Smartphones: Audiologic Considerations for Facilitating Communication

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Orlando, FL
Learning Objectives

• Participants will be able to identify current and future smartphone features that facilitate communication.
• Participants will be able to identify smartphone apps that can facilitate communication.
• Participants will be able to identify current smartphone hearing aid compatibility (HAC) features.
Disclaimer

I have no relevant financial or nonfinancial relationships in the products or services described, reviewed, evaluated or compared this presentation

Note:
Images from the Web in presentation “labeled for reuse.”
Why Inclusion of Smartphones

1. Phone conversation is challenging for many persons with hearing loss
2. Consumer adoption of smartphones
3. Consumers satisfaction and hearing aid adoption increase with “high multiple environmental listening utility” (MELU)
4. Differentiate services of audiologist from Costco/Walmart/Sams bulk store services
5. Manufacturer trend to offer smartphone apps for HA/implants
6. Apps for AR
7. Provide additional avenues to facilitate communication/repair communication breakdowns
8. Improve phone communication and resolve communication participation/restrictions (WHO)
9. Younger, tech-savvy customers entering market and new potential opportunities to reach younger consumers.
10. Smartphones will become increasingly powerful and provide increasing accessibility features
11. Made For iPhone (MFi )
12. PSAP device (AUD-1 app)
United Nations Study

• U.N. Report March 2013: More people have access to cell phones than toilets!
• 7 billion people:
  - 6 billion have mobile phones
  - 4.5 billion have access to working toilets
“New” Digital Swiss Army Knife

• Mobile/portable
• Volume control/Speaker phone
• Direct Audio Input (DAI)/Loop compatible
• Bluetooth
• Telecoil compatibility/HAC features
• Closed Captioning
• Text communication
• Communication Apps
• Increased audio bandwidth
• Audio, visual, haptic (vibration) features
• Video conferencing (Skype, FaceTime, Google Hangouts)
• Electronic media (Internet, movies, music, etc.)
Fastest Growing Technology

- Smartphones sales surpassed PCs in 2010
- “Mobile broadband uptake is growing at 30 per cent per year, according to the 2013 State of the Broadband report, and will be the fastest growing technology in history.”

Smartphone Adoption

- Almost 2/3 of Americans owned a smartphone in 2013
- Sales of smartphones surpassed feature phones in 2013

Future Smartphones

“Taking Moore's Law to its extreme conclusion, smartphones should be packing sub-20nm 256-bit, 32-core processors in five years.”

Future Smartphones

• **Augmented Reality (AR):** refers to what is perceive through one’s senses enhanced through computer-generated sensory input such as sound, video, graphics and GPS data.

• More information is made available by combining computer data to what we see in real life.

• **Example:** Audio-Visual Speech Recognition (AVSR) combines audio, video, and facial expressions to capture speaker’s voice.

Future Smartphones

• 3D
• Holographic projections
  - Provide better speechreading cues in 3 dimension?
Future Smartphones

• Ubiquitous, seamless Wi-Fi, everywhere
• Wi-Fi will create cellular-like automatic, ubiquitous and secure Wi-Fi connections. without ever losing a Wi-Fi connection

See: www.google.com/loon/
Future Smartphones

- **Biometric Data:** Transmit hearing aid/implant data-logging information regarding listening conditions, sound sampling, etc., to audiologist
Future Smartphones

- **4G LTE Advanced**: Also known as Long Time Evolution (LTE) Wideband or LTE-A, will deliver data at 150-300 megabits per second (mbps)
  - Up to 20 times faster than current 4G LTE cellular connections
- **HD Voice** (7 kHz bandwidth)
- **Full HD Voice** (20 kHz bandwidth)

See: [www.full-hd-voice.com](http://www.full-hd-voice.com) to listen to comparison of 3.4, 7, and 20 kHz example
Anytime, Anywhere, Anything

• GM and Audi cars to offer "connected cars" 2015
  – GM vehicles integrate with the iPhone or iPad and GM's own OnStar service.
  – Implications for Made for iPhones Hearing Aids?

