

# Hearing Aid Compatibility of Cellphones: Results from a National Survey

John Morris, Ph.D., Jim Mueller, M.A.  
Mike Jones, Ph.D., Ben Lippincott, B.A.

Shepherd Center

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# AGENDA

1. Overview of the Wireless RERC
2. Overview of HAC requirements
3. Overview of the Hearing Aid Compatibility Survey
4. HAC Survey Sample
5. Data Analysis
  - a. Ease of finding a hearing aid compatible cellphone
  - b. Satisfaction with sound quality of cellphone
  - c. Sources of information used for finding cellphone
  - d. Satisfaction with HAC information provided by industry
  - e. Knowledge of the M and T ratings of respondent's cellphones and hearing aids

# Overview of the Wireless RERC

- **Founded in 2001**
  - by grant from U.S. Dept of Education, National Institute on Disability and Rehabilitation Research (NIDRR)
  - Currently in Year 3 of our third 5-year grant cycle, which began in October 2011
- **Partners**
  - Shepherd Center
    - consumer research, industry outreach and training
  - Georgia Institute of Technology (Georgia Tech)
    - policy research, technology development

# Overview of the Wireless RERC

Organized into 3 areas:

- Research

  - R1 - User-Centered Research

  - R2 - Policy Approaches to Accelerate Wireless Accessibility

- Engineering and Development

  - D1 - App Factory for Assistive and Accessibility Apps

  - D2 - Emergency Lifelines on Wireless Platforms

- Training and Outreach

  - T1 - Promoting Awareness of Access and Usability Needs

  - T2 - State of the Technology Conference

  - T3 - Student Capacity Building

# Research Projects

## R1 – User Centered Research

- Survey of User Needs (SUN)
- Consumer Advisory Network (CAN)
- Topical Surveys
- Focus Groups/User Studies/Technology Evaluations



## R2 – Policy Approaches to Accelerate Access to Advanced Wireless Technologies

- Regulatory Filings
- Trends and Barriers Analysis
- Technology and Policy Highlights



# Development Projects

## D1 – The App Factory

- Development of accessible and/or assistive apps
- Wireless RERC funds app developers through annual RFP
- Ability to fund up to 8 apps per year



BrailleTouch



IDEAL Currency Identifier



Access Note



Georgia ReadMore for ASL Learners

• Alternative text input app based on the Braille alphabet

• Identifies three generations of U.S. currency notes beginning in 1993

• Note taking app designed for people with substantial loss of vision

• Streams video of GPB's Georgia Read More program with ASL overlay

# Development Projects (cont.)

## D2 – Emergency Lifelines on Wireless Platforms

- **External Alerting Interface** - Control traditional alerting devices such as bed shakers and light flashers from wireless devices via Bluetooth
- **WEA Video Platform** - Test methods to provide American Sign Language to Wireless Emergency Alerts
- **AAC Emergency Alerts** - Allow access to emergency communications channels such as 9-1-1 via AAC devices (Augmentative and Alternative Communications)

# Training Projects

## T1 – Promoting Awareness of Access and Usability Needs for Wireless Devices

- Training events
- Re: Wireless - Industry/Consumer Newsletter
- Events/Conferences/Webinars/Trade Shows



## T2 – State of Technology Summit 2015

- Experts exploring micro and macro trends in wireless technology



## T3 – Building Research Capacity in Wireless Accessibility and Usability

- Annual student design challenge
- Annual Healthy Environments and Active Living (HEAL) open house at Georgia Tech



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# Overview of HAC Requirements

## Hearing Aid Compatibility Act of 1988 (HAC Act)

- Requires the FCC to ensure that telephones manufactured or imported for use in the United States after August 1989, and all "essential" telephones, are hearing aid-compatible.
- Exempted "telephones used with public mobile services" (wireless telephones)
- But gave FCC authority to revoke or limit the exemption in order to ensure that the HAC Act keep pace with the evolution of telecommunications

## 2004 Update

- **AAC Emergency Alerts** - Allow access to emergency communications channels such as 9-1-1 via AAC devices (Hearing and Alternative Communications)

# Overview of HAC Requirements

## Federal Communications Commission HAC rules (2003)

- FCC adopted rules to limit cellphone exemption
- Graduated implementation of rules requiring manufacture and sale of HAC compliant cellphones

# Overview of HAC Requirements

## Acoustic versus Inductive Coupling: Hearing Aids and Cellphones

- Hearing aids operate in one of two modes – acoustic coupling or telecoil (inductive) coupling.
- Hearing aids operating in **acoustic coupling mode** receive and amplify all sounds surrounding the user; both desired sounds, such as a telephone's audio signal, as well as unwanted ambient noise.
- Hearing aids operating in **telecoil coupling mode** avoid unwanted ambient noise by turning off the microphone and receiving only signals from magnetic fields generated by telecoil-compatible telephones.
- In the United States, about 60 percent of hearing aids contain telecoils, which generally are used by individuals with profound hearing loss.

