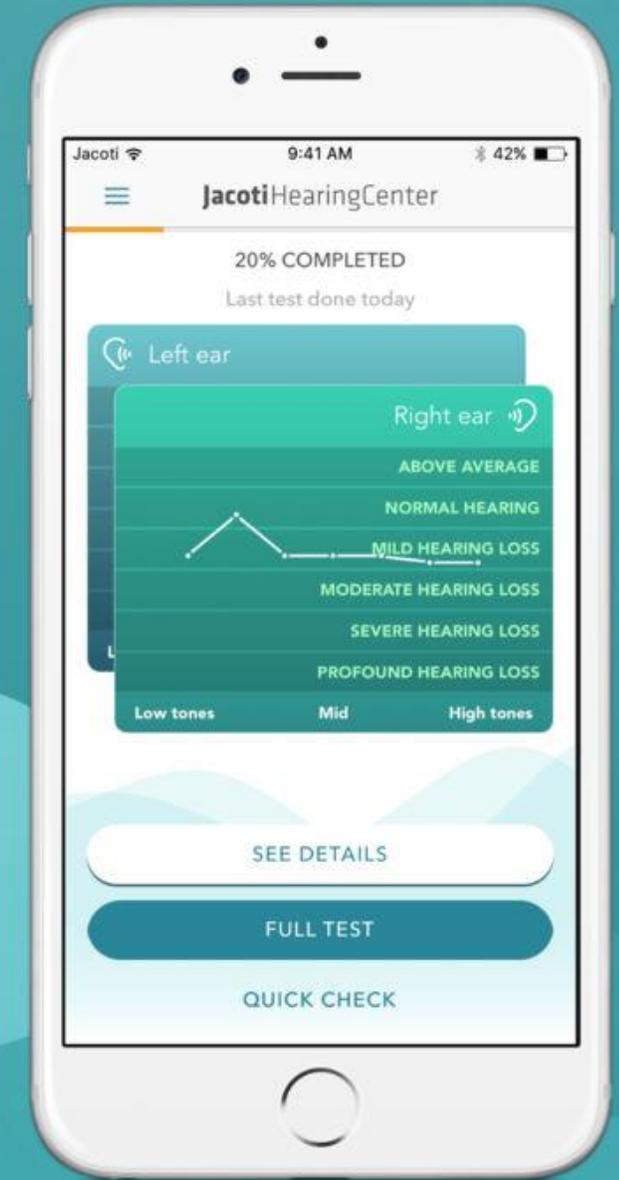
★★★★



Hearing Screening Apps

Jacoti Hearing Center

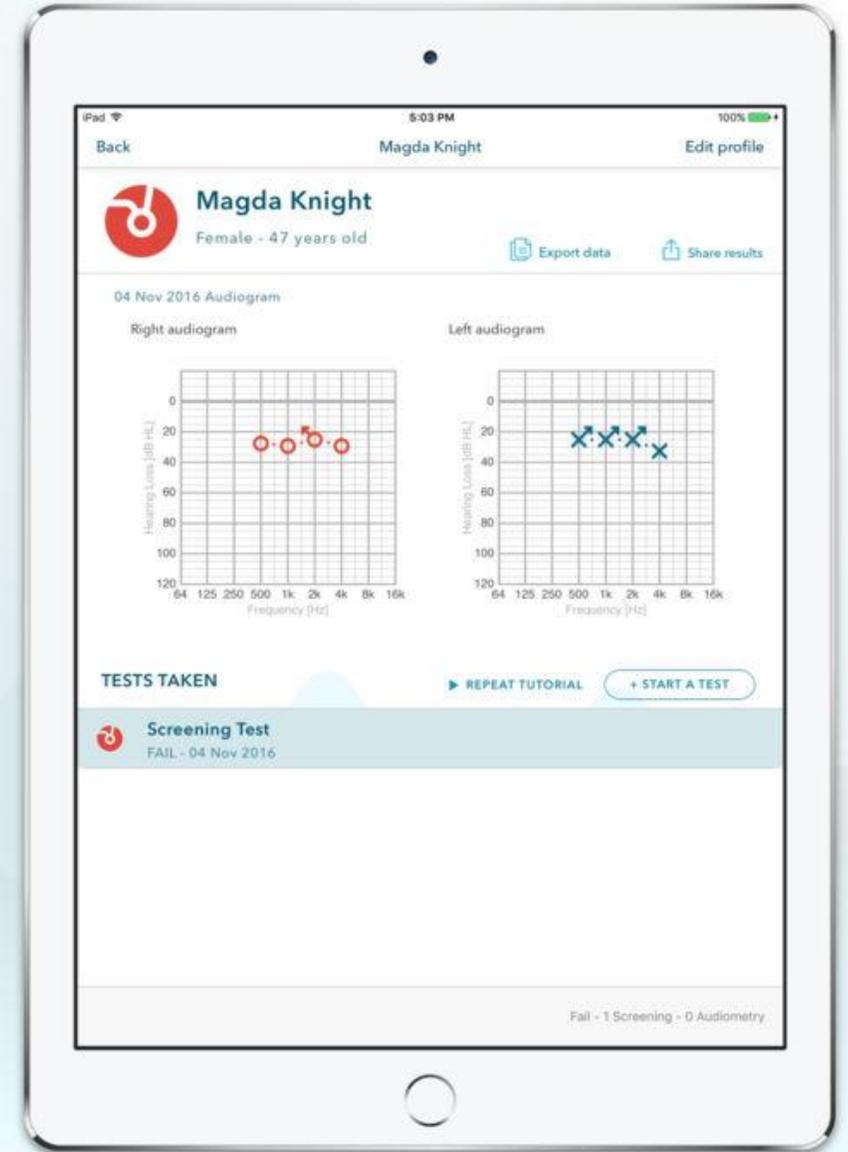
- CE Certified Medical Device in EU
- Class II FDA listed Medical Device in USA
- Fully-functioning “professional clinical audiometer that partially conforms to EN 60645-1 for audiometers and ANSI S3.6 for Type 4 audiometers”
- Calibrated for Apple EarPods



Hearing Screening Apps

Jacoti Hearing Center Pro

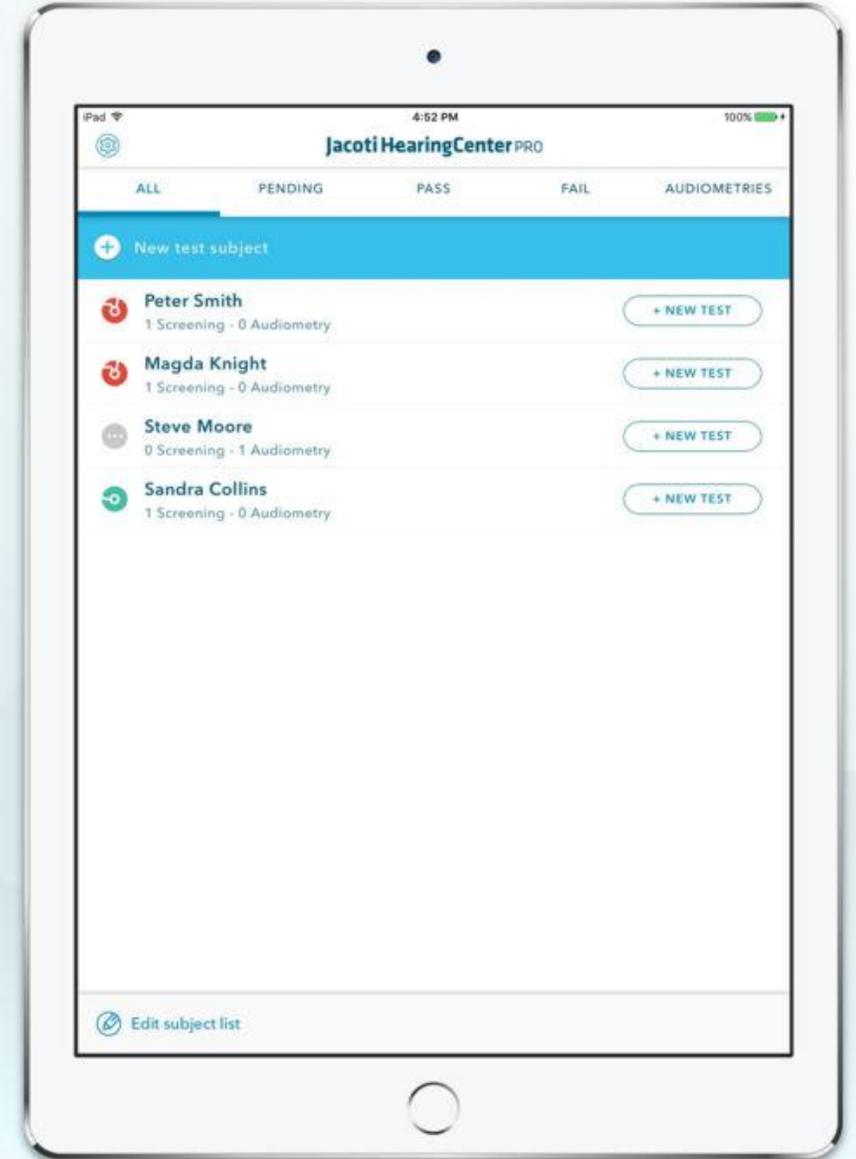
- **Portable:** Works outside traditional sound booths and can be easily transported to remote locations to perform hearing assessments.
- **Automated:** the test is performed automatically and requires little guidance by the hearing professional.



Hearing Screening Apps

Jacoti Hearing Center Pro

- **Intelligent:** smart noise monitoring prevents inaccurate measurements in noisy environments.
- **Compliant:** conforms with ISO and ANSI requirements.
- **Approved:** Listed as a Class II medical device with the FDA



Other Hearing Screening Apps

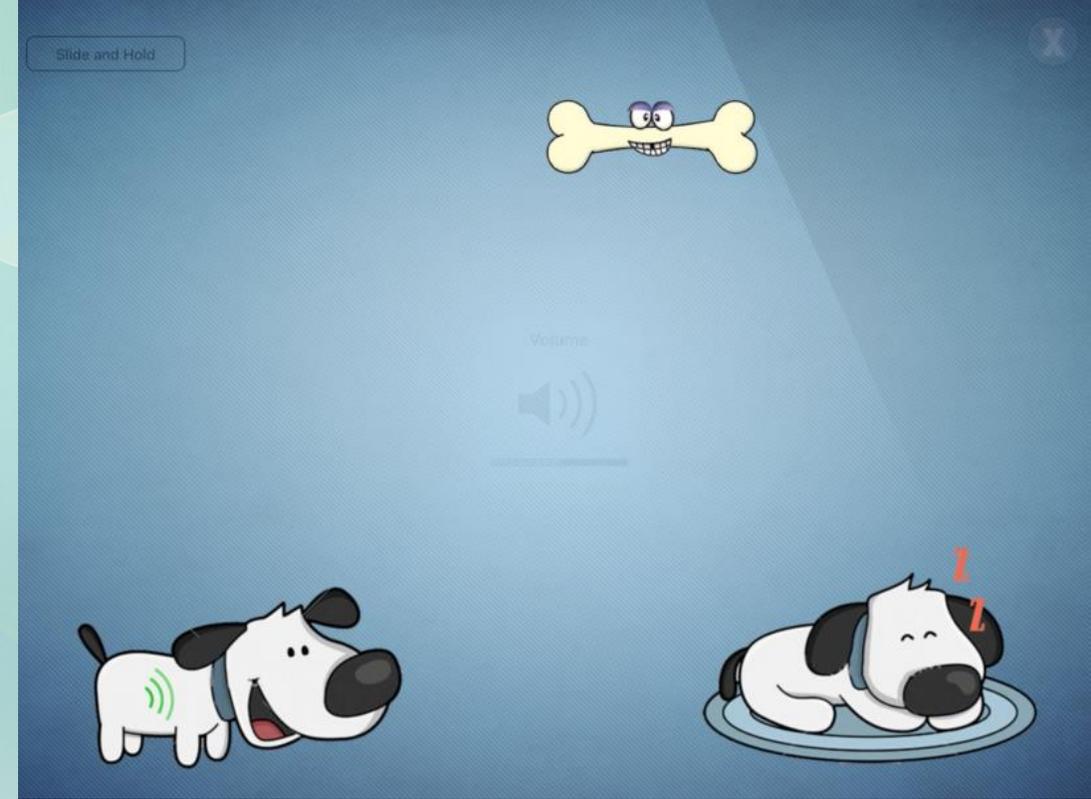
The screenshot shows the AppAdvice website interface. At the top, there are navigation tabs: LATEST, TOP LISTS (with a 'NEW' badge), BEST APPS, BEST GAMES, APPSGONEFREE, and GADGETS. A search bar contains the text 'hearing test'. Below the search bar, there are tabs for 'Articles', 'Collections', 'TV Collections', 'Apps' (which is selected and has a '71503' count), and 'TV Apps'. The main content area displays a grid of 16 hearing-related apps, each with an icon, title, and developer name.