Smartphone Vs. Feature Phone

- **Smartphone**: A cellular phone that is able to perform many of the functions of a computer, typically having a relatively large screen and an operating system capable of running general-purpose applications. (Google Online Dictionary)

- **Feature Phone**: A mobile phone that incorporates features such as the ability to access the Internet and store and play music but lacks the advanced functionality of a smartphone (Google Online Dictionary)

- **Smartphone**: A mobile phone with a touch screen, third party operating system, Internet accessible and used for communication. (Hanavan, 2014)
Phone Vs. Phablet Vs. Tablet

• Smartphone
  - Typically varying screen sizes from 3 inches to 5 inches

• Phablet
  - Device that combines capabilities of smartphones and tablets, usually larger than a smartphone, but smaller than a tablet

• Tablet
  - Device that has a touch screen interface, and usually larger than a phablet
Operating Systems Vs. Applications

• **Operating System (OS):** Software that runs/manages the smartphone computer memory, processes, and all of its application software (apps) and hardware.
  
  - Android 50.3% U.S. sales, 3Q 2013
  - iOS 43.1%
  - Windows Phone 4.7%
  - Blackberry 0.6%
  - Other 1.3%

• **Application Software (Apps):** Smartphone software that causes the smartphone to perform useful tasks beyond the running of the computer itself.
U.S. Smartphone OS (Platform) Projections

Figure 1 – Smart Phone Unit Market Share - Forecast Ratios By Operating System – 2003-2017

Source and Copyright ITCandor, 2012
World Wide Smartphone Sales

World-Wide Smartphone Sales (%)
## U.S. Mobile Phone Penetration

<table>
<thead>
<tr>
<th>Generation</th>
<th>Age</th>
<th>Mobile Phone</th>
<th>Smartphone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen Z</td>
<td>18-23</td>
<td>95%</td>
<td>64%</td>
</tr>
<tr>
<td>Gen Y Millennials</td>
<td>24-32</td>
<td>97%</td>
<td>72%</td>
</tr>
<tr>
<td>Gen X</td>
<td>33-46</td>
<td>95%</td>
<td>61%</td>
</tr>
<tr>
<td>Younger boomers</td>
<td>47-56</td>
<td>92%</td>
<td>39%</td>
</tr>
<tr>
<td>Older boomers</td>
<td>57-67</td>
<td>89%</td>
<td>28%</td>
</tr>
<tr>
<td>Golden generation</td>
<td>68-88</td>
<td>85%</td>
<td>16%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>93%</td>
<td>50%</td>
</tr>
</tbody>
</table>

*(eMarketer, January 2013)*
# Brand by Generation

<table>
<thead>
<tr>
<th>Brand</th>
<th>Generation</th>
<th>Note</th>
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</thead>
<tbody>
<tr>
<td>iPhone</td>
<td>Generation Y</td>
<td>generation more likely</td>
</tr>
<tr>
<td>Samsung</td>
<td>all other ages</td>
<td>led or tied Apple</td>
</tr>
<tr>
<td>LG</td>
<td>Generation Golden</td>
<td>particularly favored</td>
</tr>
</tbody>
</table>

(eMarketer, January 2013)
Hearing Aid Use with Telephones

- One reason patients purchase but do not use--perceived hearing aids do not work with telephone (Kochkin 2000)
- Hearing aids may not provide satisfactory benefit when used with telephone (Palmer 2001)
- 4 of 10 hearing aid users satisfied with hearing aid performance with telephone (Kochkin 2002)
- 1 of 5 indicated dissatisfaction when using telephone with hearing aids (Kochkin 2005)
Likely to Adopt HA

• About a third (34.2%) would be highly motivated to purchase hearing aids if they worked perfectly on the phone.
• When presented with seven listening situations, potential consumers rate ability to hear soft sounds first (#12), followed by hearing aids working perfectly on phone (#19).

