

eAudiology: A review of perceptions and report on new audiological findings

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Telemedicine: Definition

...the provision of health services from **one location**
to **another** using a telecommunications medium...

Source: Darkins & Carey, 2000

“I do tech support for a HA manufacturer. I have fit patients over a telephone/internet connection several provinces away. I have been able to sort out their issues in less than 30 min without travelling. Weird at first but wonderful!”

Audiologist with 28 years of experience

“I think that the whole concept of teleaudiology is horrible! Why not just invent robots to take over the profession???”

Audiologist with 7 years of experience

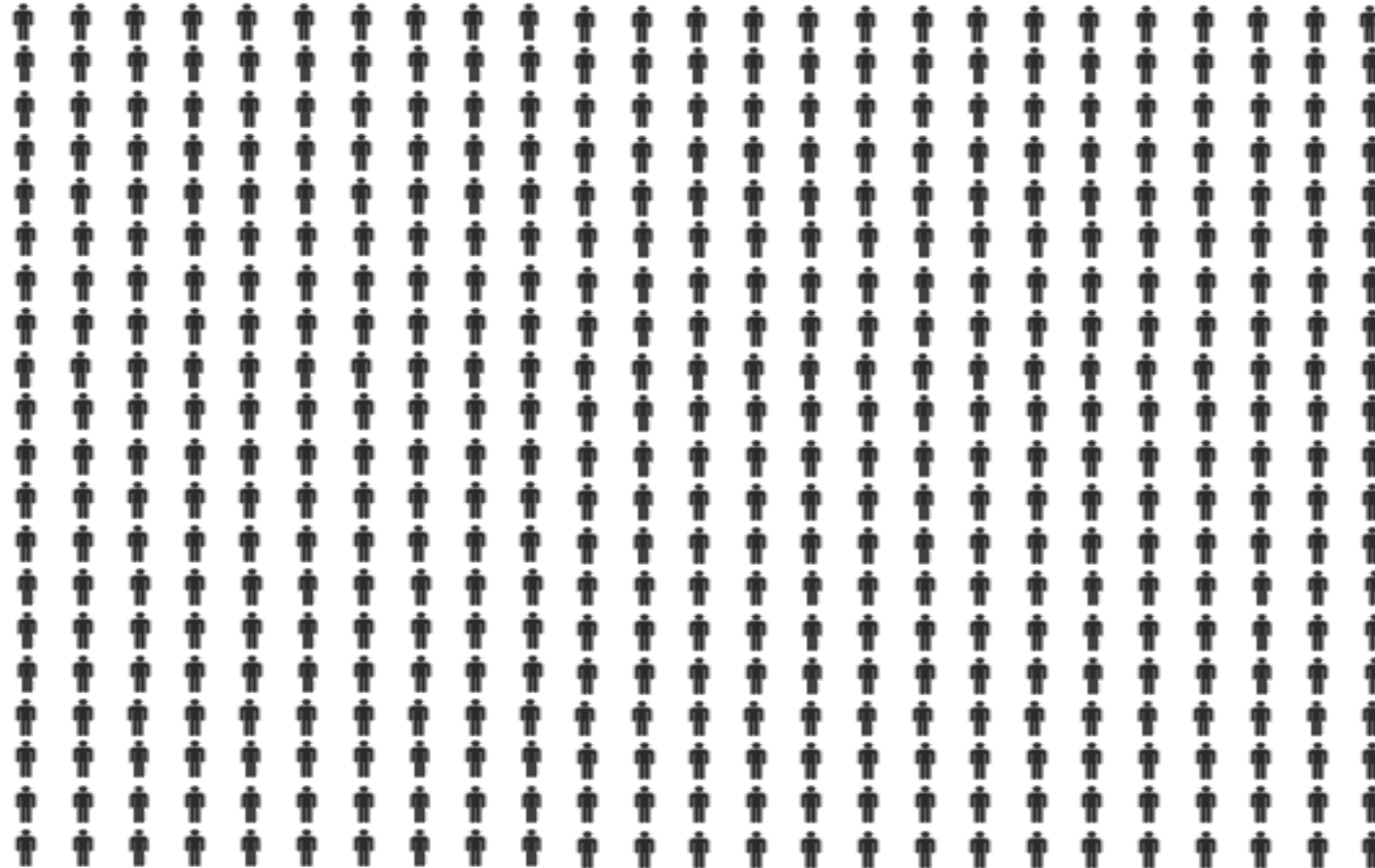
Why study eAudiology?

Ratio of Audiologists to General Population:



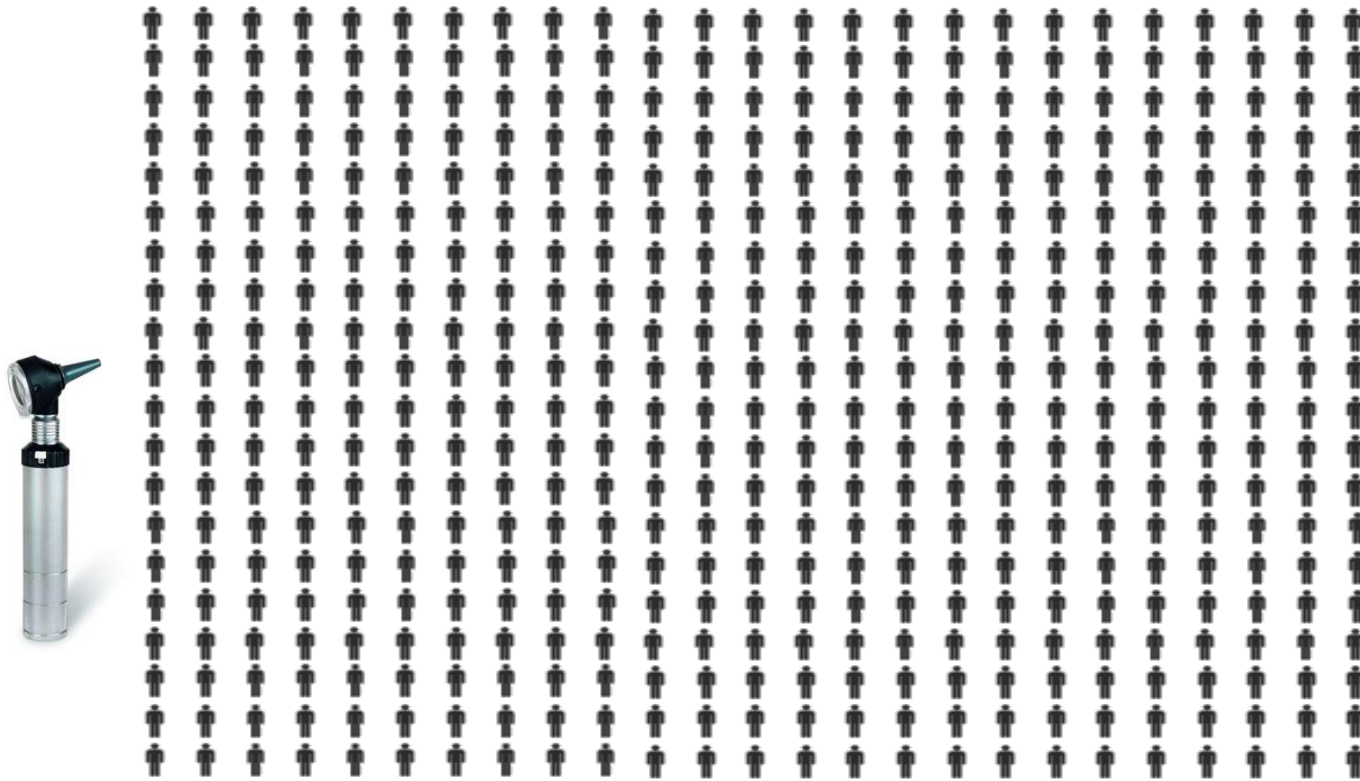
 = 1000 people

Ratio of Audiologists to General Population:



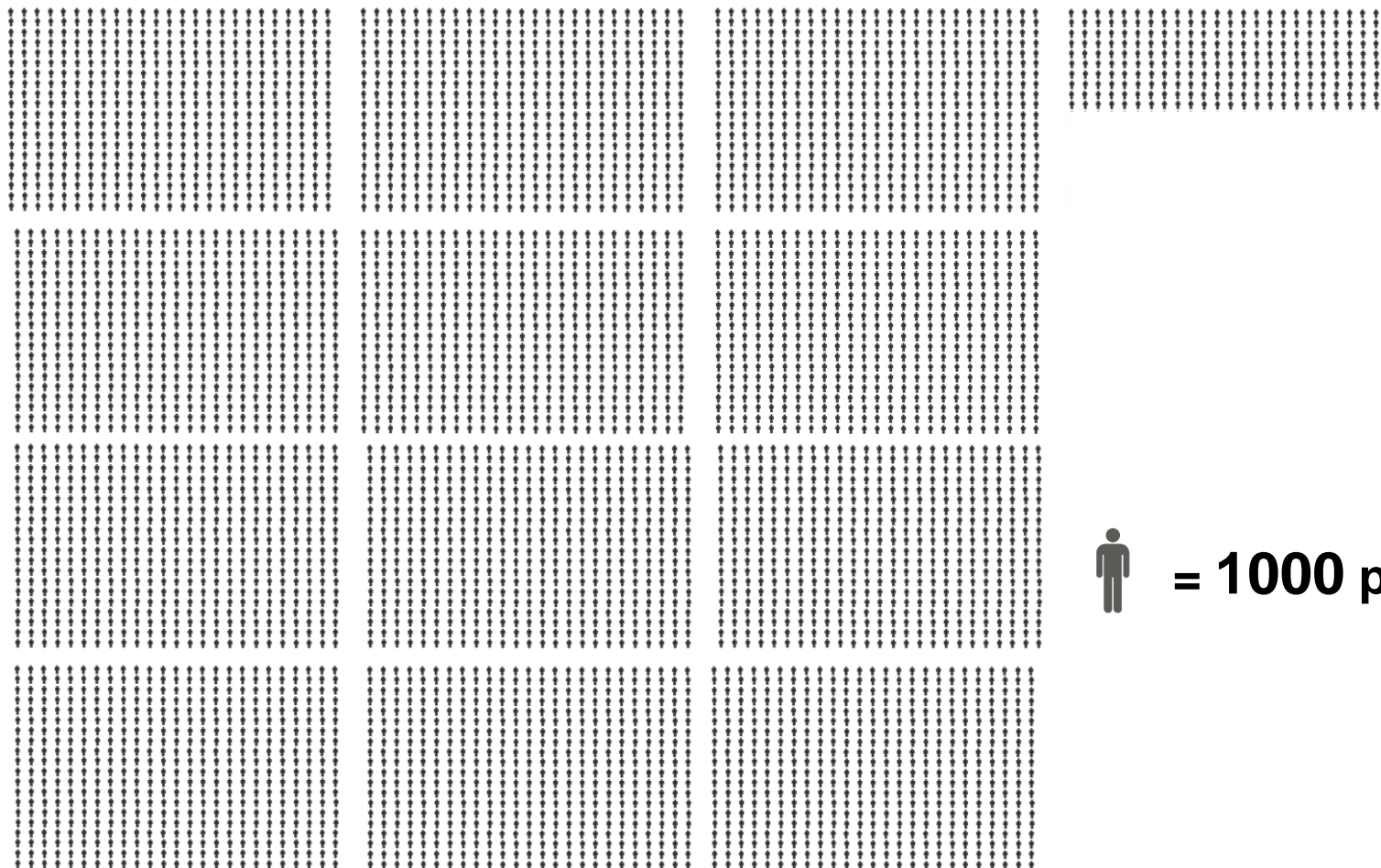
 = 1000 people

Ratio of Audiologists to General Population: (optimistic estimate)



 = 1000 people

Ratio of Audiologists to General Population: (pessimistic estimate)



 = 1000 people

Models of Telehealth Delivery

Real Time: Synchronous, interactive, and live:

- Users on both ends are communicating with real-time feedback
 - Telephone
 - Skype

Cloud-based: Asynchronous & off-line:

- Information is stored and reviewed at a later time (also known as “store-and forward”)
 - Answering machine
 - E-mail

eAudiology:

eAudiology Reports According to Category, Populations, and Models

CATEGORY	NO.	POPULATIONS	PROCEDURES
Screening	5	Pediatrics & adults	Video-otoscopy, immittance, OAE, AABR, audiometry, speech-in-noise
Diagnosis	12	Pediatrics & adults	Video-otoscopy, audiometry, HINT, ABR, intraoperative monitoring, balance testing
Intervention	7	Adults	HI fitting/verification, CI programming, tinnitus therapy, HI counselling
Perceptions	2	Adult clinic patients ¹	Questionnaires

¹Including tinnitus and cochlear implant mapping patients

eAudiology: General summary of the current literature

- Most studies involved a facilitator with the patient
- Study designs mostly compared the results of face-to-face evaluations and remote evaluations
- Results: Good agreement between face-to-face appointments and teleaudiology appointments
- Caveat: Thus far, few studies per topic

Today's Research:

1. Attitudes towards eAudiology
2. Compare audiological outcomes when conducting adjustments to hearing instruments either during face-to-face appointments or during internet-based appointments

Why study attitudes?

Broens et al. (2007) and Hailey & Crowe (2000) conducted meta-analyses of telemedicine interventions, and found that successful telemedicine implementations have:

Reliable technological systems that support the intervention

Stakeholders that buy-in

**Literature suggests
NOT**

I initially assumed that the attitudes of patients toward audiology mattered most

Dr. Sujit Singh

The broader literature in telemedicine

Acceptance by clinicians is a key factor in determining success with telemedicine interventions

(Al-Qirim, 2007; May, 2006)

The practitioner is described as:

“the most important initial gatekeeper for success with telemedicine interventions”...

(Whitten & Mackert, 2005)

Study I: Qualitative study of attitudes



Michael Boretzki



Stefan Launer



Kathy Pichora-Fuller

Study I: Qualitative Study

- Interview-based qualitative study exploring attitudes toward eAudiology
- Potential participants were nominated by a panel of 3 experts, with the goal of inviting hearing health care professionals with varied but relevant work histories
- 60-100 minute long interviews of 11 hearing health care practitioners (data saturation was obtained) were conducted
- Interviews were transcribed and coded by 2 independent coders

Qualitative study: Major themes revealed

A total of 97 codes emerged, clustering into core themes:

- Advantages & disadvantages of teleaudiology

Singh et al. (submitted)

Key Themes

Advantages

- Accessibility
- Convenience

Disadvantages

- Relationship Quality

...it's a **gut feeling**....

....the in-person experience is **richer**...

“You almost need to be in [the client’s] presence to understand their body language and eye contact and their tone. I’m not exactly sure what it is. It’s almost an intangible thing to me. In order to feel comfortable with someone and trust them, I would prefer to have built that in person.”

*-Audiologist (public setting)
18 years of experience*

Qualitative study: Major themes revealed

eAudiology is well-suited for some clinical tasks & patient populations, and not others.