App Icon	App Name	Developer
	Mimi Hearing Test - Check your E...	Mimi Hearing Technologies
	Hearing Test & Ear Age Test	Yuichi Sakashita
	MFA Hearing Test	Unlimiter
	Siemens Hearing Test	Sivantos Pte. Ltd.
	Audicus Hearing Test	Audicus Inc.
	Hearing Test	Hurryforward Ltd
	Hearing Test Pro Free	Up With Apps
	Mimi Music - clear sound, health...	Mimi Hearing Technologies
	Test Your Hearing	Novasa
	Fast Hearing Check - Hearing tes...	Kyunghyun Park
	My Hearing Test	M-Data SA
	Hearing test #1	Aveos
	iHearing-Hearing Test Basic	武汉豆听科技有限公司
	Hearing Test - Check Your Hearin...	Bo Xu
	Hearing Test App iOS	Mike Lenny
	Hearing Test Pro - Check Your He...	Bo Xu

Audiometer Apps

Shoebox Audiometry

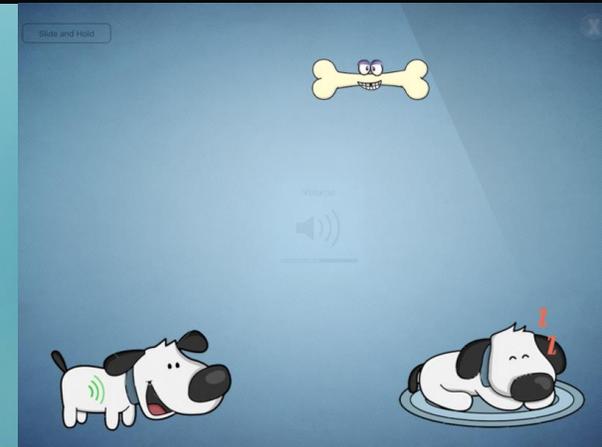
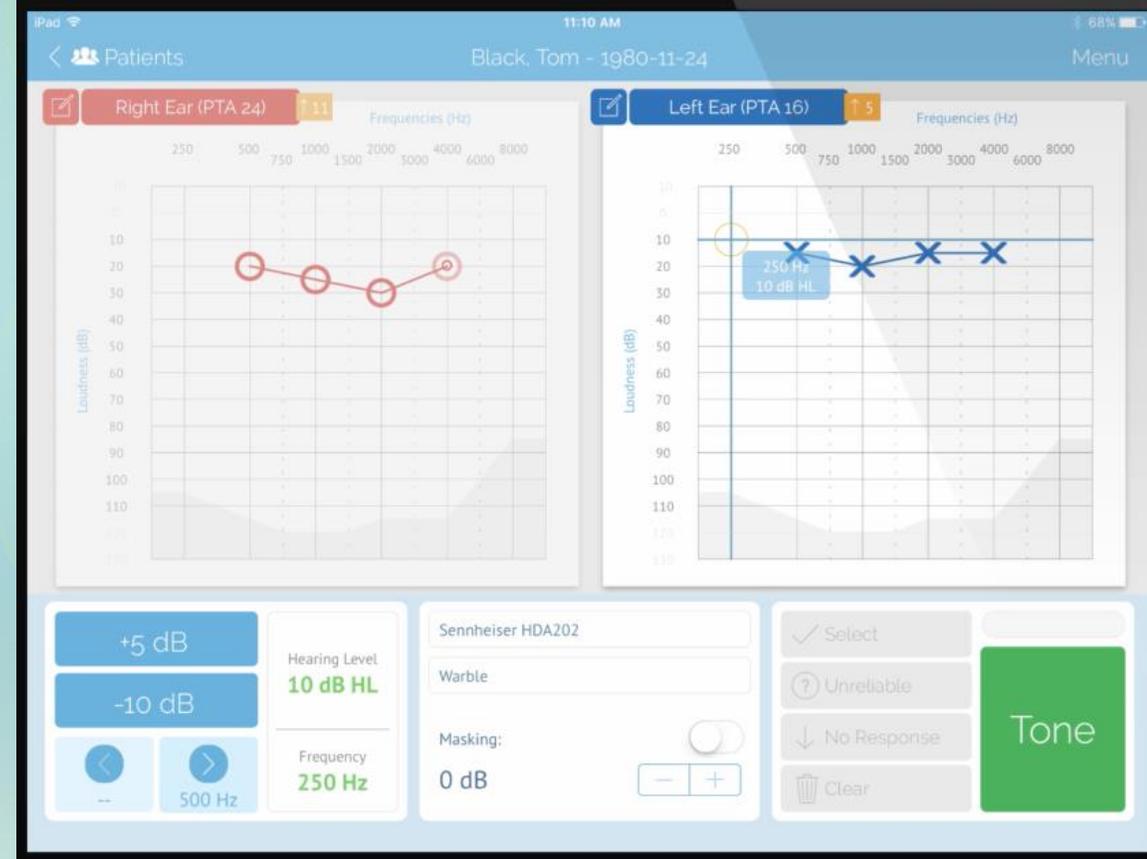
- Automated tests that give diagnostic thresholds in a variety of settings
- Designed for **non-audiologists** including primary care physicians, nurses, occupational hearing testers, teachers, researchers, and more



Audiometer Apps

Shoebox Audiometry Pro

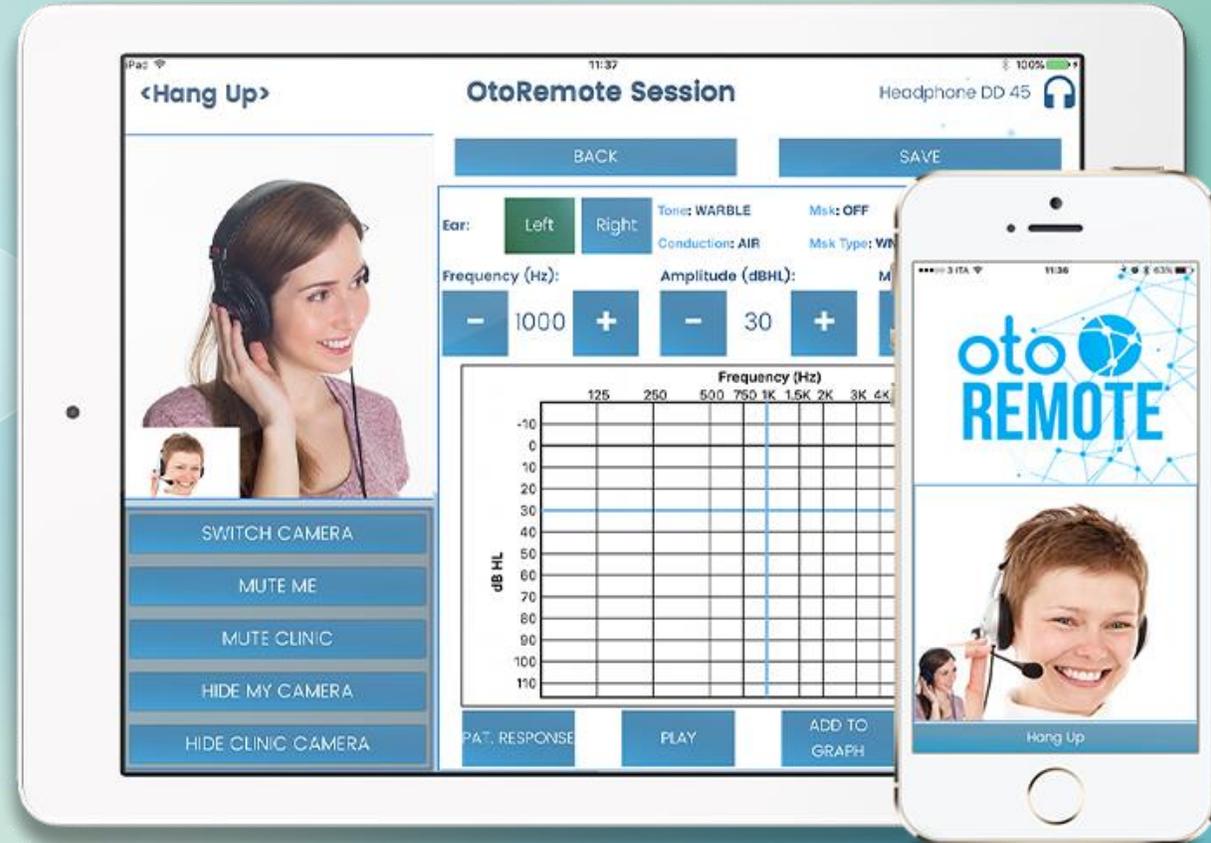
- Air and bone conduction
- Automated tests for adults and kids
- Test can be performed as a game
- Manual hearing test (up to 16kHz)
- Speech tests (NU-6, PBK), HHIA-S
- ANSI calibrated / FDA cleared
- Data backed up to HIPAA-compliant cloud while iPad connected to net



Audiometer Apps

Otohub - OtoPad

- ANSI and ISO compliant
- NOAH compatible
- AC/BC
- Speech (SRT, NU-6, W-22, etc)
- Tinnitus evaluations
- PDF reports
- Can be paired with OtoRemote for remote testing at patient site
 - Pharmacy, PCP, satellite clinic



Release dates:

- *OtoPad – July 2017*
- *OtoRemote – September 2017*

Hearing Screening Kiosks

Otohub - OtoKiosk

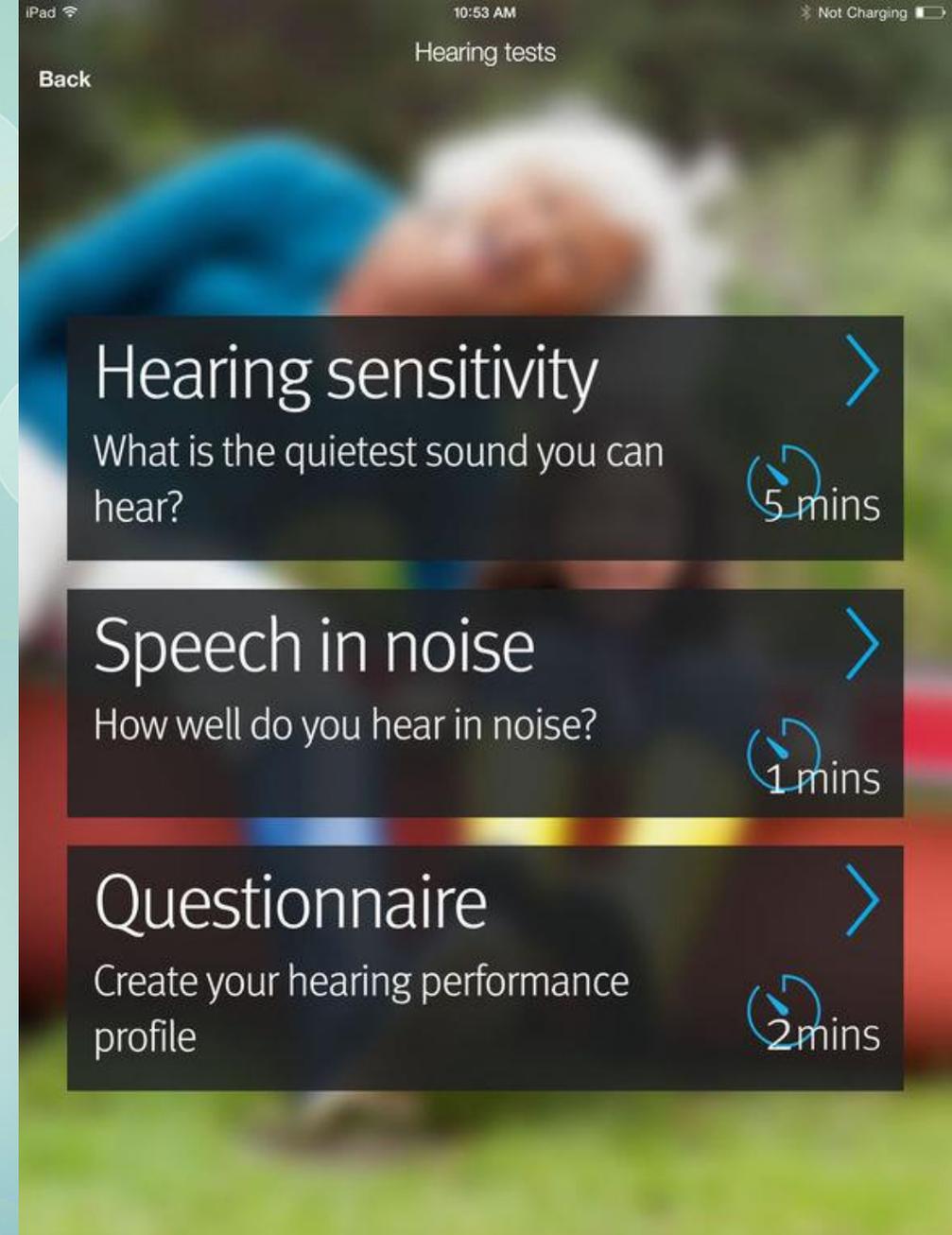
- First ANSI calibrated kiosk
- AC test - Hughson-Westlake
- NOAH integration (import to clinic)
- Compatible with multiple transducers
- HIPAA compliant data storage
- Integrated HA Simulation based on audiogram
- Web-portal to remotely manage leads



Hearing Screening Kiosks

Unitron – uHear Kiosk

- Three free hearing screening tests
- Emails lead results and contact info to audiologist to schedule a follow up consultation.