# Overview of HAC Requirements

## Analog versus Digital Wireless Phones

- Analog phones usually **do not** cause interference with hearing aids.
- Digital wireless telephones can cause interference because of electromagnetic energy emitted by the telephone's antenna, backlight or other components.
- Therefore, FCC has adopted specific hearing aid compatibility rules for digital wireless telephones.

# Overview of HAC Requirements

## M and T ratings

- Cell phones and hearing aids inter-operate in one of two modes:
  1. Microphone coupling mode (M rating)
  2. Telecoil coupling mode (T rating)
- Each mode is rated on a scale of 1-4 (with 4 being the best) in terms of the resistance of the device to interference

## Rating your cellphone and hearing aid

M (cellphone) + M (hearing aid) = Resistance to interference

**OR**

T (cellphone) + T (hearing aid) = Resistance to interference

# Overview of HAC Requirements

**M and T ratings** - Higher rating means you will be able to hear better the particular mode

## **Rate your cellphone**

- Cell phones that work well with hearing aids will have a microphone (M) rating of M3 or M4. This means the cell phone will work with the hearing aid in the microphone position.
- If you have a hearing aid or cochlear implant with a telecoil, look for a phone that has a telecoil (T) rating of T3 or T4.

## **Rate your hearing aid**

- Hearing aids using the microphone mode will be rated M1 to M4.
- The rating for the telecoil will be from T1 to T4.

# Overview of HAC Requirements

## M and T ratings – Resistance to interference

M (cellphone) + M (hearing aid) = Resistance to interference

**OR**

T (cellphone) + T (hearing aid) = Resistance to interference

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- **Combined rating 6:** Considered "best" or "excellent." This rating would provide highly useable, excellent performance.
- **Combined rating 5:** Considered "normal." Acceptable for normal, regular phone use.
- **Combined rating 4:** Considered "usable." May be able to complete a brief call, but not an acceptable quality for normal, regular phone use.

# Overview of HAC Requirements

## Federal Communications Commission Requirements

### For Acoustic Coupling

- Each handset manufacturer must meet at least an M3 rating for 1/3 of the handset models that it offers to service providers per digital air interface. If 1/3 of the manufacturer's handset models works out to a fraction, they may round the result down.
- Each nationwide and non-nationwide wireless service provider (Verizon Wireless, AT&T Mobility, Sprint Nextel, T-Mobile) must meet at least an M3 rating for 50% or 8 of the handset models it offers to consumers, whichever is less, per digital air interface (GSM, CMDA).
- For service providers that do not meet 50 percent threshold, the minimum number of compatible models increased to 10 in 2010.

# Overview of HAC Requirements

## Federal Communications Commission Requirements

### For Inductive Coupling

- Each handset manufacturer must offer at least two T3-rated handset models per digital air interface.
- In addition, manufacturers have to ensure that one third of their handset models per air interface meet at least a T3 rating. If this percentage works out to a fraction, the manufacturer may round the result down; however, any manufacturer offering four or more handset models over a digital air interface must offer at least two that meet a T3 or higher rating.
- Each wireless service provider must meet at least a T3 rating for one third or ten of the handset models it offers to consumers, whichever is less, per digital air interface.

# Overview of HAC Requirements

## Federal Communications Commission Requirements

### “De minimis” exception

- The FCC allows a "de minimis" exception to its requirements:
  - Wireless service providers and handset manufacturers that offer two or fewer digital wireless handsets in the U.S. for a particular air interface need not offer hearing aid-compatible handsets.
  - Wireless service providers and handset manufacturers that offer three digital wireless handsets in the U.S. for a particular air interface must offer at least one hearing aid-compatible handset model.
- Beginning September 8, 2012, wireless service providers and handset manufacturers that are not small entities under Small Business Administration standards, and that have been offering handsets over a digital air interface for at least two years, will no longer qualify for the *de minimis* exception.

# Overview of HAC Requirements

## Federal Communications Commission Requirements

### Packaging and testing requirements

- Packages containing hearing aid-compatible handsets must be explicitly labeled and must include detailed information in the package or product manual.
- Wireless service providers must offer a means for consumers to test hearing aid-compatible handsets in their owned or operated retail stores.
- Since January 15, 2009, manufacturers and service providers have been required to post information about their hearing aid-compatible handset offerings on their websites.