Likely to Adopt HA

• Non-adopters with hearing loss reported non-use of loop systems in teleconferencing, telephone captioning services, alerting devices, and external microphones
• Small minority use telephone ring indicator (14%), telephone amplifier (7%), earphones for the television (3%), amplified headsets in public places (2%), and loop systems with headsets in public places (0.5%)

Hearing Aid Orientation

- Practical Hearing Aid Skills Test (PHAST)
- 75% of experienced HA users unable to perform appropriate telephone use with hearing aids

(Desjardins & Doherty 2009)
Practical Hearing Aid Skills Test-Revised
PHAST-R

• Eight tasks on the PHAST-R cover the following skills:
  (1) hearing aid insertion
  (2) hearing aid removal
  (3) opening the battery door
  (4) changing the hearing aid battery
  (5) cleaning the aid
  (6) manipulating the volume control
  (7) telephone use (ranked highest)
  (8) use of the noise program

Smartphone Calling Difficulty Factors

- Poor signal characteristics due to limited codec bandwidth
- Hearing aid incompatibility
- Absence of visual cues
- Coupling phone with hearing aids
- Difficulty hearing in presence of background noise
- Electromagnetic interference
- Feedback
Wireless – Acoustic Coupling Comparison

Several factors contributed to difficulties communicating on phone:

1. Absence of visual cues
2. Inappropriate or inadequate strategies using phone with hearing aids
2. Presence of background noise

Wireless – Acoustic Coupling Comparison

- Phone signal transmitted to both ears results in significantly better speech recognition compared to signal to only one ear.
- Binaural telephone listening can be accomplished by using a streamer between the telephone and the hearing aids.
- Technologies that allow for data streaming between two hearing aids, a relay is unnecessary and can receive binaural hearing on the phone holding mobile phone to one ear.

Six Listening Strategies

- Three unilateral telephone conditions and one bilateral telephone condition (unilateral acoustic telephone with contralateral ear amplified or plugged),
- Unilateral telecoil with contralateral ear amplified or plugged,
- Unilateral wireless streaming
- Bilateral wireless streaming
- Best performance using bilateral wireless streaming

Mobile Phone Bandwidth

• Compared listening abilities of 3.5 and 7.5 kHz bandwidths in laboratory setting
• Significant improvement in phoneme-recognition scores with increased audio bandwidth of 7.5 kHz

Internet Video Telephony

• Internet versus conventional telephone quality across all subject groups:
  – 15% (4-33) better with monosyllabic word test
  – 25% (8-51) better for sentence test

• Speech perception was not significantly different when Internet telephone quality was compared with high-cut CD quality

• Internet telephony offers significantly improved speech perception to hearing-impaired and normal-hearing adults under ideal laboratory conditions through doubling the frequency range and through conserving audio quality during digital sound processing.

Internet Video Telephony

• Frame rates above 15 fps
• Camera resolution above 640x480 px,
• Slower speaker and shorter audio-visual delay (100 ms).
• Overall, Internet video telephony transmits sufficient lip shape information for speech reading by deaf and CI individuals.
• Significant audio-visual benefits observed for CI users;
• Bimodal cues with the addition of sign language for deaf individuals or auditory input for CI patients still recommended for engaging in meaningful video-conversation over the web.

Internet Video Telephony

- Skype (CI and deaf subjects)
- Overall, Internet video telephony transmits sufficient lip shape information for speech reading by deaf and CI individuals
- Significant audio-visual benefits observed for CI users
- Speechreading cues available with Skype although scores poorer than face to face
- Bimodal cues with the addition of sign language for deaf individuals or auditory input for CI patients still recommended for engaging in meaningful video-conversation over the web

4G/LTE

- 4th Generation/Long Term Evolution
- CDMA, GSM will be the past
- LTE data
- LTE voice (U.S. began implementation 2013)
- Which codecs will be adopted by various service providers?
- If adopted, will there be HD Voice or Full HD Voice available between calls of various service providers?
- Adoption of Full HD Voice would have positive implications for very high voice quality via cell phones
Smartphone Hearing Aid Compatibility Features