Hearing Screening Kiosks

Hearing Care Marketing - Hearing Touch Machines

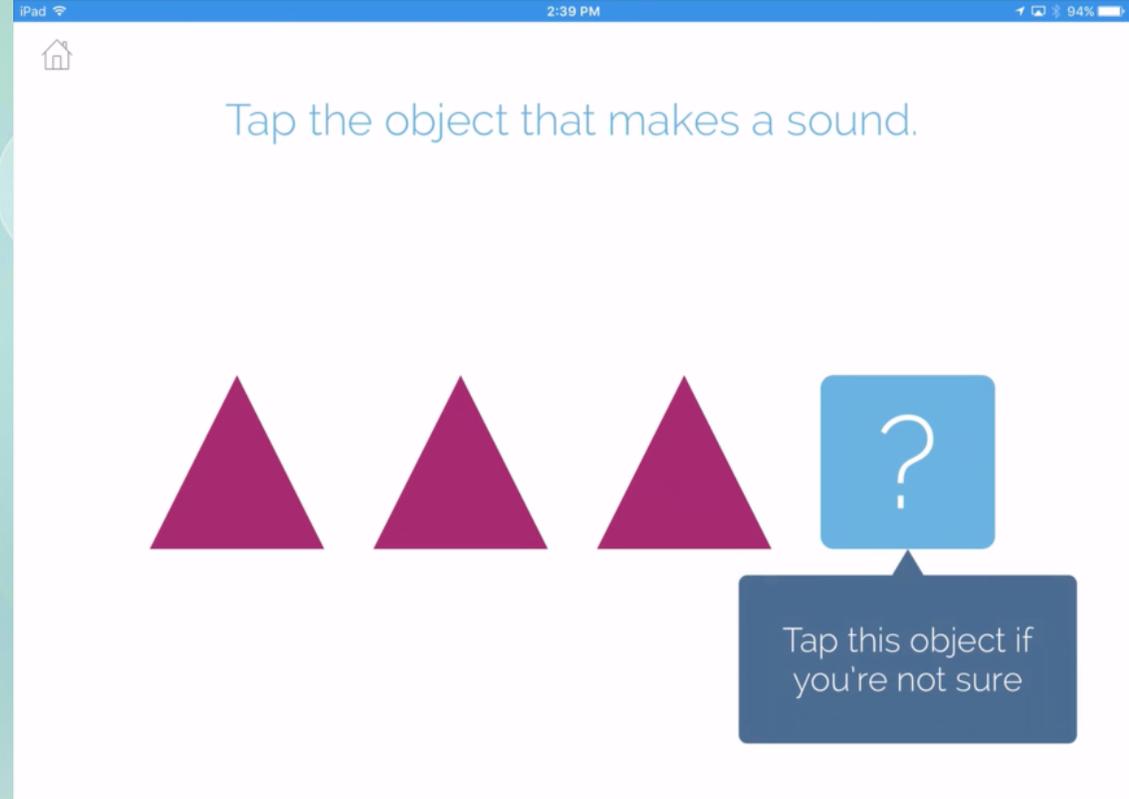
- Tests 4 tones in each ear
- Results shown to customer after test
- Option to request a consultation or copy of their free report
- If they choose either option audiologist receives lead information



Hearing Screening Kiosks

Shoebox Quicktest

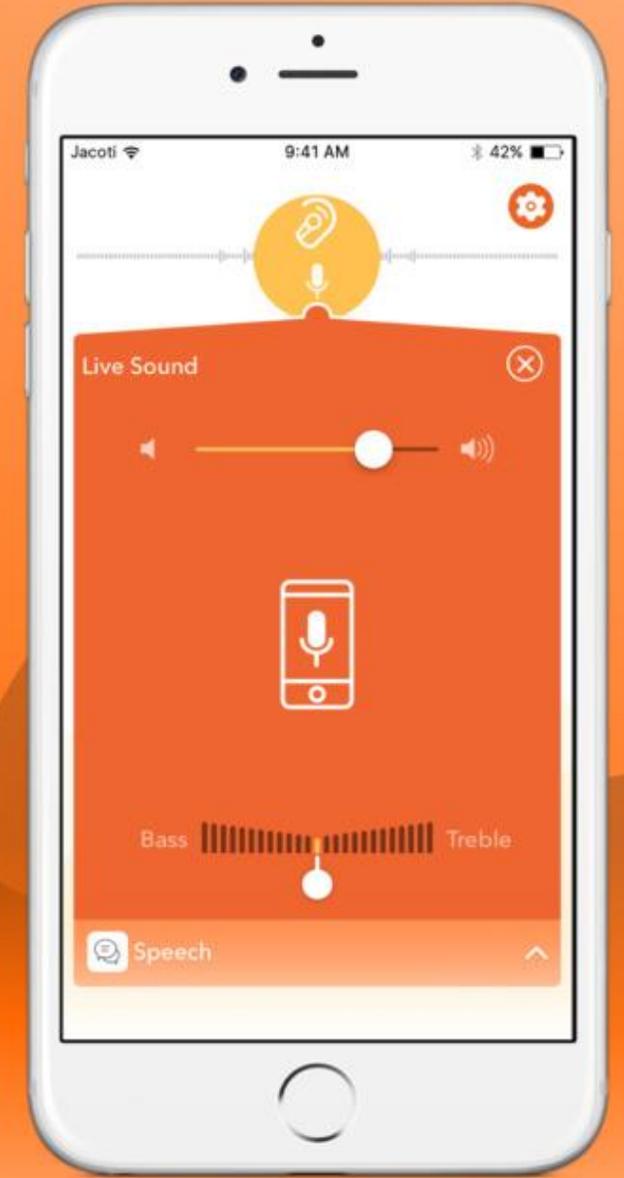
- Tests 4 tones in each ear
- User enters contact details in order to see test results
- You can follow up with good candidates



Amplification Apps

Jacoti ListenApp

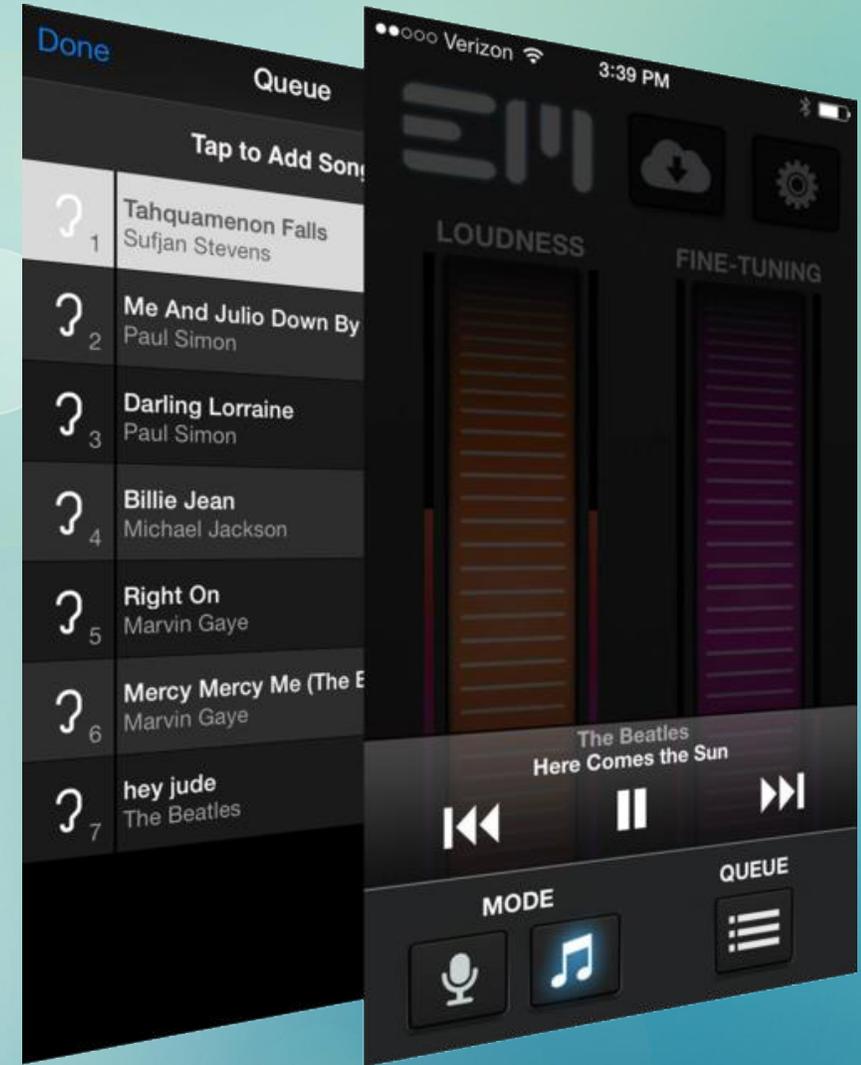
- CE and FDA registered medical device.
- Uses test results from Jacoti Hearing Center (or input audiogram) to provide amplification for:
 - Live speech
 - Jacoti Lola (wireless audio system)
 - Jacoti Music / iTunes
 - Any other iOS app using Apple's Inter-App audio technology
 - Calibrated for Apple AirPods



Amplification Apps

EarMachine

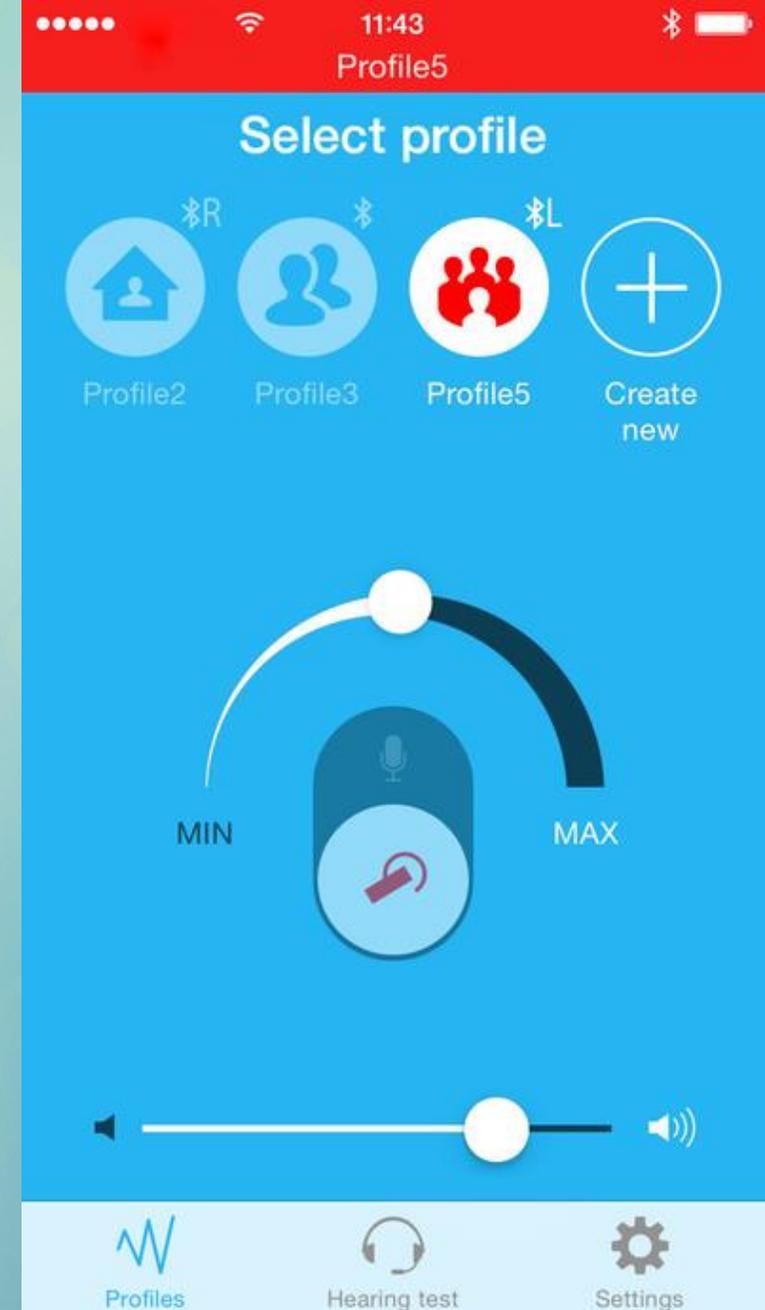
- Funded in part by NIH
- Research partners
 - Northwestern University Audiology Clinic
 - University of Minnesota HRL
- Advanced signal processing / simple interface
- “EarShare” suggests settings based acoustic environment, user history, and other user preferences