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# Overview: Hearing Aid Compatibility Survey

## ➤ Background

- Launched in 2006
- Conducted every year until 2010 (5 years)

## ➤ Current survey

- Conducted in 2013
- Data collected:  
April 8 – December 20
- Added questions from FCC

The screenshot shows a document titled "Hearing Aid Compatibility Survey 2013". The document contains the following text:

**Hearing Aid Compatibility Survey 2013**

**Hearing Aid Compatibility Survey**

The Hearing Aid Compatibility Act of 1988 (HAC Act) requires that landline telephones manufactured or imported for use in the United States after August 1989 be hearing aid-compatible. In 2003, the Federal Communications Commission (FCC) adopted rules to make digital wireless telephones (cell phones) compatible with hearing aids and cochlear implants.

The Wireless Rehabilitation Engineering Research Center (Wireless RERC) monitors this regulation and is interested in how it impacts the usability of cell phones for people who use hearing aids and cochlear implants.

We invite people who use hearing aids or cochlear implants to participate in the survey regarding their use of cell phones. The purpose of this survey is to analyze the compatibility of hearing aids. We plan to conduct this survey annually to track any changes in cell phone and hearing aid compatibility.

Please try your best to complete all parts of this survey. Your answers are important to us, even if you don't use wireless technology. This survey can be completed by an assistant or caregiver for you if you are unable to complete it directly.

Your personal information will not be sold or used in any way other than for research related to this survey. Your personal data will be kept strictly confidential.

Please take the HAC survey and enter a drawing for the chance to win one of four \$50 Amazon gift certificates. Participation in the survey is not required to enter the drawing. Just provide your contact information for a chance to win.

**ABOUT US**  
This survey is being conducted by the Rehabilitation Engineering Research Center for Wireless Technologies (Wireless RERC), which is funded by a 5-year grant from the U.S. Department of Education's National Institute on Disability and Rehabilitation Research (grant number H133E110002). For more information about the Wireless RERC, please visit us on the Internet at: [www.wirelessrerc.org](http://www.wirelessrerc.org).

If you have questions or need help with this survey, please contact:  
John Morris  
404-307-1348  
[john\\_morris@shepherd.org](mailto:john_morris@shepherd.org)

**1. What is your hearing status?**

Hard of hearing

Late-deafened

Deaf (primarily use sign language to communicate)

Deaf (oral – primarily use voice to communicate)

Other (please specify)

\_\_\_\_\_

# Overview: Hearing Aid Compatibility Survey

## Organization of the HAC Survey

Part 1	About you – Demographics (age, race, gender, etc)
Part 2	Hearing status and hearing technology used
Part 3	Cellphone use and other assistive technology
Part 4	Cellphone purchase experience and satisfaction
Part 5	Ratings knowledge, sound quality satisfaction

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# Hearing Aid Compatibility Survey - Sample

Data collection period: 04/08/2013 – 12/20/2013

Number of respondents/ with hearing aids: 656 / 567

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## Gender

- Female 65%
- Male 35%

## Age

- Range 18-90
- Mean 58
- Median 60
- Std Deviation 15.9

## Employment

- Full time 37%
- Part time 12%
- Retired 36%
- Not employed 15%

# Hearing Aid Compatibility Survey - Sample

## WHAT IS YOUR RACIAL/ETHNIC BACKGROUND? (Check all that apply)

Asian/Pacific Islander	1.6%
Black/African American	1.1%
Hispanic/Latino	2.6%
Native American	1.2%
White/Caucasian	84.5%
Other	0.5%
Not answered	8.5%

# Hearing Aid Compatibility Survey - Sample

## WHAT IS YOUR ANNUAL GROSS HOUSEHOLD INCOME?

	Survey sample
Less than \$10,000	4.9%
\$10,000-\$14,999	6.1%
\$15,000-\$24,999	8.3%
\$25,000-\$34,999	10.1%
\$35,000-\$49,999	12.3%
\$50,000-\$74,999	22.6%
\$75,000 or more	35.7%

# Hearing Aid Compatibility Survey - Sample

## WHAT IS YOUR HIGHEST LEVEL OF EDUCATION COMPLETED?

	<b>HAC</b>
Not applicable or no schooling	0.2%
Elementary school	1.2%
High school diploma or GED	4.6%
Some college, no degree	18.0%
Associates degree	10.1%
Bachelors degree	31.9%
Masters or doctoral degree	34.1%

# Hearing Aid Compatibility Survey - Sample

## What kind of hearing technology do you use?

Behind ear aids	60.1%
In the ear aids	11.3%
Bone anchored hearing aids	1.3%
Cochlear implant	27.3%

\*Percent of all respondents who use some sort of assistive hearing technology.