- Audio, Visual and Vibrating Features
- Bluetooth®, Loopsets, Neckloops, or Silhouette Compatible
- Closed Captioning
- Hearing Aid Compatible
- Hearing Aid Menu - Telecoil function on some cell phones requires user activation--abled “Hearing Aid Mode” or “Hearing Aid Compatible Menu.”
- Text Communications - Apps with similar text-based web services can also be downloaded.
- TTY Compatible
- Video Conferencing
- Visual Displays to Indicate Call Functions
- Voice Output
- Volume Control
iPhone Hearing Accessibility

FaceTime
Closed Captioning
iMessage
Mono Audio
Visible and Haptic Alerts

Visual and vibrating alerts for FaceTime calls, new text messages, new and sent mail, and calendar events

LED light flash for incoming calls and alerts

Visual Voicemail
TTY Support

www.apple.com/accessibility/iphone/hearing.html
Google Phone Accessibility

Google Hangouts
Google Voice
Google SMS
Google Voice
Google Translate
Mono Audio
Visual and Haptic Alerts

www.google.com/accessibility/products/#hard-of-hearing
Smartphone Input to HA/Implant Device

- Smartphone
  - Audio
    - Earphone or speakerphone
  - Magnetic Induction
    - Telecoil
      - Neckloop or Silloutte
  - Direct Audio Input (DAI)
    - Adaptors or Cords
  - Streamer
    - Magnetic Induction, DAI, RF (including FM)
  - Radio Frequency (RF) Bluetooth
SSD/UHL

Mono headset or earplug patch cord

- 3.5 mm mono audio jack for smartphone
- Some streamers use 2.5 mm jack to streamer
Accessories for Smartphone

DAI patchcords

• 3.5 mm jack for most smartphones and 2.5 mm jack to connect to streamer 3.5 mm jack with either mono or binaural universal 3 pin Euro jack patchcord to connect to HA/Implant
Most Smartphone – HA Configurations

- Smartphone
  - Streamer
  - Smartphone with App (remote control)
  - HA, Implant Device
Smartphone Connections to Streamers

Smartphone

DAI

Bluetooth
Streamers

- Bernafon SoundGate 2 and Phone Adapter 2
- GN ReSound Unite PhoneClip+ and Resound Control
- Oticon ConnectLine Streamer Pro with "mini-mic"
- Phonak Roger Pen and Inspiro wireless microphone transmits to hearing aids via proprietary 2.4 GHz.
  - Wireless transmitter can stream smartphone audio using Bluetooth 4.0 wideband receiver from Bluetooth devices
- Siemens miniTek features a "mini-mic"
- Starkey SurfLink Mobile
- Unitron uDirect2
- Widex WidexLink M-DEX
New Paradigm

Smartphone
(with App)
MFi
Streams audio directly to HA and serves as remote with app

HA/Implant via Bluetooth 4.0
### Bluetooth 4.0 and MFi Hearing Aids

<table>
<thead>
<tr>
<th>Hearing Aid</th>
<th>Model</th>
<th>App</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN ReSound</td>
<td>LiNX</td>
<td>ReSound Smart</td>
</tr>
<tr>
<td>Beltone</td>
<td>First</td>
<td>SmartRemote</td>
</tr>
<tr>
<td>Starkey</td>
<td>Halo</td>
<td>TruLink</td>
</tr>
<tr>
<td>Oticon*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Oticon continues to use streamer with MFi
ReSound Smart App with LiNX

- ReSound LiNX and one or more of the following devices:
  - iPhone 5s, iPhone 5c, iPhone 5, iPad (4th generation), iPad Air, iPad mini, iPad mini with Retina display (running in 2X mode), and iPod touch (5th generation).
  - iOS 7.X or later
  - Optimized for iPhone 5s, iPhone 5c, iPhone 5.
GN ReSound LiNX Smart App
ReSound Smart App (iOS)

The ReSound Smart™ app enables you to control and personalize your hearing experience. First hearing aid app with a direct connection between your ReSound LiNX™ hearing aids and iPhone®, iPad® or iPod touch®.