Amplification Apps

Petralex Hearing aid

- Tests hearing to setup amplification
- Low latency amplification from iPhone microphone
- Can use wired or Bluetooth earphones
- Multiple listening programs



Other Amplification Apps

AppAdvice

LATEST TOP LISTS ^{NEW} BEST APPS BEST GAMES APPSGONEFREE GADGETS

You searched for: hearing aid

Articles Collections TV Collections **Apps** TV Apps

17620

 Zounds Hearing Aid Remote Zounds Hearing	 Jacoti ListenApp - Hearing aid Jacoti bvba	 Enhanced Ears Hearing Aid Bxtel LLC	 Super Hearing Aid - audio enhan... X11 Apps
 Petralex Hearing aid IT ForYou	 Eriksson Hearing Aid Remote Zounds Hearing	 Hearing Aid Smart AlgorKorea Co., Ltd.	 Olive Hearing Aid Olive Union
 hearingOS - Hearing Aid App Michael Bollinger	 Hearing Aid TicTacToe Rule the School	 Mobile Ears: TV Hearing Aid Listen AS	 Mimi Hearing Test - Check your ... Mimi Hearing Technologies
 Hearing Aid Pro - professional he.. iMect Ltd.	 Visual Hearing Aid Berry Wing LLC	 Hearing Aid Smart SB AlgorKorea Co., Ltd.	 Mimi Music - clear sound, health... Mimi Hearing Technologies

Sound Broadcast

Jacoti Lola

- Low-latency multi-peer audio streaming over consumer grade Wi-Fi
- Bi-directional communication
- Support for 3rd-party applications support
- Jacoti Lola works in standalone mode (normal hearing), with Jacoti Listenapp, standard hearing aids, cochlear implant speech processors, and with the Made for iPhone[®] hearing aid platform.

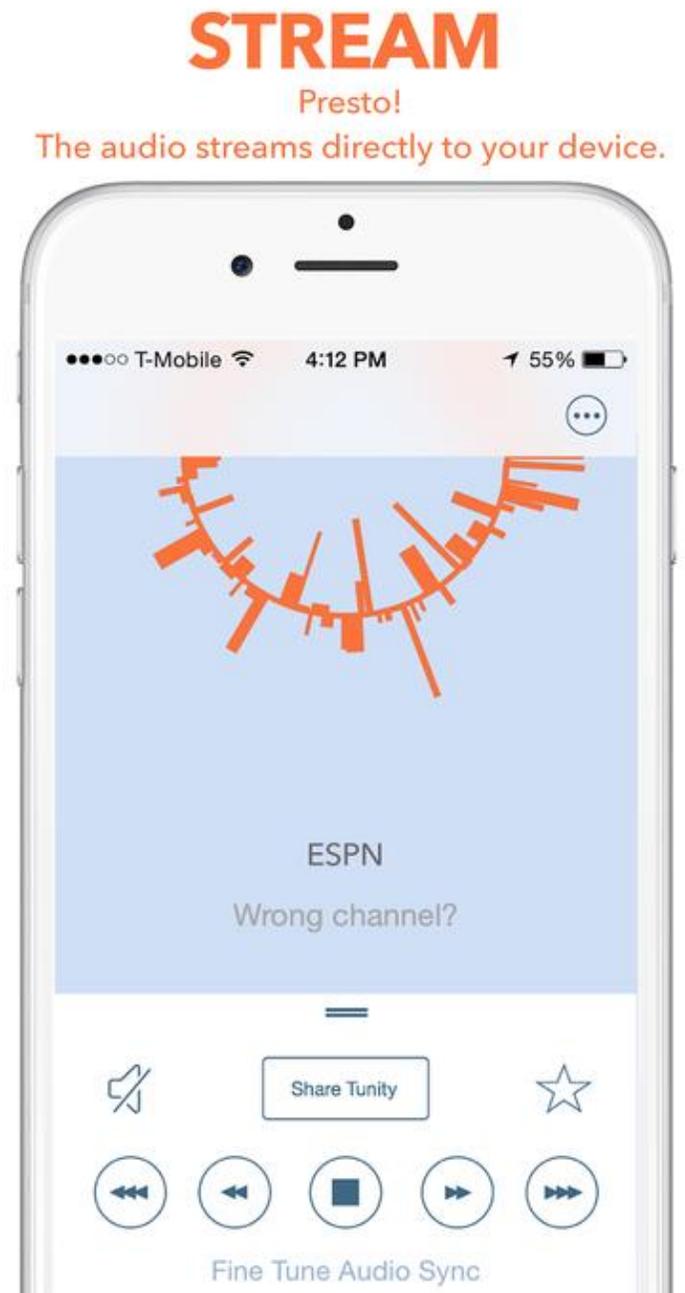
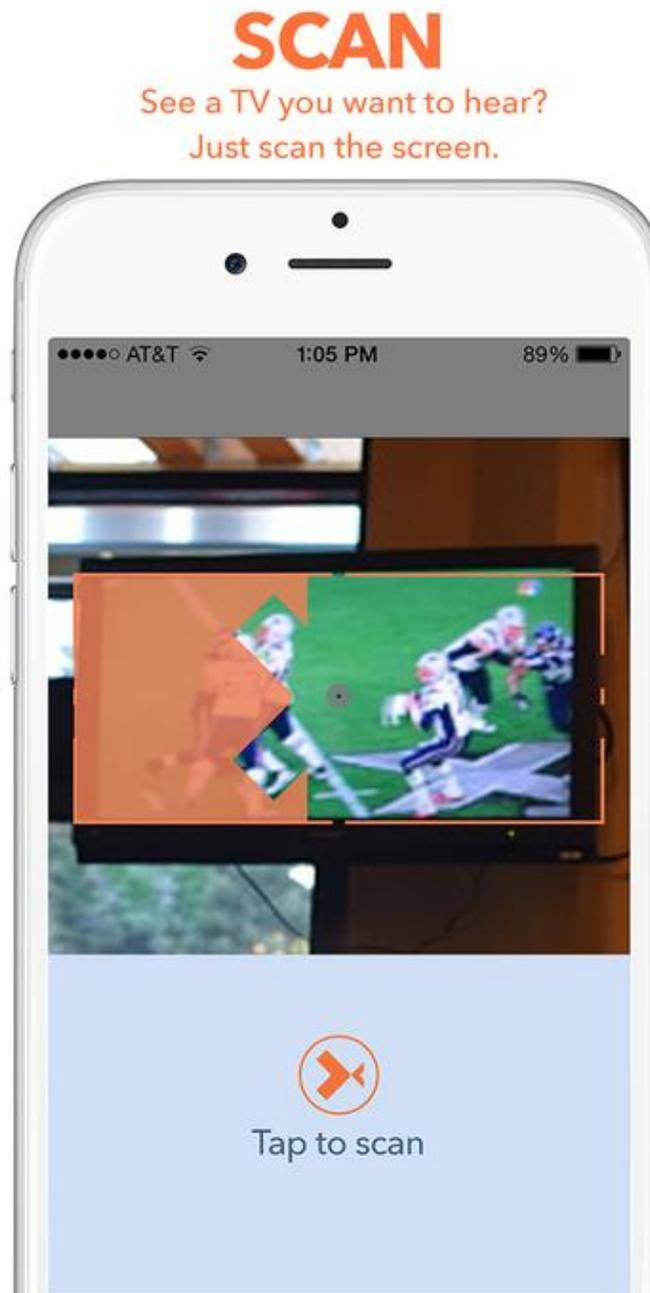
Teacher's voice will be broadcasted free of echo, reverb or noise via Wi-Fi



Sound Broadcast

Tunity

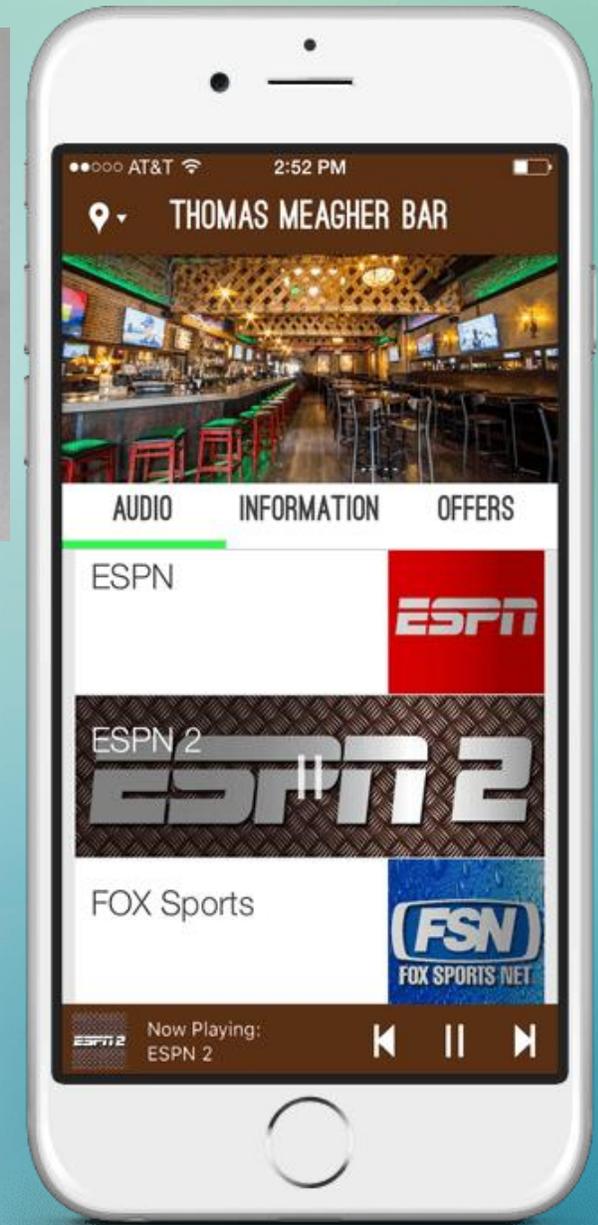
- Scan the TV
- Stream the Audio
- Bars, gyms, etc
- At home or anywhere someone with hearing loss wants to listen louder without affecting others



Sound Broadcast

Audio Everywhere

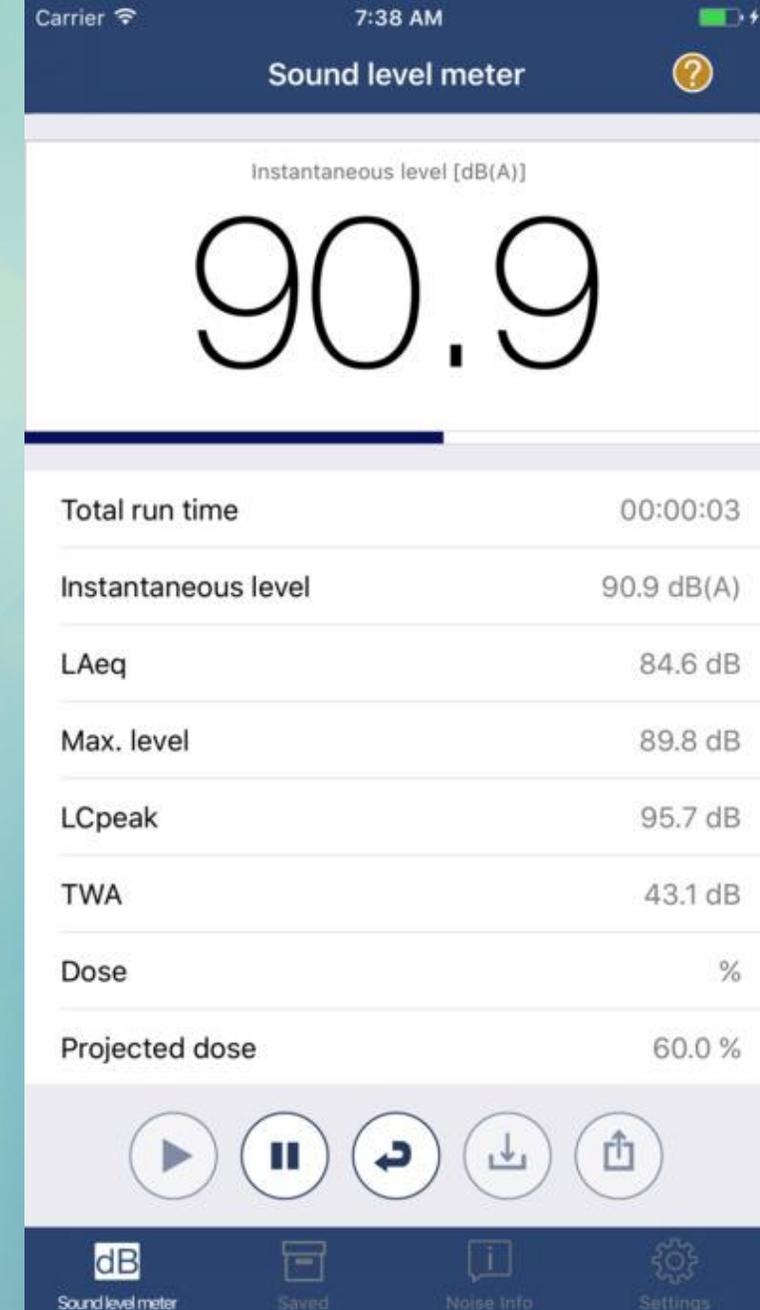
- Requires purchase / install of network box
- Much cheaper than telecoil loop and popular in churches
- Users need iPhone / iPod Touch, etc
- Very good audio quality over 5GHz WiFi
- Can be used with any device connected to phone (hearing aids, etc)