Well-suited

- Aural Rehab
- Follow-up appointments
- Issue of accessibility

Not well-suited

- Diagnostics
- New patients
- Children

Study II: Quantitative study of attitudes



Michael Boretzki



Stefan Launer



Kathy Pichora-Fuller



Marissa Malkowski

Study II: Survey of Attitudes

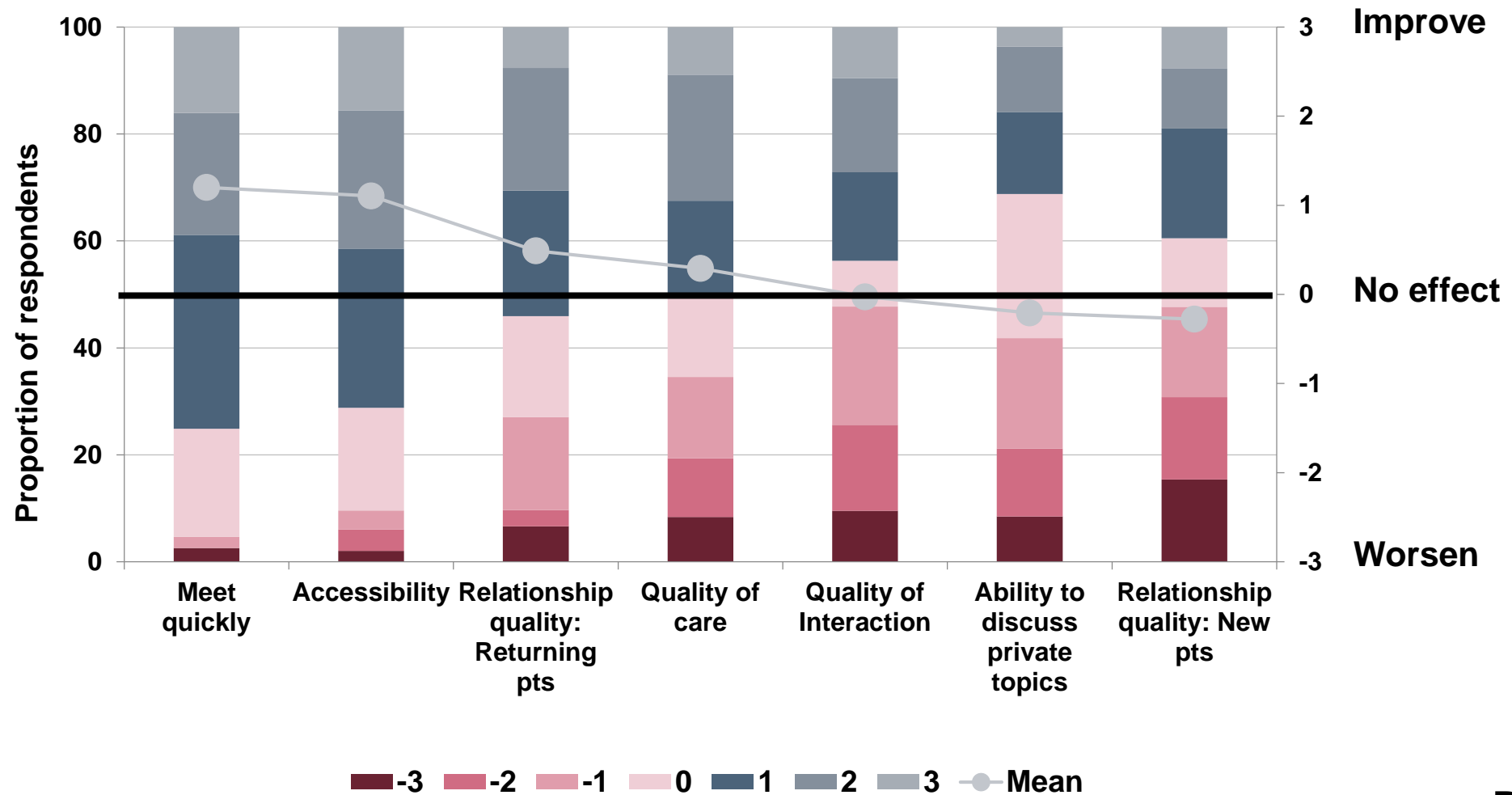
Goal:

To survey attitudes toward eAudiology in a large sample of hearing health care practitioners

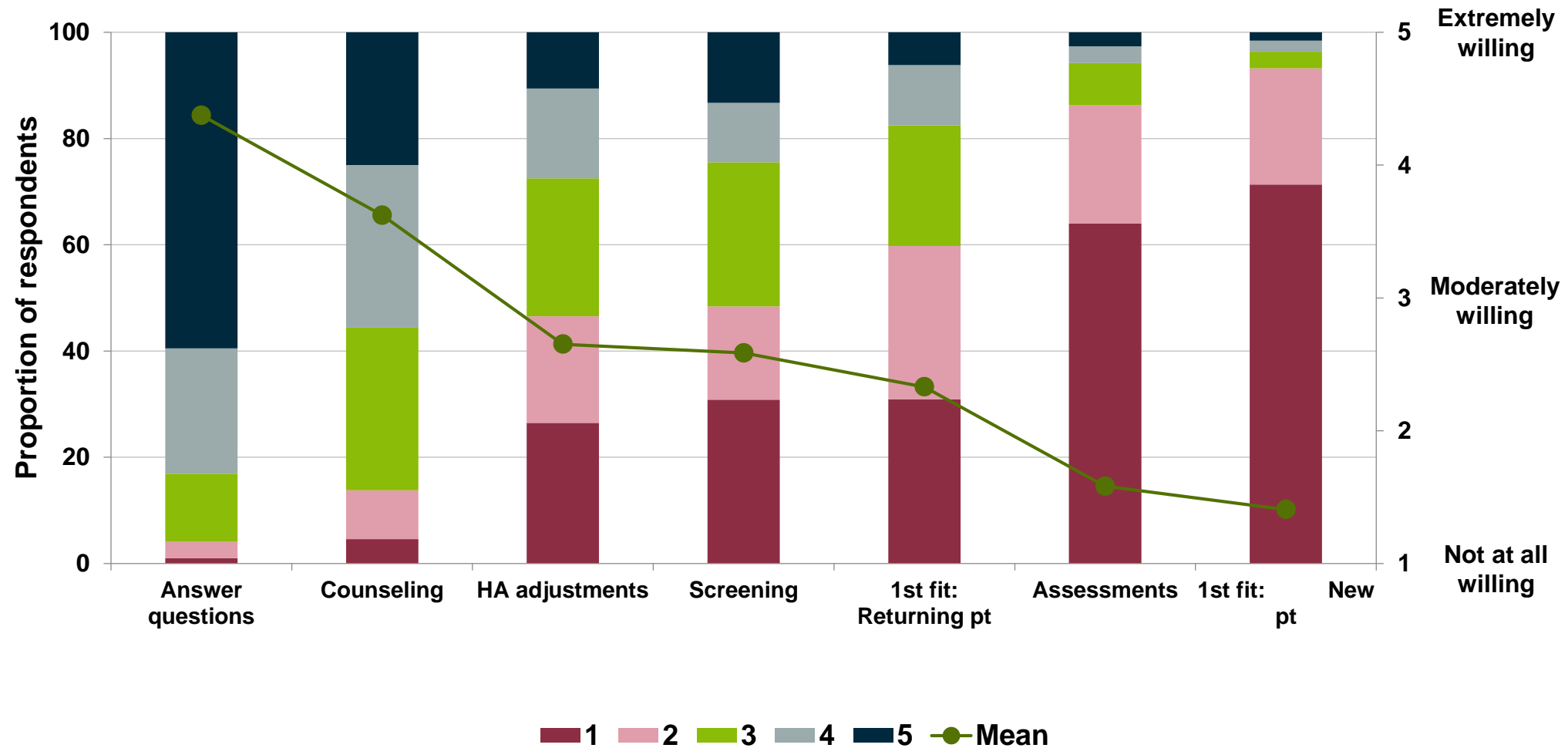
Participants:

- Recruited through electronic mailing lists and postings at conferences
 - 202 practitioners ($M = 39.3$ years age; $SD = 11.0$)
 - 28: Owned their own clinic(s)
 - 109: Worked in a private practice
 - 53: Worked in a non-profit environment