- Adjust volume settings on your hearing aids
- Change manual and streamer programs
- Edit and personalize program names
- Adjust treble and bass to your preferences
- Link a program and settings to favorite places
- See battery and connection status
- Get inspiration and personalized information about your hearing aid
- Stream phone calls, music, audio from videos, movies & games, turn-by-turn directions, FaceTime® conversations, Siri® from iPhone to LiNX
- Help locate lost or misplaced hearing aids
Starkey Hearing Halo™

• MFi
• Stream calls, FaceTime®, music from iPhone directly to hearing aids using Bluetooth® 4.0 wireless technology
• Remotely control aids with iPhone app
• Pristine sound and exceptional listening clarity
• Help hear comfortably in noise
• Eliminate buzzing and whistling
Oticon Joining Apple MFi

• Oticon’s MFi solution will be available for all existing and future users of Oticon’s ConnectLine instruments
• Includes an installed base of around 2 million current users of wireless Oticon hearing instruments
AB Phonak

- “Marrying” Phonak hearing aid technology (Naida) with Advance Bionics CI technology
- Roger 2.4 GHz wireless streaming technology
ReSound Unite with Cochlear Nucleus 6

• Cochlear’s Nucleus 6 cochlear implant speech processor
• Uses GN ReSound Unite 2.4 gHz wireless streaming accessories
Oticon, Oticon Medical and Neurelec

• Oticon hearing aids and accessories
• Oticon Medical Pronto (bone anchored hearing aid)
• Neurelec (cochlear implant)
Hearing Aid Compatibility for Wireless Telephones

Background

The Hearing Aid Compatibility Act of 1988 (HAC Act) generally requires that the Federal Communications Commission (FCC) ensure that telephones manufactured or imported for use in the United States after August 1991, and all “essential” telephones, are hearing aid-compatible. When Congress passed the Act in 1988, it specifically exempted “telephones used with public mobile services” (wireless telephones) from these requirements. To ensure that the HAC Act kept pace with the evolution of telecommunications, however, Congress granted the FCC a means to revoke or limit the exemption for wireless telephones. On August 14, 2003, the FCC determined that continuation of a complete exemption for wireless telephones would have an adverse effect on individuals with hearing disabilities, and that limiting the exemption was technologically feasible and in the public interest. Based upon these findings, the FCC
Wireless Acoustic Coupling

• Each handset manufacturer must meet at least an M3 rating for one third of the handset models that it offers to service providers per digital air interface.

• Each nationwide wireless service provider (Verizon Wireless, AT&T Mobility, Sprint Nextel and T-Mobile) must meet at least an M3 rating for 50 percent or eight of the handset models it offers to consumers, whichever is less, per digital air interface.
  – For service providers that do not meet the 50 percent threshold, the minimum number of compatible models required increased to ten on February 15, 2010.

• Each non-nationwide wireless service provider must meet at least an M3 rating for 50 percent or eight of the handset models it offers to consumers, whichever is less, per digital air interface.
  – For service providers that do not meet the 50 percent threshold, the minimum number of compatible models required, increased to ten on May 15, 2010.
Wireless 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.
  - 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.
Exceptions for Small Manufacturers/Service Providers

- The FCC "de minimis" exception to its requirements for handset manufacturers and wireless service providers offering a small number of HAC handsets. Under this exception:
  - 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. All such service providers and manufacturers will be required to offer at least one hearing aid compatible model for acoustic coupling and for inductive coupling per air interface."
CTIA Website for Accessibility

Welcome to the most complete website designed to help people with disabilities, seniors and their families to find a cell phone and service! CTIA-The Wireless Association® and the wireless industry created AccessWireless.org to be your “first stop” to learn about the ever-changing world of cell phones and wireless services, and discover those that meet your specific needs.

- PHONES
- CARRIERS & SERVICES
- MANUFACTURERS
- GUIDES & HOW TOs

Hearing
For people who need handsets with volume, text, video communication or hearing aid compatible features.