Sound Awareness

NIOSH SLM

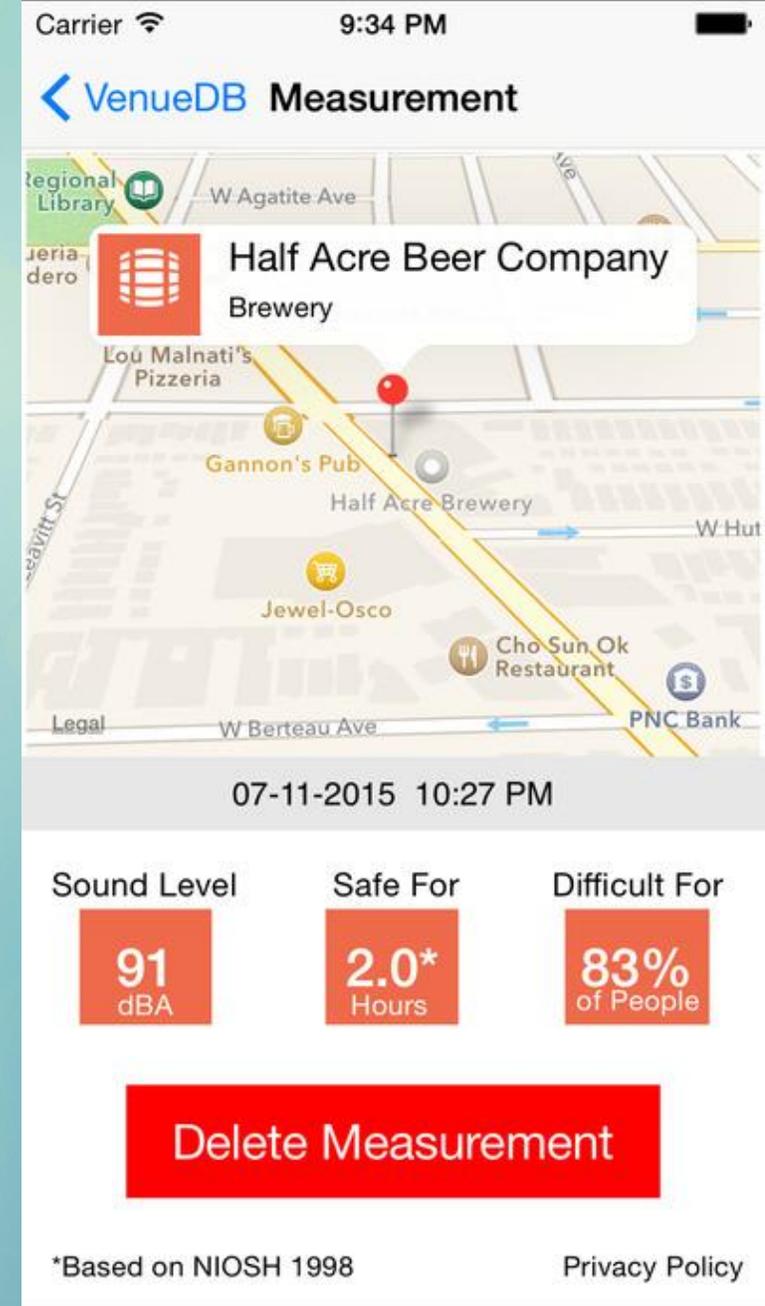
- Raises workers' awareness about their work environment
- Serves as a research tool to collect noise exposure data
- Accurate, can be calibrated with an external mic



Sound Awareness

VenueDB

- Created by EarMachine developers
- Turns your phone into a sound level meter
- Uses GPS for location
- See measurements from other users
- Displays the Recommended Exposure Limit



Carrier 9:34 PM

< VenueDB Measurement

Regional Library W Agatite Ave

Jeria dero

Half Acre Beer Company Brewery

Lou Malnati's Pizzeria

Gannon's Pub

Half Acre Brewery

Jewel-Osco

Cho Sun Ok Restaurant

Legal W Berteau Ave PNC Bank

07-11-2015 10:27 PM

Sound Level	Safe For	Difficult For
91 dBA	2.0* Hours	83% of People

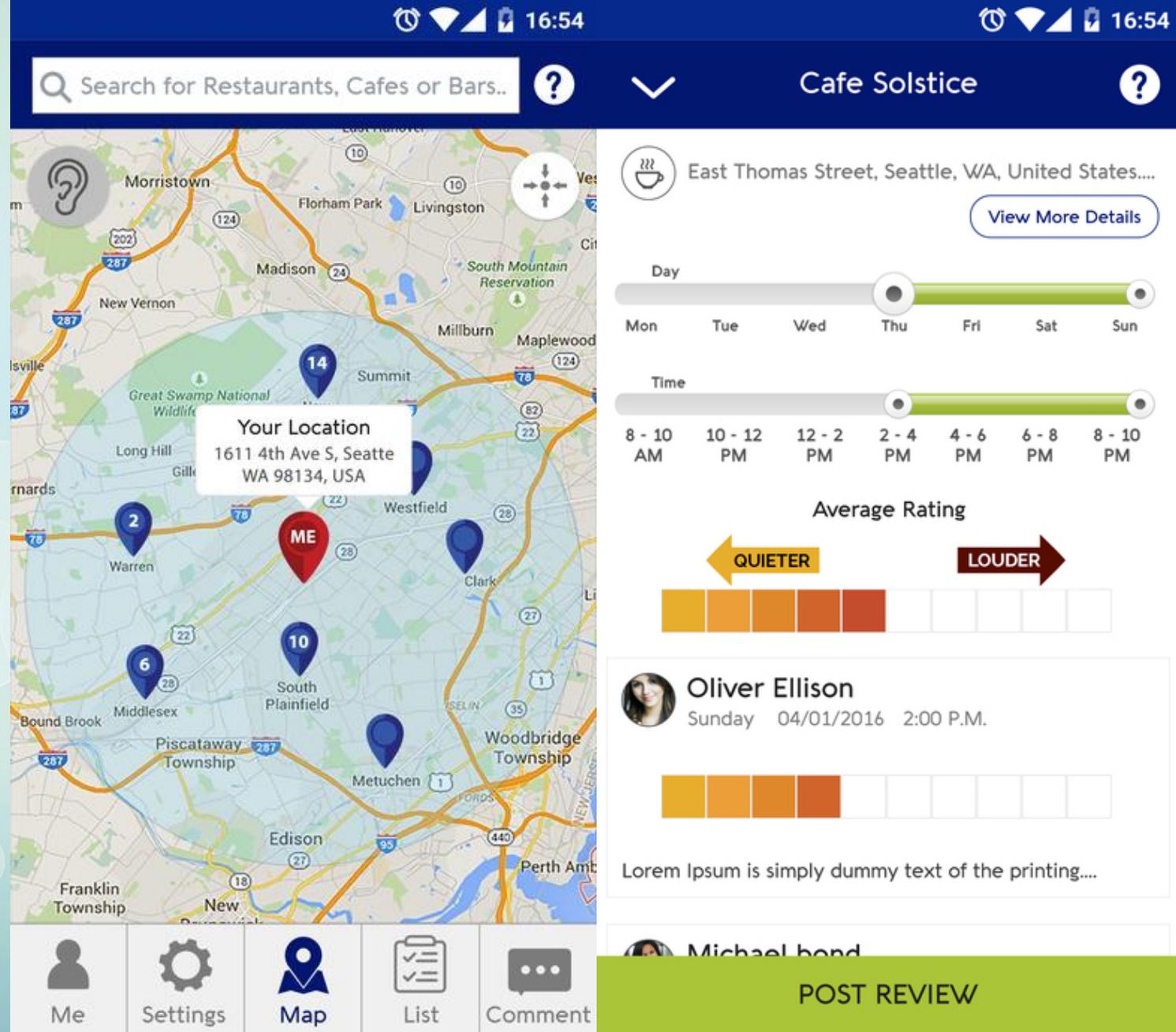
Delete Measurement

*Based on NIOSH 1998 Privacy Policy

Sound Awareness

iHEARu Here

- Mic measurement
- User rating of quieter/louder
- May include written review and photos
- Day and time of review
- Map finder



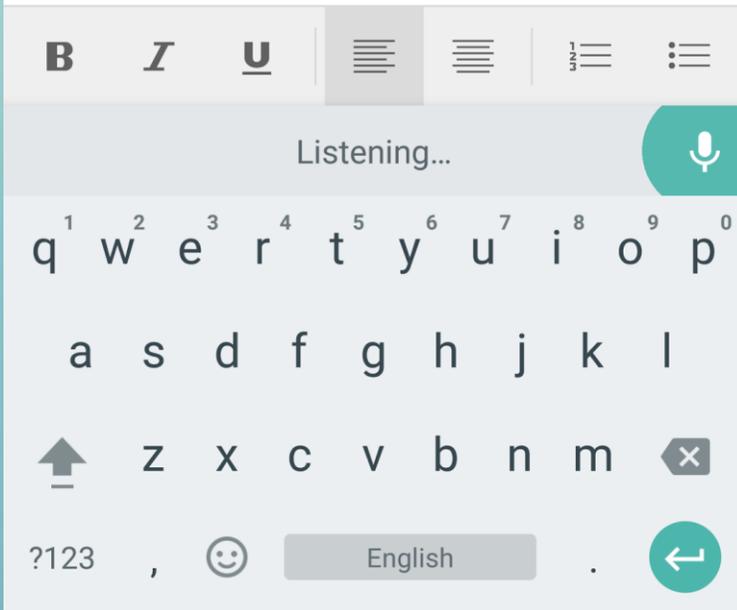
The screenshot displays the iHEARu app interface. At the top, there is a search bar with the text "Search for Restaurants, Cafes or Bars..". The app is currently showing a map of Seattle, WA, with a red pin indicating the user's location at "1611 4th Ave S, Seattle WA 98134, USA". The map shows various landmarks and streets. On the right side, there is a section for "Cafe Solstice" located at "East Thomas Street, Seattle, WA, United States...". Below this, there are two sliders: "Day" (set to Thursday) and "Time" (set to 2-4 PM). An "Average Rating" section shows a scale from "QUIETER" to "LOUDER" with a bar indicating the current rating. Below the rating, there is a review by "Oliver Ellison" dated "Sunday 04/01/2016 2:00 P.M." with a rating bar and the text "Lorem Ipsum is simply dummy text of the printing...". At the bottom, there is a navigation bar with icons for "Me", "Settings", "Map", "List", and "Comment".

Live Captioning

Google Doc

- Live transcription using Google's voice recognition
- Page scrolls as you record
- Can bump up the font size if needed

This is just a test to see if Google is able to transcribe my voice live through a Google doc. So far this seems to be working great and I can take pauses without the microphone stopping.