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# Cellphone ownership by type of hearing tech

Do you currently use a cellphone?  
(by **type of hearing tech used**)

	Yes (%)
Behind ear aids	88%
In the ear aids	96%
Bone anchored hearing aids	100%
Cochlear implant	89%

# Cellphone ownership by age

Do you currently use a cellphone?  
(by **Age**)

	Yes (%)
18-29	96%
30-49	88%
50-64	90%
65 or older	89%

\*Percent of all respondents who use some sort of assistive hearing technology.

# Ability to use cellphone with hearing tech

Can you use your current cellphone while using your hearing aid, cochlear implant or other hearing tech?  
(by **type of hearing tech used**)

	Yes (%)
Behind ear aids	82%
In the ear aids	78%
Bone anchored hearing aids	29%
Cochlear implant	84%

# Ease of finding a compatible phone

How difficult was it to find a cell phone that works with your hearing aid, cochlear implant or other hearing tech?  
(by **type of hearing tech used**)

<b>EASY OR VERY EASY</b>	<b>(%)</b>
Behind ear aids	22%
In the ear aids	24%
Bone anchored hearing aids	33%
Cochlear implant	25%

# Ease of finding a compatible phone

How difficult was it to find a cell phone that works with your hearing aid, cochlear implant or other hearing tech?  
(by **Age**)

<b>EASY OR VERY EASY</b>	<b>(%)</b>
18-29	28%
30-49	25%
50-64	22%
65 or older	22%

# Satisfaction with sound quality

How **SATISFIED** are you with your cellphone?

*Clarity is good. You can hear and understand the other person. Volume is loud enough.*

(by **type of hearing tech used**)

**SATISFIED OR VERY SATISFIED**

**(%)**

Behind ear aids

42%

In the ear aids

54%

Bone anchored hearing aids

50%

Cochlear implant

51%

# Satisfaction with sound quality

How SATISFIED are you with your cellphone?

*Clarity is good. You can hear and understand the other person. Volume is loud enough.*

(by **Age**)

SATISFIED OR VERY SATISFIED	(%)
18-29	35%
30-49	49%
50-64	49%
65 or older	43%

# Sources of cellphone information

## How did you find your cellphone? (by **Type of hearing tech used**)

	Recommen dation	Package label	Sales person	Online research	Other
Behind ear aids	21%	13%	23%	29%	27%
In the ear aids	24%	8%	22%	27%	27%
Bone anchored hearing aids	14%	14%	14%	29%	0%
Cochlear implant	27%	18%	14%	28%	32%

# Sources of cellphone information

## How did you find your cellphone? (by Age)

	Recommen dation	Package label	Sales person	Online research	Other
18-29	19%	12%	31%	19%	31%
30-49	20%	21%	9%	34%	21%
50-64	24%	13%	19%	30%	33%
65 or older	24%	11%	27%	26%	26%

# Satisfaction with HAC information

How **SATISFIED** are you with HAC information received from:

## **SATISFIED OR VERY SATISFIED**

**(%) \***

Websites and packaging by service providers and manufacturers?

21%

Retail staff

17%

\*All respondents who own a cellphone and use hearing technology.

# Satisfaction with HAC information

How **SATISFIED** are you with HAC information received from:

<b>SATISFIED OR VERY SATISFIED</b>	<b>(%)</b>
Websites and packaging by service providers and manufacturers?*	25%
Retail staff**	29%

\* Respondents who own a cellphone and use hearing technology, AND who researched online or used package information to find their cellphone.

\*\* Respondents who own a cellphone and use hearing technology, AND who consulted a salesperson to find their cellphone.

# Knowledge of M and T ratings

Do you know the M and T ratings of your hearing aid and cellphone? (by **type of hearing tech used**)

Yes (%)	Hearing aid	Cellphone
Behind ear aids	33%	37%
In the ear aids	13%	16%
Bone anchored hearing aids	14%	29%
Cochlear implant	26%	55%

# Knowledge of M and T ratings

Do you know the M and T ratings of your hearing aid and cellphone? (by **Age**)

Yes (%)	Hearing aid	Cellphone
18-29	20%	36%
30-49	33%	39%
50-64	33%	44%
65 or older	24%	35%

# Thank you!

John Morris, Ph.D.

Research Scientist

john\_morris@shepherd.org

404-367-1348