Vision
For people who need handsets with voice output, voice control or tactile features.

Mobility/Manipulation
For people who need easy to use handsets.

Speech
For people who need handsets for text-based communications.

Cognition
For people who need handsets that are easy to understand.

Read More

March 13, 2012 - Free Applications for the Blind and Visually Impaired that Offer Accessibility
Global Accessibility Reporting Initiative (GARI)
## Smartphone Apps

<table>
<thead>
<tr>
<th>App Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>Evernote, DeafNote</td>
</tr>
<tr>
<td>Listening Practice</td>
<td>Auditory Verbal, Sound Match, Cochlear HOPE Words, Hear Coach, Baldi, music</td>
</tr>
<tr>
<td>Weather Alerts</td>
<td>Weather Alerts</td>
</tr>
<tr>
<td>Hearing Tests</td>
<td>uHear, Ear Trumpet, Siemens Hearing Test, Ling 6</td>
</tr>
<tr>
<td>Caption, Subtitles</td>
<td>CaptionFish, subtitles, Netflix, TED Talk subtitles</td>
</tr>
<tr>
<td>Amplifiers</td>
<td>AUD1, EARs, Sound AMP R, Ear Trumpet</td>
</tr>
<tr>
<td>Hearing Aid Adjusters</td>
<td>T², SoundPoint</td>
</tr>
<tr>
<td>Telephone</td>
<td>CapTel, IP-Relay, VRS</td>
</tr>
<tr>
<td>Hearing Aid/CI</td>
<td>BAHA, Hearing Aid Tic Tac Toe</td>
</tr>
</tbody>
</table>
Oticon Hearing Diary App (iOS)
Cognitive/Attention Mind Builder (iOS) $.99

Mind Builder

Level 1

If you see a block 'light' up twice in a row, then press the 'Location' button.

Note: In some turns you should not press any button, while in other turns you may need to press more than one button.

Start Level 1

Performance Statistics

Overall

DIFFICULTY INCREASED!
You played well! Now read the rules because its going to get harder!

Start  Menu
Fish Ears (Android) free

Your Fish Ears detect differences of 2.00 Hz

This is great, you are better than P50, which means that you belong to the better half of the hearing listeners (Δ ≤ 3 Hz).

Find out what this means on the Eargroup's web site.
http://www.eargroup.net/FishEar.htm

When a contrast is played, please press the correct response.
AuditoryVoIP (iOS) $4.99

- users can choose their preferred sound quality and volume from various default settings.
- An intelligent signal processing module then optimizes all incoming calls to match this hearing profile.
- The technology is specifically optimized for the frequency range of a telephone signal.
- Compatible with iPhone 4, iPhone 4S, iPhone 5 or iPod™ touch. Note: In order to use AuditoryVoIP, you require a paid account with an SIP provider.
- only compatible with iOS 6. Functionality in iOS 7 is not guaranteed. (An iOS 7 compatible version is in progress.)
- Initial studies show that this allows people with slight to moderate hearing loss to again easily understand telephone conversations.
Auditory Verbal (iPad)($3.99)
Neurelec Rehabilitation Game
Cochlear HOPE Words Lite and HD
Cochlear HOPE Words HD(iOS)($1.99)

- Cochlear HOPE program
- Adopted from **Speech Sounds** and **Speech Sounds Vowels**
- Listen to a word and matching their speech production to what they heard.
- Vocabulary development also facilitated
- Each letter of alphabet has twenty different flashcards
- In some instances, letter may have two different speech sounds (for example, “A” as in “way” or “A” as in “cat”)

**Speech Sounds**

**Speech Sounds Vowels**
AB Apps

- AB CLIX made for tablet rather than smartphone
- AB IT-MAIS
Listen Game (iOS) ($1.99)

Choose the Number of Players:

1 2

Then Choose Your Challenge:

- Cartoon Sounds
- Musical Instruments
- Piano Notes
- Horn Notes
- Bass Notes

Make sure the ringer switch is not set to silent and that your ringer volume is turned up.
Sound Match (iOS) free
Hear Coach (iOS)(free)
Auditory Figure-Ground ($29.99)
Baldi (iOS)($4.99)
Black Hawk, Colorado
Broomfield/Rocky Mtn Metro Airport
Observed Mar 13, at 03:47 PM MDT

Mostly Cloudy
Humidity 19% • Wind W 16 G 30 MPH
Barometer 30.16''
Dewpoint 14°F • Wind Chill 51°F
Visibility 40.00 Mi.