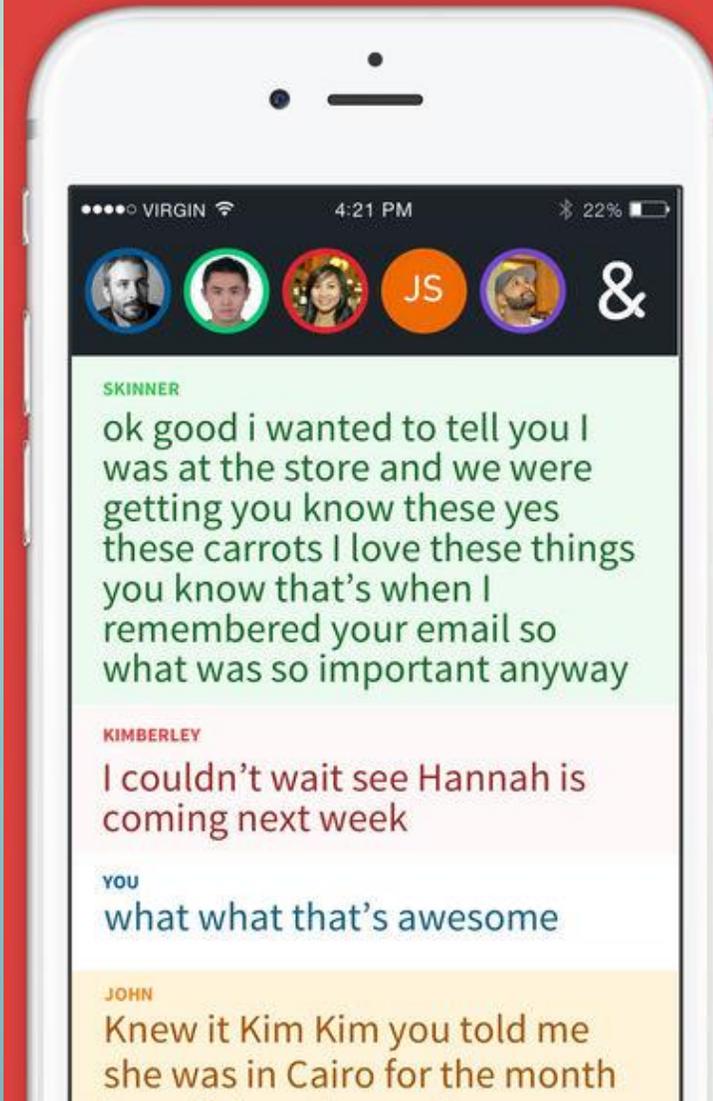
The screenshot shows a mobile interface for a Google Doc. At the top, there is a toolbar with icons for bold (B), italic (I), underline (U), bulleted list, numbered list, and indent. Below the toolbar, a grey bar displays "Listening..." with a microphone icon on the right. A virtual keyboard is visible below, with keys for q, w, e, r, t, y, u, i, o, p, a, s, d, f, g, h, j, k, l, z, x, c, v, b, n, m, and a backspace key. At the bottom, there is a row with "?123", a smiley face emoji, a button labeled "English", a period key, and a return key.

Live Captioning

Ava

- Captions for one-on-one or group chats
- All users install app and use their own phone's microphone for their voice
- Hosting group chats limited to 5h/m on free plan

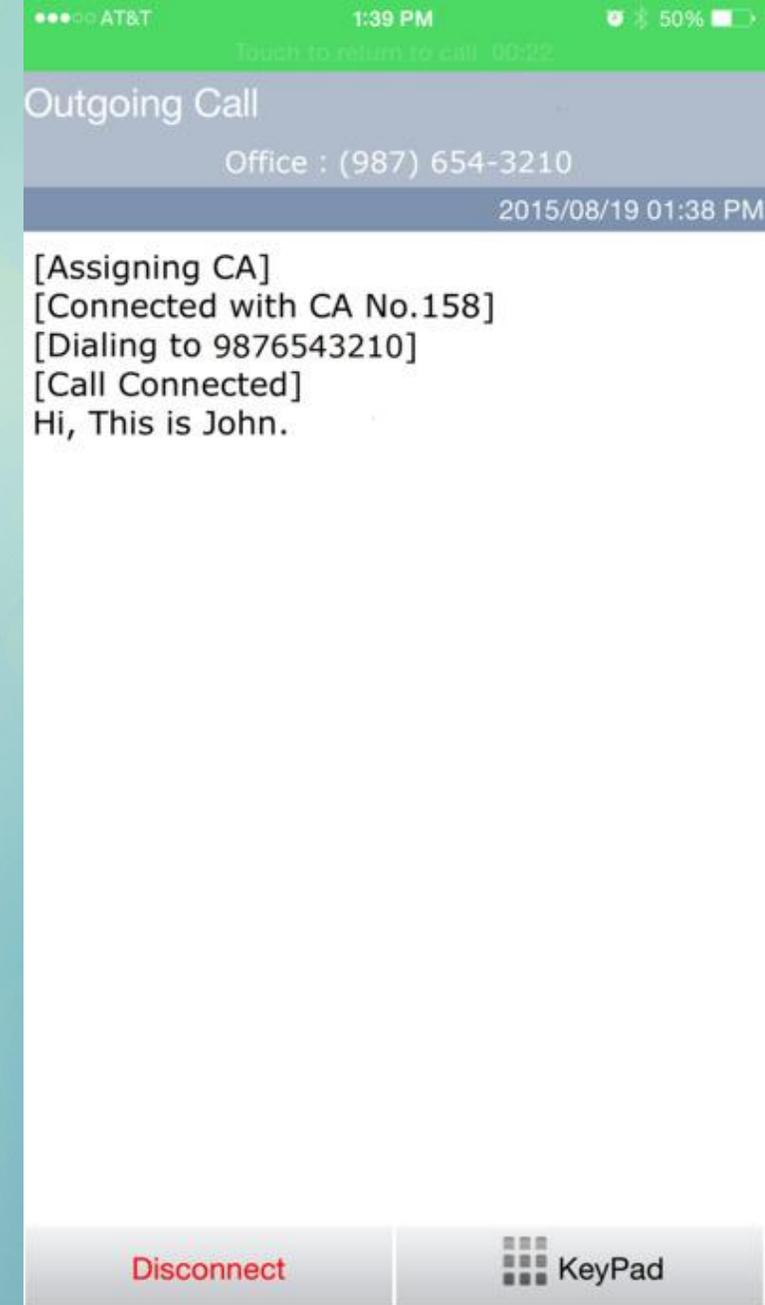
Ava shows you who says what.
Never miss a conversation again.



Live Captioning

InnoCaption

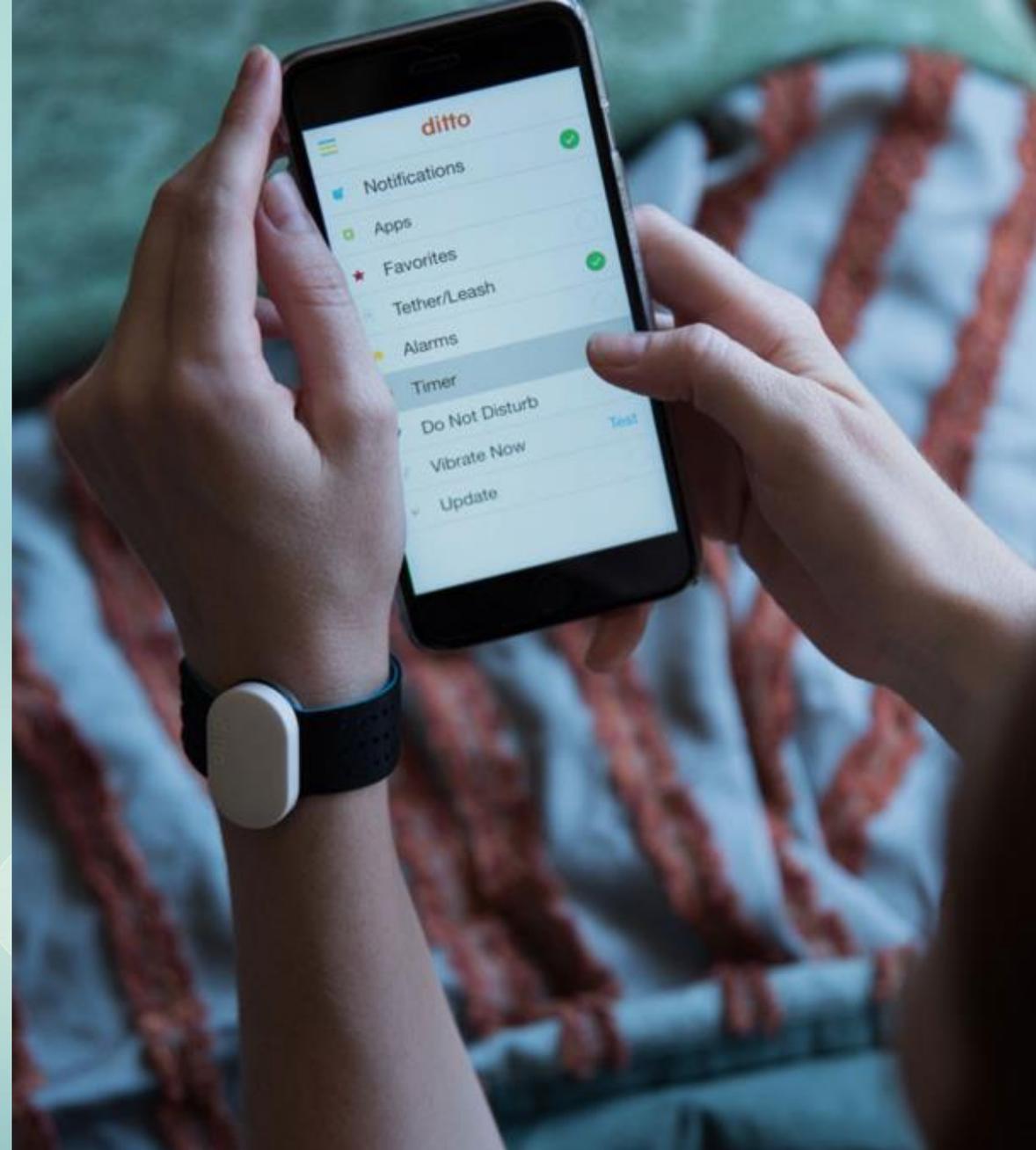
- Phone calls
- Voice mails
- No 911 support
- Uses live stenographer to create real-time captions
- Captioners funded by federally-funded Telecommunications Relay Service (TRS)



Alerting

Ditto

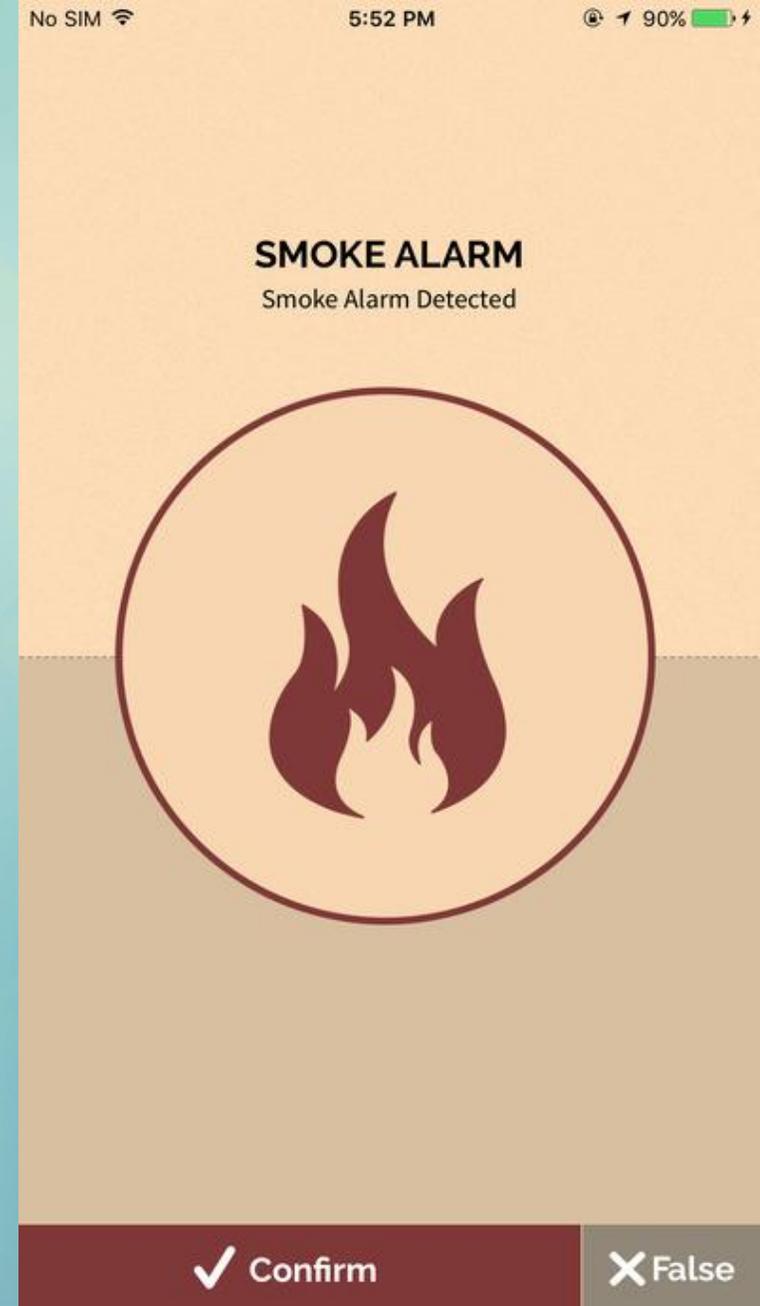
- Vibrates when you leave phone
- Vibrates for calls, notifications
- Customizable
- Waterproof
- Battery lasts 3-6 months
- Range 50-100 ft
- \$39.95