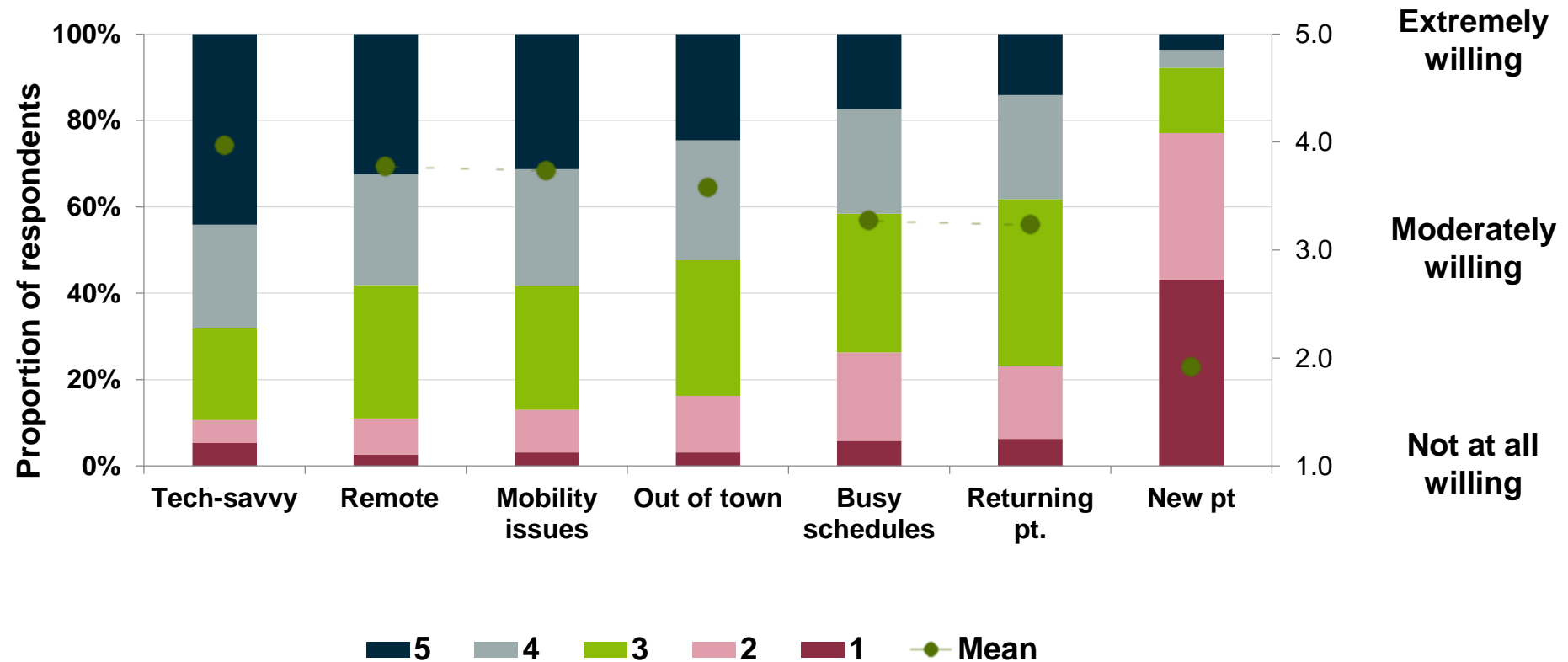
Perceived effect of eAudiology on hearing care



Willingness to use eAudiology: Clinical tasks



Willingness to use eAudiology: Patient groups



Study II: Conclusions

On average, it is believed that eAudiology will increase accessibility, but will likely have a minimal effect on hearing health care.

However, there are significant proportions of clinicians who have opposing attitudes toward eAudiology.

Willingness to conduct eAudiology appointments is highly dependent on the clinical task to be performed and the patient group receiving service.

Why are there such fervent beliefs for and against the use of eAudiology in hearing health care?

In part, practitioners may be adopting different frames of reference regarding:

- Clinical tasks to be performed
- Patient populations being served

Study III: Attitudes of Patients



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Stefan Launer



Kathy Pichora-Fuller

What are the attitudes of patients toward eAudiology?

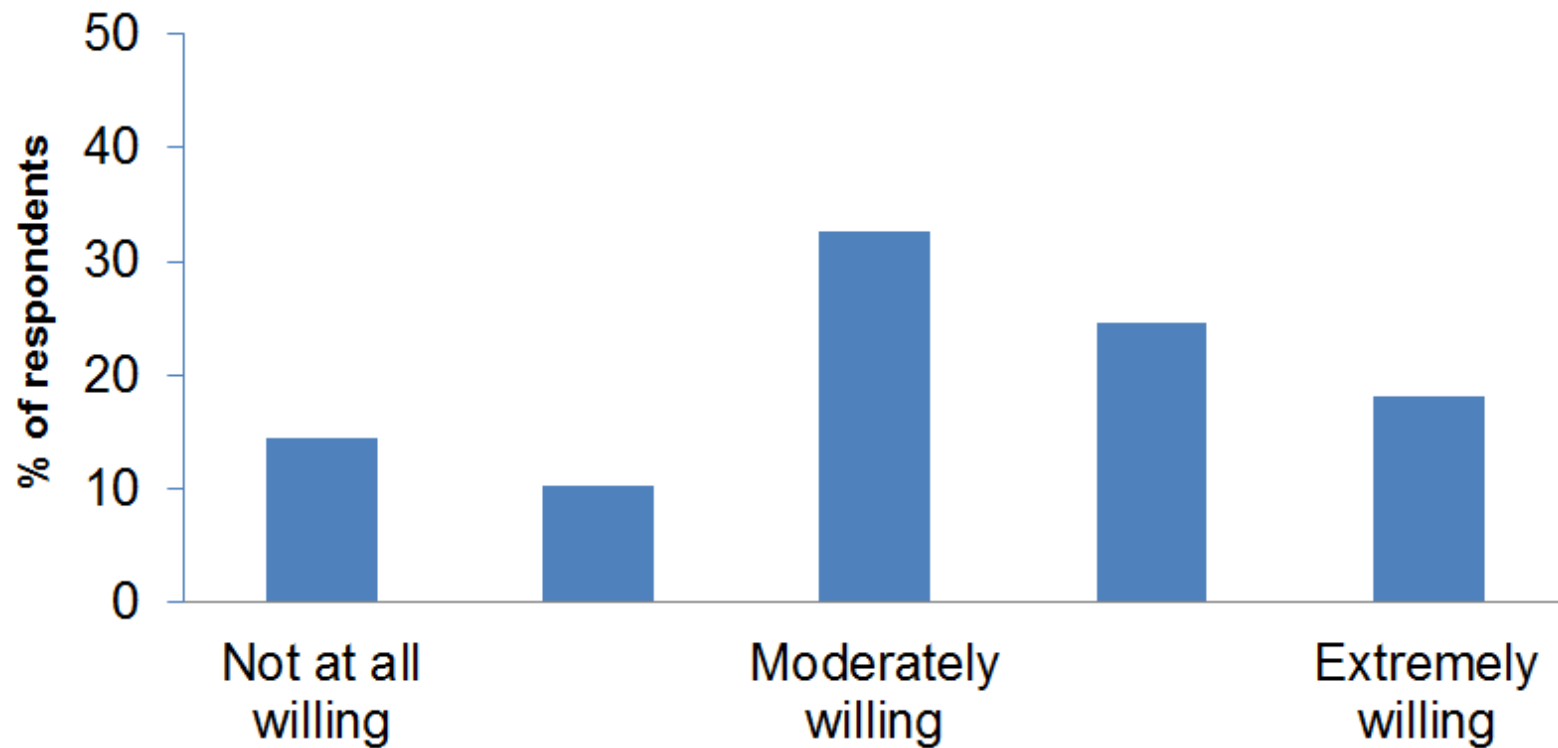
Patient attitudes toward eAudiology

- Questionnaire design
- Postings at 50+ audiology clinics (electronic or paper copies)