<table>
<thead>
<tr>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
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<td>03/17</td>
<td>03/18</td>
<td>03/19</td>
<td>03/13</td>
</tr>
<tr>
<td>10% Windy</td>
<td>38°</td>
<td>Windy</td>
<td>52°</td>
<td>Breezy</td>
<td>49°</td>
<td>56°</td>
<td>38°</td>
</tr>
<tr>
<td>33°</td>
<td>26°</td>
<td>28°</td>
<td>28°</td>
<td>28°</td>
<td>28°</td>
<td>28°</td>
<td>28°</td>
</tr>
</tbody>
</table>

Monday
Sunrise: 7:16 AM
Windy
Partly sunny, with a high near 52. West wind between 10 and 16 mph, with gusts as high as 22 mph.

52°

Sunset: 7:07 PM
Day Length: 11 Hours 50 Minutes

Monday Night
Moonrise: 1:30 PM

10% A slight chance of rain and snow showers. Mostly cloudy, with a low around 31. Breezy, with a west wind 14 to 17 mph increasing to between 23 and 26 mph. Winds could gust as high as 39 mph.

31° Chance of precipitation is 10%.

Moonset: 3:40 AM

Tuesday
uHear: (iOS)(free)
AUD-1 (iOS)($2.99)
EarTrumpet (iOS)($2.99)

• Medical student developed app for iPhone and iPad which has to enhance and adjust sound to discretely improve hearing experience through earphones provided on your device.

• Developed in collaboration with the Otolaryngology Head and Neck Surgery Department at the University of California, Irvine.
Siemens Hearing Test (iOS)(free)
NOWiHEAR (Android)(free)

Quick Hearing Check

The hearing solution action needed:

Hearing test recommended; hearing solution probably need in many situations.

Find Audiologist

NOWiHEAR.com

NowiHear.com is a wholly owned division of AuDNet, Inc., “America’s Audiology Network”
Ling 6 (iOS)(Android)(free)
Audio Tools SPL Meter (iOS ($19.99)
Too Loud (iOS)(free)
Sound AMP R (iOS)($4.99)
EARs (iOS) ($3.99)
T² Hearing Adjuster(iOS)(Android)($.99)
SoundPoint (iOS)(free)
Hearing Loss Simulator (iOS) ($1.99)
(WebCapTel CA# C118 with a call) (Dialing your telephone number: 1235558654) ~ ~ (F) hey dad it is julie ~ how is mom doing? that is great news I should be over around 5 ~ are John and Sarah going to be there? OK is there anything I should pick up on my way over? Great we will see you soon. Bye.

ringing 1 ... 2 .... 3 .... hello. dr. gaston's office. that's no problem we will change your appointment to 3pm next thursday the 25th. thank you and we will see you next week.

Your conversation has ended. Please touch the "End Call" button below or use any of the navigation tabs to continue.
Wireless CapTel by Sprint (free)
IP-Relay (iOS)(free)

Hi this is Joe (confirming spelling) GA

Hi Joe, Bob here. Wondered where we will meet for lunch today QQ GA

Oh hi Bob let's go ahead and meet at Lucy's at 12:30 GA
IP-Relay (Android) (free)
MED-EL EasyGuide (iOS)(Android)free
Cochlear BAHA Support

Baha® 3 Sound Processor (BP100)

GENERAL
ADJUSTING
BATTERIES
CLEANING
TELEPHONE
TRAVEL
MRI
INCIDENTS
TROUBLESHOOT

© Cochlear Bone Anchored Solutions AB

GENERAL
Basic rules

INSTRUCTIONS
Turning your sound processor on and off
Attaching your sound processor
Removing your sound processor
Reading status indicators – LED lights and beep sounds
Testing your sound processor
Changing colours or moisture barriers
Using a tamper-proof battery
1. The processor is turned 'on' when a charged battery is attached to the processor.