Alerting

Sound Alert

- Detects some sounds natively:
 - Doorbells, Telephone, Microwave, Burglar Alarm, Intercom
- Can add custom sounds
- Vibrates, triggers camera flash, shows alert on screen that matches sound type
- Works with Pebble watch
- App costs £69.99



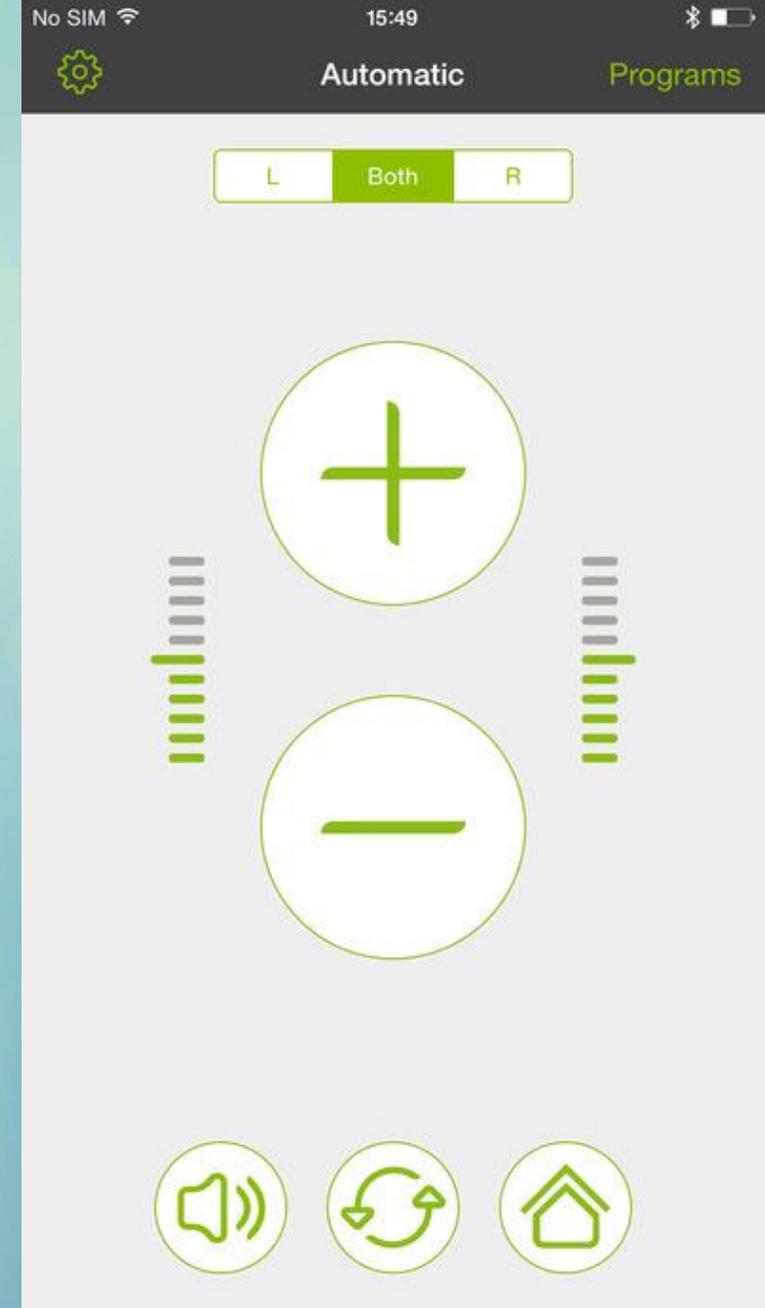
Manufacturer Apps

- Hearing aid control
- Accessory control
- Informational
- Made For iPhone
- Remote care

Manufacturer Apps

Hearing Aid Control

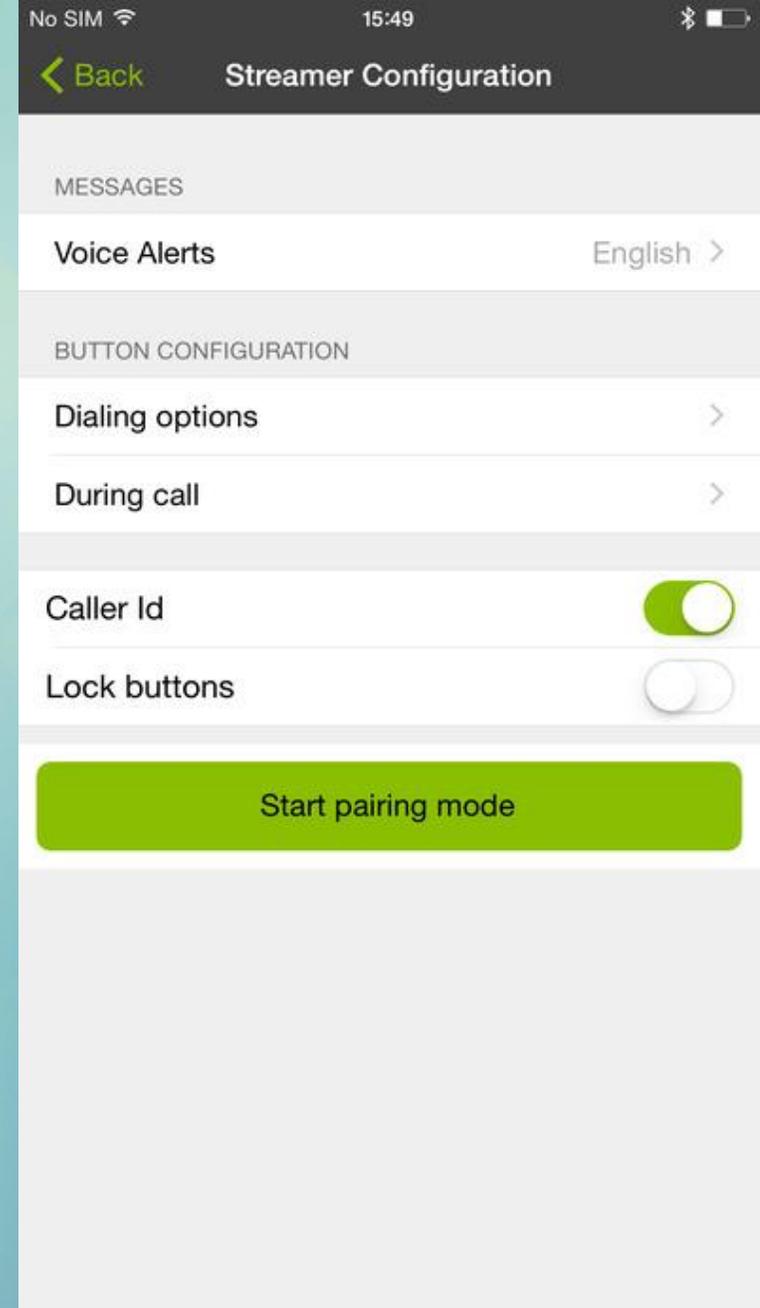
- Display hearing aid settings, battery status, etc
- Adjust hearing aid settings
 - Volume
 - Program
 - Balance
 - Tone
 - Mute
 - Other advanced program settings



Manufacturer Apps

Accessory Control

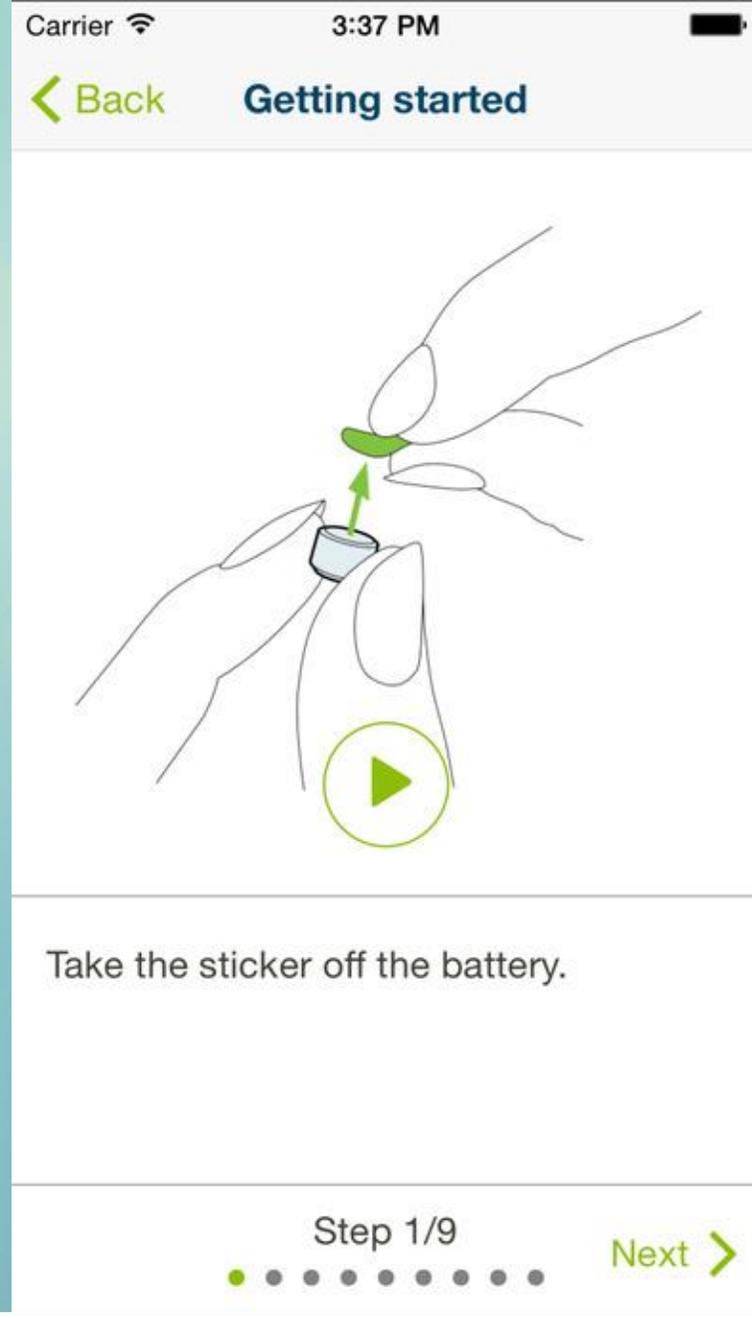
- Pair accessories
- Setup accessory preferences
 - Voice alerts
 - Call settings
- Control accessories
 - Streaming source from accessory



Manufacturer Apps

Informational

- Product instructions
- Walk-throughs
- Troubleshooting
- Clinic contact data
- Sound exposure monitoring



Manufacturer Apps

Made For iPhone (MFi)