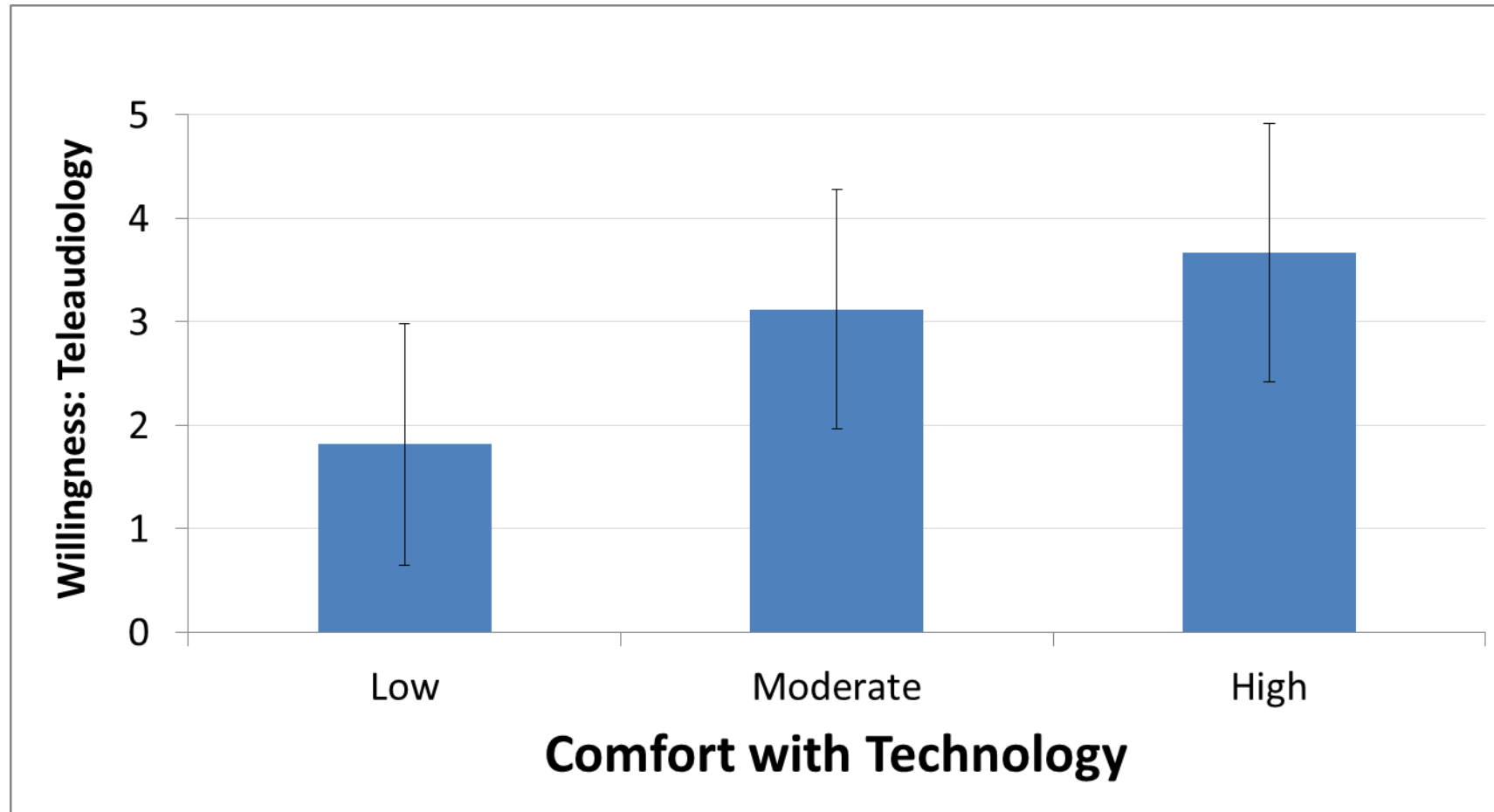
224 respondents

- All had experienced at least one audiology appointment
- 129 males; 95 females
- Mean age = 67.1 years ($SD = 15.3$)

Patient Willingness to use eAudiology



Willingness to have an eAudiology appointment: Comfort with technology



Study IV: Motivation



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Stefan Launer



Kathy Pichora-Fuller

Motivation

Purpose:

To investigate short-term audiological outcomes when using an internet-based tool for the purpose of conducting follow-up adjustments to hearing instruments.

How were adjustments to hearing instruments accomplished?

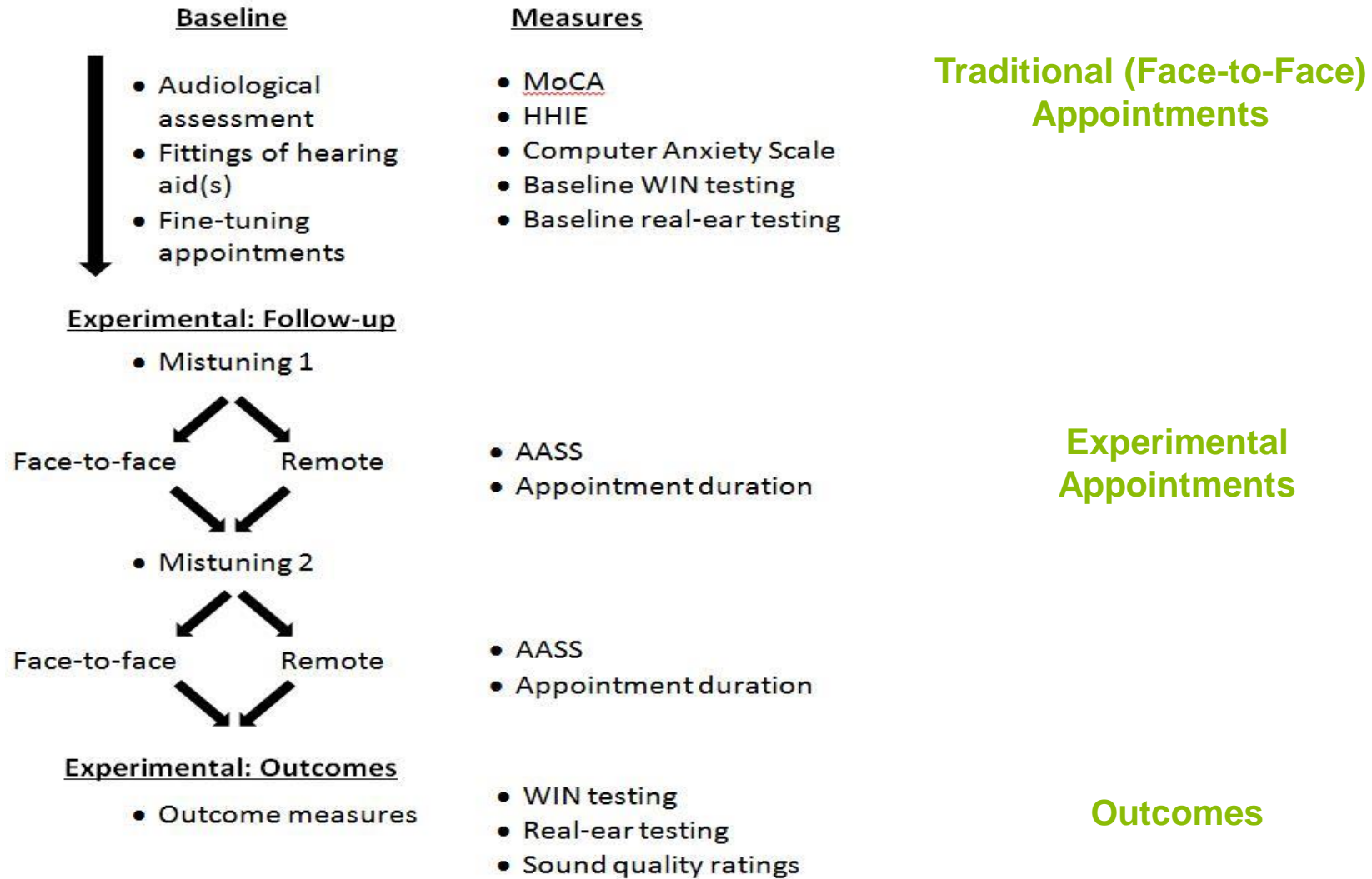
- Via a technology solution that connects an end-user's hearing instrument(s) to fitting software that is located on the clinician's computer.