2. When the battery is properly attached, the orange LED located in the center of the volume control flashes to indicate battery charge status.
ClearCaptions (Android/iPhone)(free)
iSpeech Translator (All)(free)
Tap Tap (iOS)($2.99)
Netflix (iOS)(Android)(Windows)(free)
TED Talks with Subtitles (free)
Subtitles allows easy access to a huge library of movie subtitles in 20 languages. Subtitles is especially useful for the hard of hearing and people who would like access to subtitles in their native language when visiting the cinema.
Captionfish (iOS)(free)
TuneWiki (iOS)(Windows)(Android)(free)
Justin Timberlake
Sexyback

[Verse 1]
I'm bringing sexy back
Them other boys don't know how to act
I think you're special, what's behind your back?
So turn around and I'll pick up the slack.

Take 'em to the bridge

[Bridge]
Dirty babe
You see the shackles
Baby I'm your slave

Metallica

Sheet Music: Jewish Traditions for Classical and Fingerstyle Guitar

(Anesthesia)-Pulling Teeth
...and Justice for All
2 X 4
Ain't My Bitch
All Nightmare Long
All Within My Hands

Am I Evil?

Open
Hide Playback

Buy Pro ($1.99)
Settings
Help

Cumnbury Festival 3-4 Jul
www.cumnburyfestival.com
SoundHound (free)
Hi John, call me when you get this e-mail. I'm running a little bit late.
Mobile Skype (iOS)(Android)(free)
FaceTime (iOS)(free)
Google Hangouts
Unable to Hear Your Android Ring?
Visual Ringer (Android) ($.99)
1: Defining Hearing Loss

2: What Causes Hearing Loss?

3: How to Diagnose Hearing Loss

4: Who is At Risk for Hearing Loss?

5: Can Hearing Loss be Prevented?

The human body works like a machine: when one part is not functioning, then the entire system suffers or fails altogether. This can also be said of your hearing system wherein if one component of your ear fails to work, then you can experience hearing loss of varying degrees, depending on the nature of

11: Treatments for Hearing Loss

Treatments for Hearing Loss

Reversing the effects of the loss of hearing can be done in multiple ways. The treatment needed for hearing loss varies according to the severity of the damage to your auditory system, its configuration, and the cause.

12: Causes of Temporary Hearing Loss

What is Temporary Hearing Loss?

While there is a varying degree of hearing loss conditions, there are also various reasons that would make the condition temporary or permanent. The duration of hearing loss is often determined by the cause. But temporary hearing loss
Cochlear Implants

A cochlear implant is a medical device that restores hearing function in individuals who have severe to profound hearing loss. In contrast to a hearing aid, which simply makes sounds louder, a cochlear implant takes the place of parts in the inner ear that are not working properly. The cochlear implant has two primary parts, the processor, and the implant. The processor is the piece outside of the body that picks up sounds, processes them, and sends signals to the implant. The implant is the piece inside the body. It is placed behind the ear during surgery and receives signals and
Hearing Aid Tic Tac Toe(iOS)($8.99)
Ideas for Smartphone Apps

• Sound rating apps
  – Attributes of sound quality of hearing aid
• Questionnaires both self and communication partners
  – APHAB
  – HHI
  – CHILD
  – LIFE
  – COW
• Facilitative/Repair strategies
• Clear speech
• Assertiveness strategies
Further Research

• Ease of use of apps vs. HA controls via application of Fitt’s Law, Hick’s Law, etc.
  - Dexterity
  - Ease of use
  - Likelihood to use
  - Speed of use
Questions/Comments