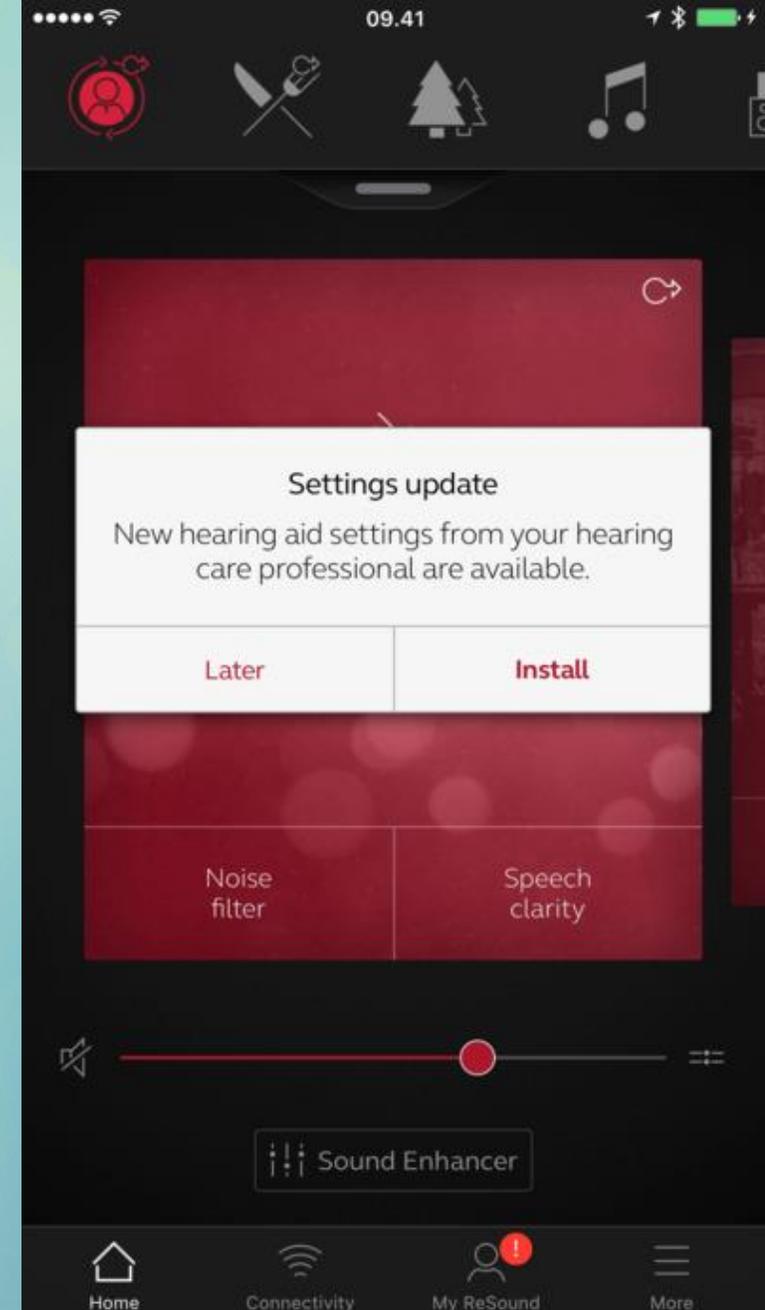
- Audio streaming from apps and phone mic
- Call streaming
- Remote control (volume/tone, etc)
- User-generated programs
- Geotagging/beacons
- Audio recording/playback
- Hearing aid finder
- IFTT



Manufacturer Apps

Remote Care – ReSound Smart 3D app

- Patient submits request.
 - Survey results about use/setup
 - Explanation of issue
 - Data logging
- Provider sends updates along with written message for patient
- + Other app features

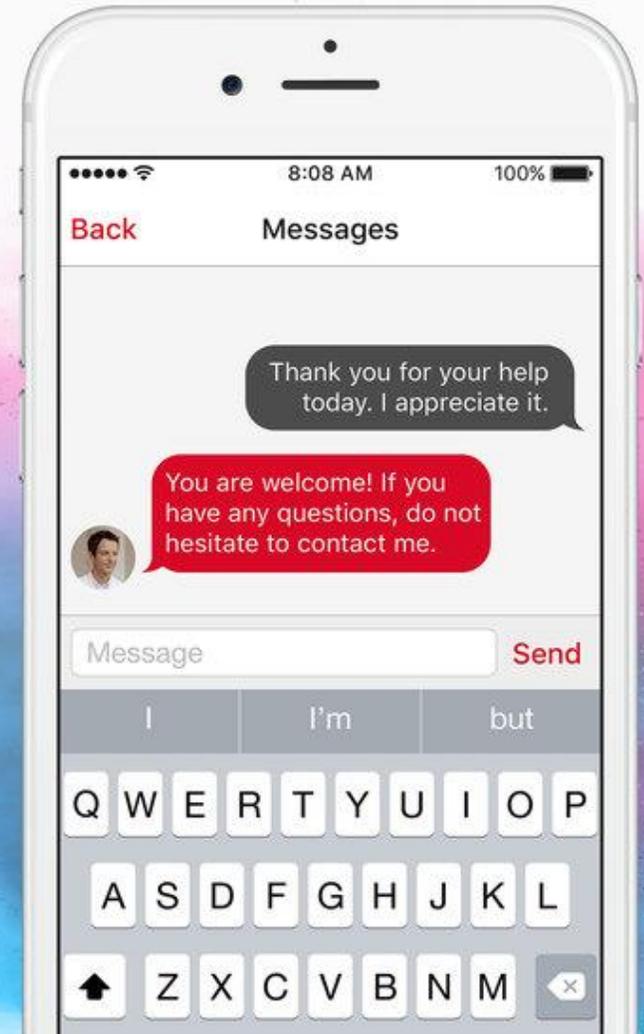


Manufacturer Apps

Remote Care – Signia TeleCare 2.0

- Tracking of daily satisfaction
- Real-time text, voice and video *CareChat*
- Adjustment delivery via *TeleLink*
- 4-band equalizer
- Configure directionality, balance, etc
- Access to data logging
- + Other features

Connect with your hearing care professional and get help the moment you need it.



What does the future hold?

- Apps as Opportunities

Back to Brian.....

The Limitations of the Current Service Delivery System

- Inconvenient
- Inaccessible
- Expensive
- Opaque

The Limitations of the Current Service Delivery System

- Wait for patients to schedule an appointment
- Conduct a test, talk about options
- Fit hearing aids (counseling and fine tune devices)
- Fine tune and adjust: 3-4 follow-up appointments spread over a year
.....works for those that can afford it and that make time

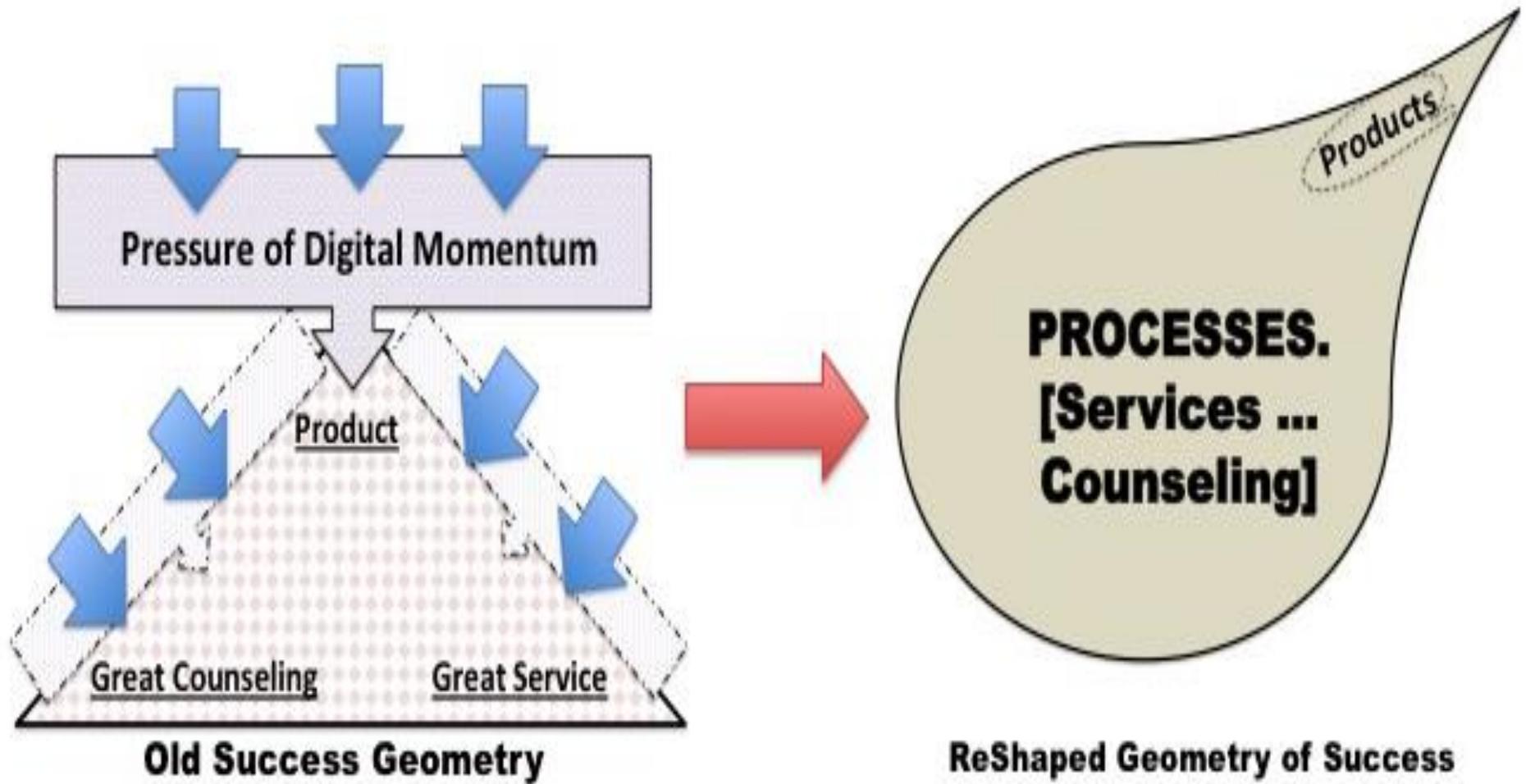
Apps as a Tool to Improve the Current Service Delivery System

- Improve Convenience
- Reduce Barriers to Care
- Lower Cost of Care
- Greater Transparency



Old Success Geometry

Schweitzer & Kaal, Hearing Review, July 2017



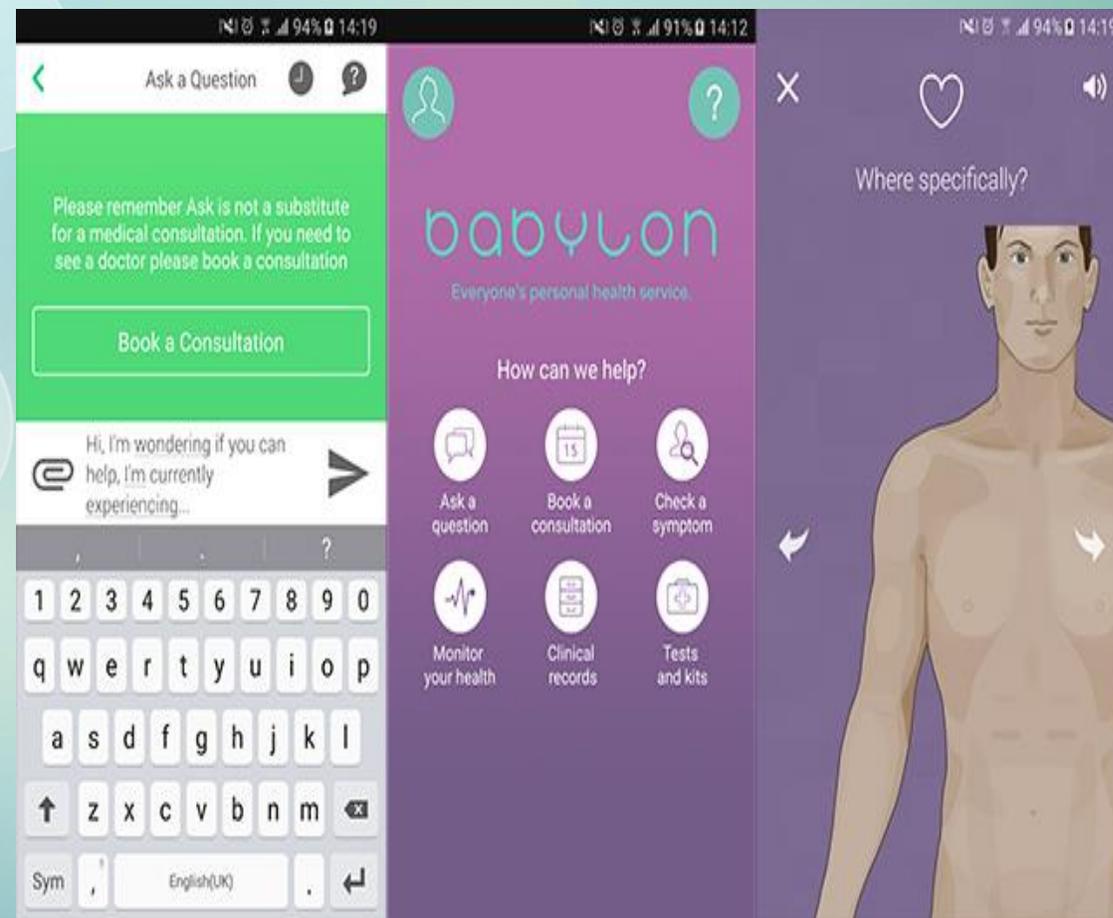
Schweitzer & Kaal, Hearing Review, July 2017

What you can do today with apps

- Gateway products
- Remote programming and adjustment
- Remote counseling
- Hearing Triage

The Future of Healthcare?

- Babylon App:
- Instant video or audio conferencing
- Stores clinical records
- Clinical tests kits
- Book consultations



References/Further Reading

- March-April 2017 ENT and Audiology News, mHealth Technologies issue
- Eric Topol, *The Patient Will See You Now: The Future of Medicine is in Your Hands*, 2015
- Schweitzer & Kaal Hearing Review July 2017
- NASEM Report on Affordable and Accessible Hearing Health Care, 2016

Questions

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- abram@hearingtracker.com