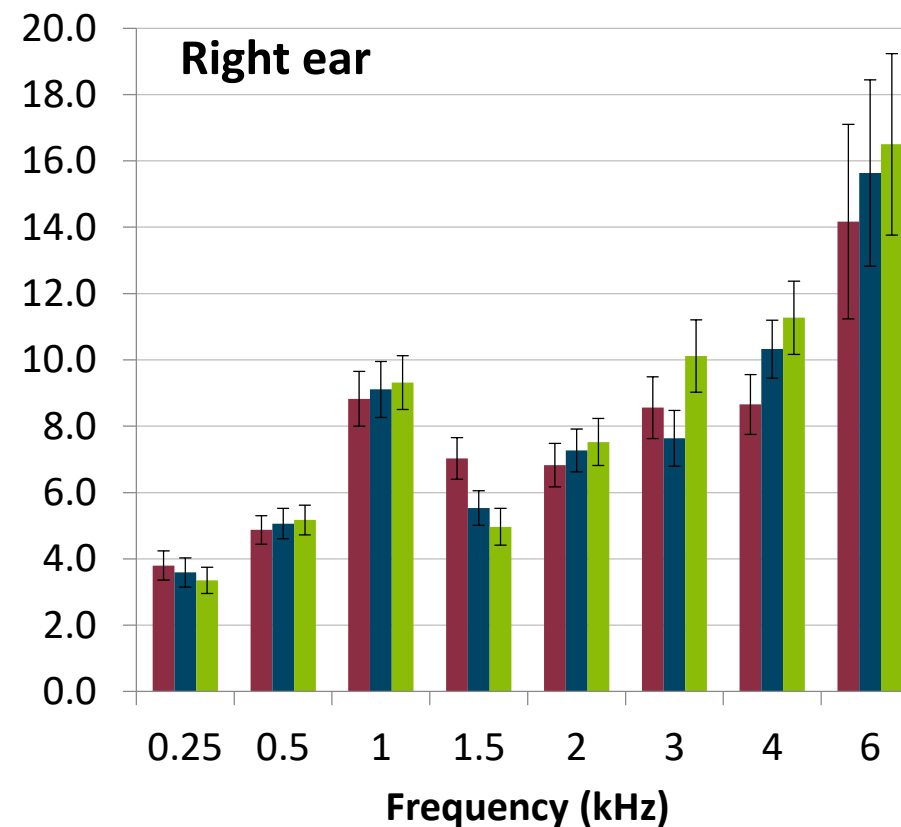
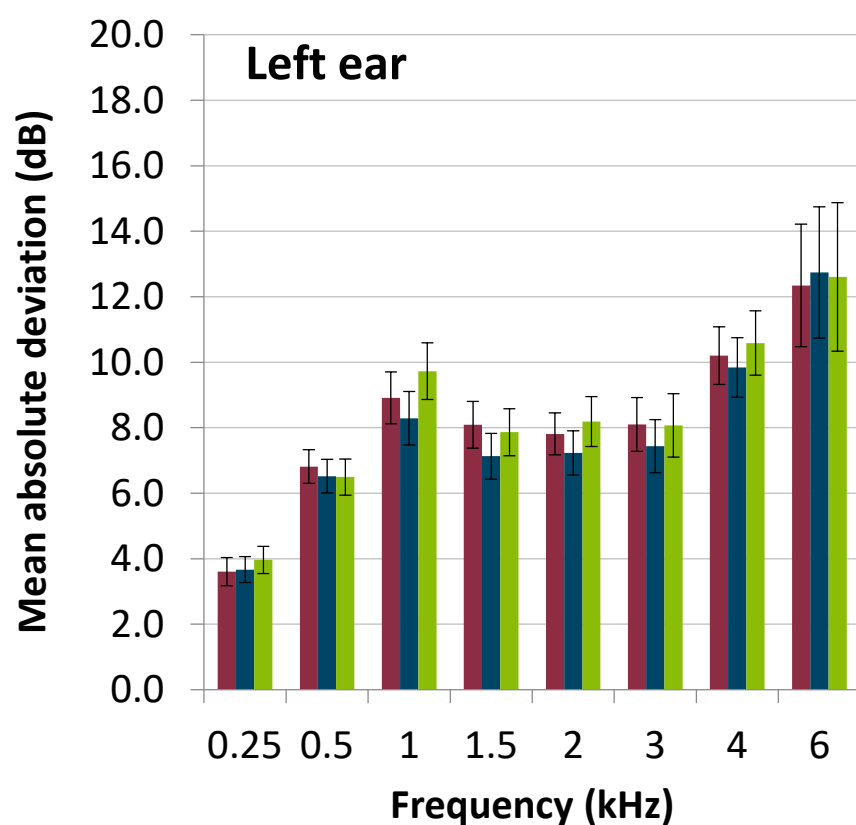
Participants

- 23 Participants
 - 15 females, 8 males
 - Mean age = 67.2 years (SD = 15.8; min = 23; Max age = 81)
- PTA = 43.4 dB HL; SD = 19.8
- 21 bilateral fittings; 2 monaural fittings
- 19 experienced users of hearing aid(s); 4 = 1st time
- 8.8 years = mean years of experience wearing a HA
- Participants were healthy community dwelling residents of the greater Toronto area

Methods



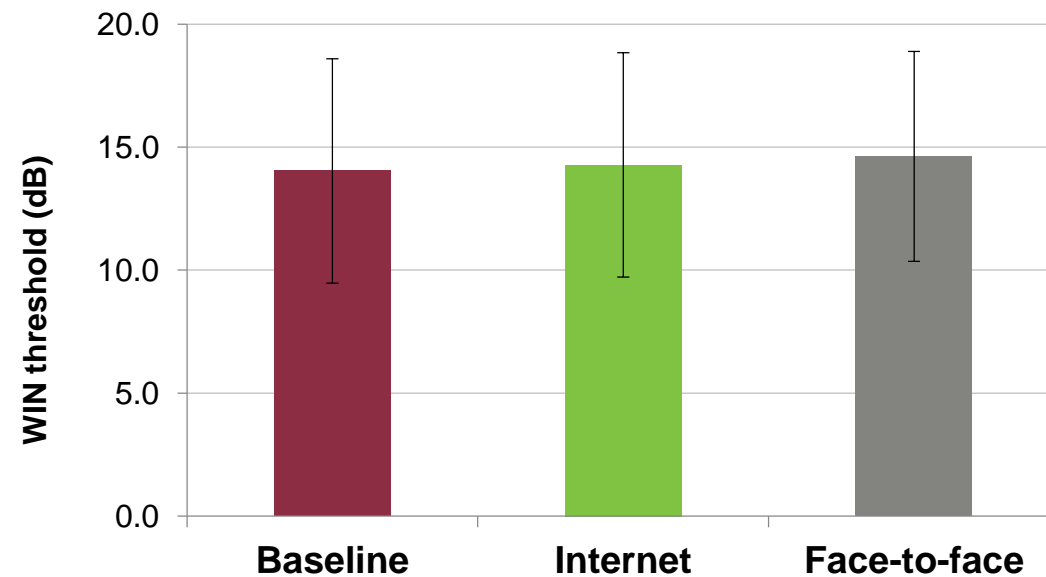
Results: Real-ear measurements: Mean of the absolute value of the deviations from NAL-NL1 targets for each participant



■ Baseline ■ F2F ■ Internet

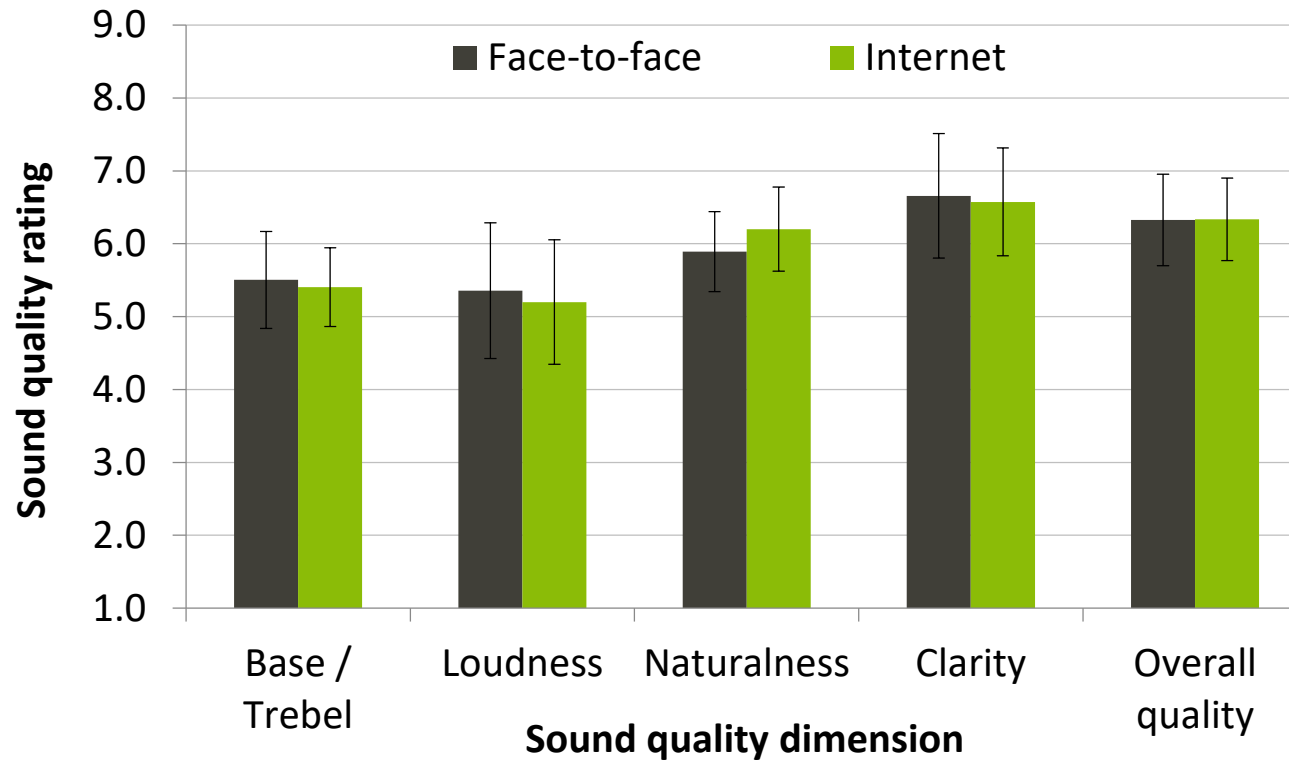
■ Baseline ■ F2F ■ Internet

Speech intelligibility performance in noise: Words-in-Noise test

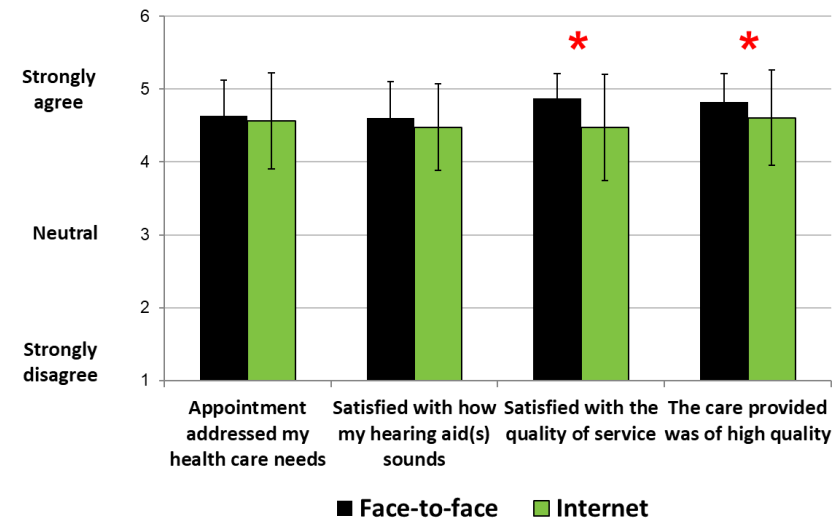
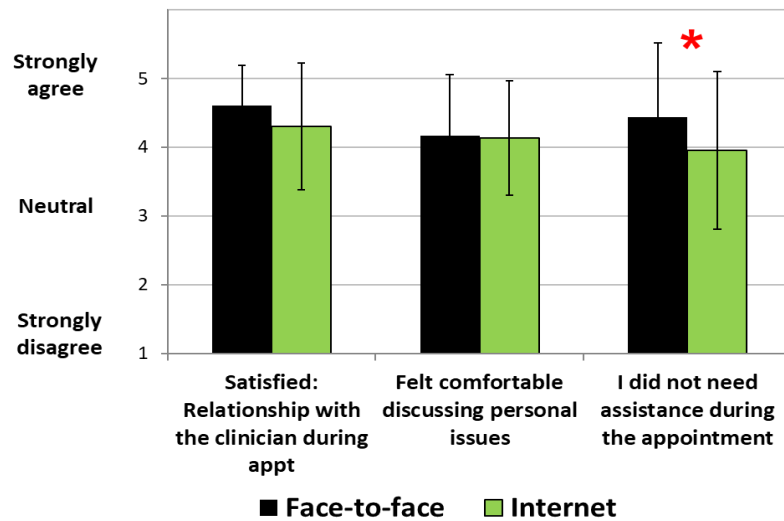
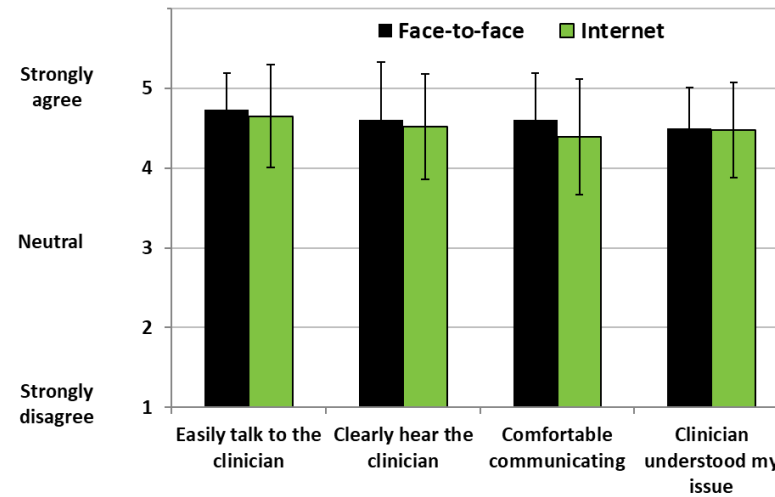


(Wilson et al., 2003)

Sound Quality Ratings



Participant's experiences of the internet & F2F appointment



A significant difference between the internet and the face-to-face condition was observed on one outcome variable

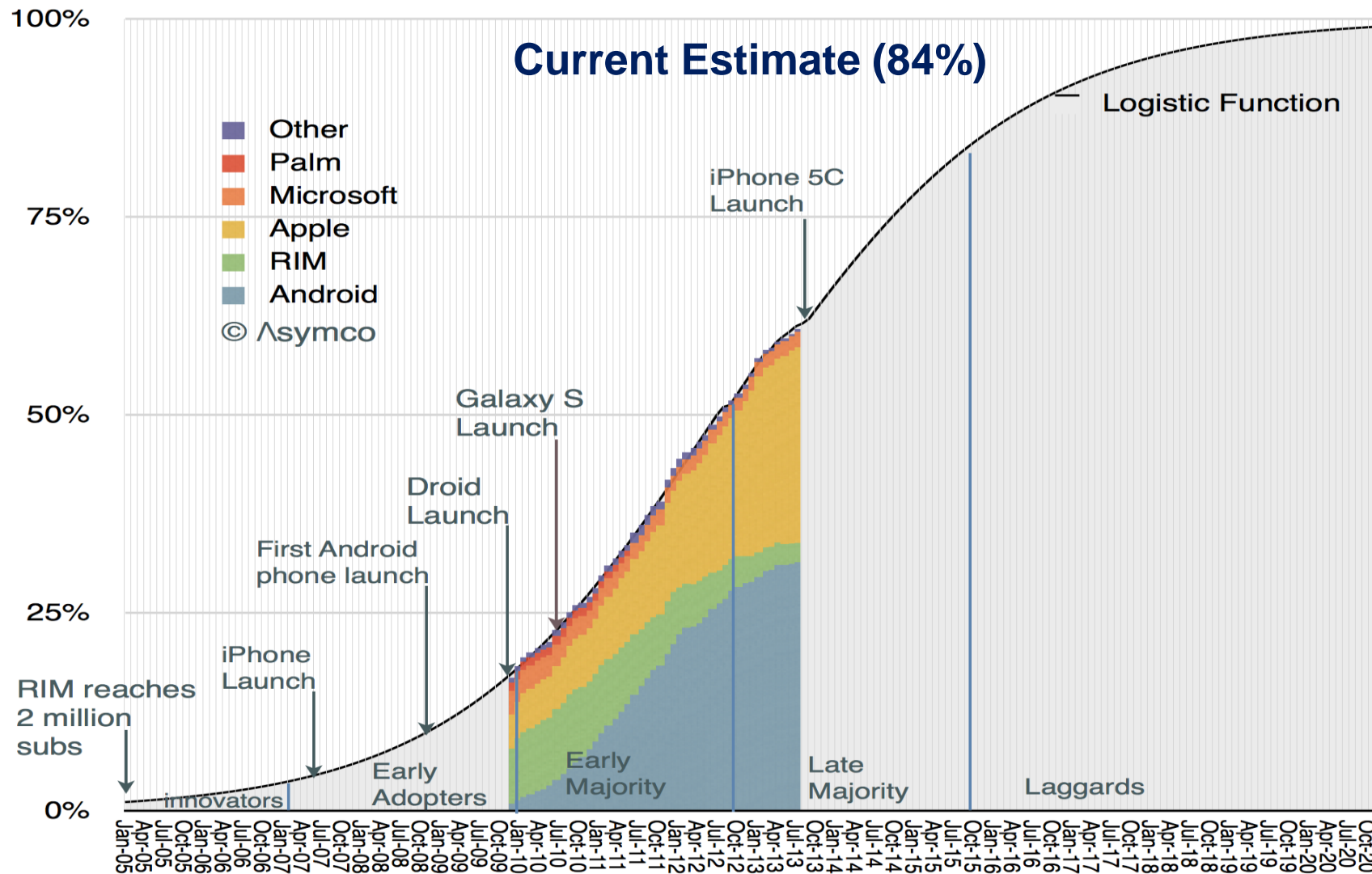
- Any guesses?
- Duration of the appointment
 - Face-to-face: 15.7 minutes (SD = 6.4; min = 6; max = 38)
 - Internet: 22.4 minutes (SD = 8.0; min = 12; max = 42)

Future Direction: Smartphone Integration in Audiology

“We shape our tools and thereafter our tools shape us.”

-Marshall McLuhan, 1964

US Smartphone Penetration



Smartphone Penetration among Older Adults

Cell phone and smartphone adoption among seniors

% of seniors (ages 65 and older) who own a ...

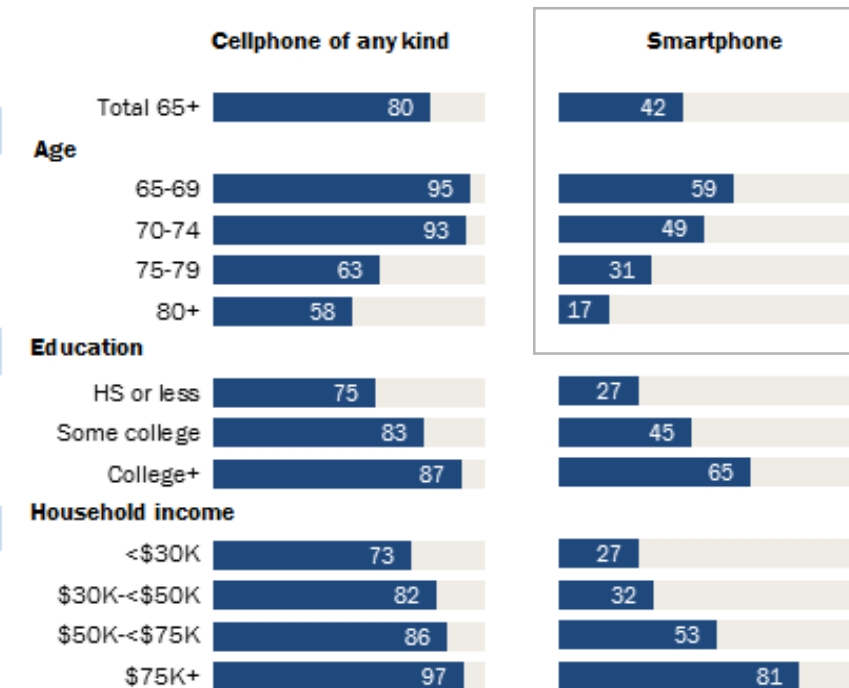
	Cell phone	Smartphone
Total for all 65+	77%	18%
Age		
65-69	84	29
70-74	84	21
75-79	72	10
80+	61	5
Education		
High school grad or less	70	10
Some college	80	19
College graduate	87	35
Household Income		
<\$30,000	67	8
\$30,000-\$49,999	83	15
\$50,000-\$74,999	88	28
\$75,000+	92	42

Pew Research Center's Internet Project July 18-September 30, 2013 tracking survey.

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Roughly four-in-ten seniors are smartphone owners

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



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

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(Some) Smartphone Applications in Audiology

- Volume and muting controls
- Streaming from phones and media
- Visual prompts of battery status
- Control of directional microphones
- Counselling
- Otoscopy using a smartphone attachment
- Hearing screening (e.g., digit triplet in noise)
- Audiometric testing (e.g., with calibrated headphones)
- Speech-in-noise testing
- Electrophysiology
- Soundscape monitoring
- Hearing instrument programming
- Tinnitus monitoring and management
- Geotagging to enable location-based configuration of a device
- Auditory training & listening exercises
- Use of the smartphone as a remote microphone
- Connection to 'If This Then That' networks (e.g., internet-enabled devices)
- 'Find my hearing aid' apps
- Ecological Momentary Assessment

**Thank you for your time.
Gurjit.singh@Sonova.com**

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to take the quiz and receive
your certificate**