



SDE-773

# Accessibility in Interaction Design

Deaf and Hearing Disabilities

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# Outline



Types of hearing  
impairment



Cultural  
implications



Difficulties faced by  
hearing impaired



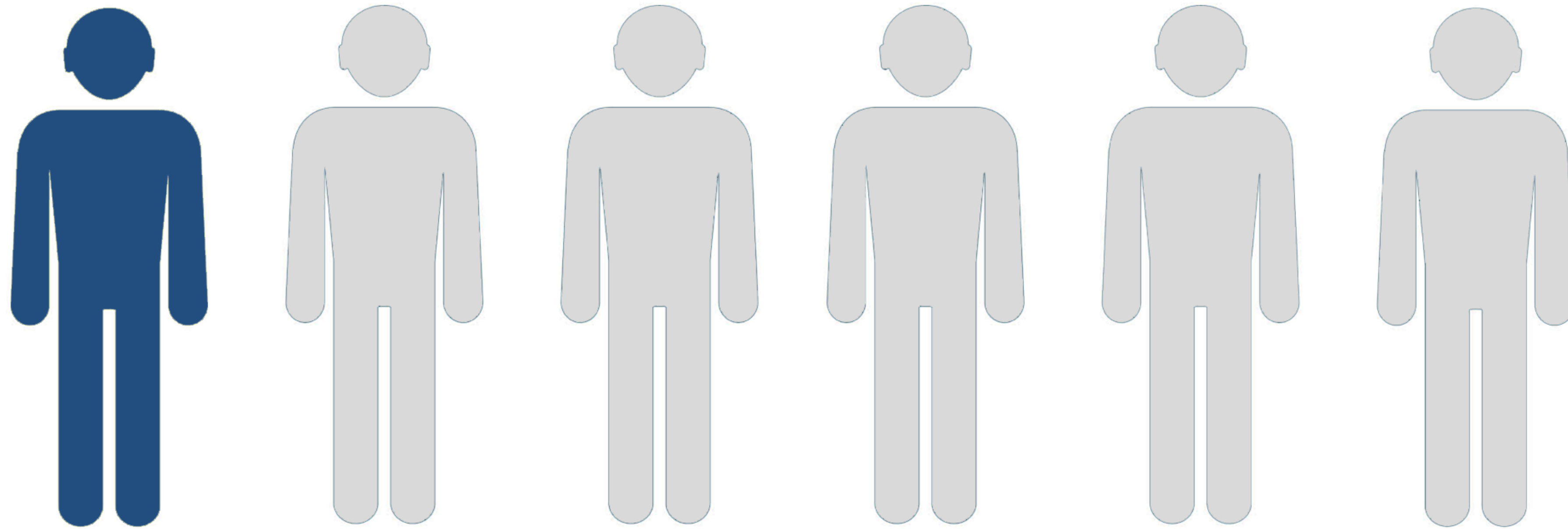
Early assistive  
technology



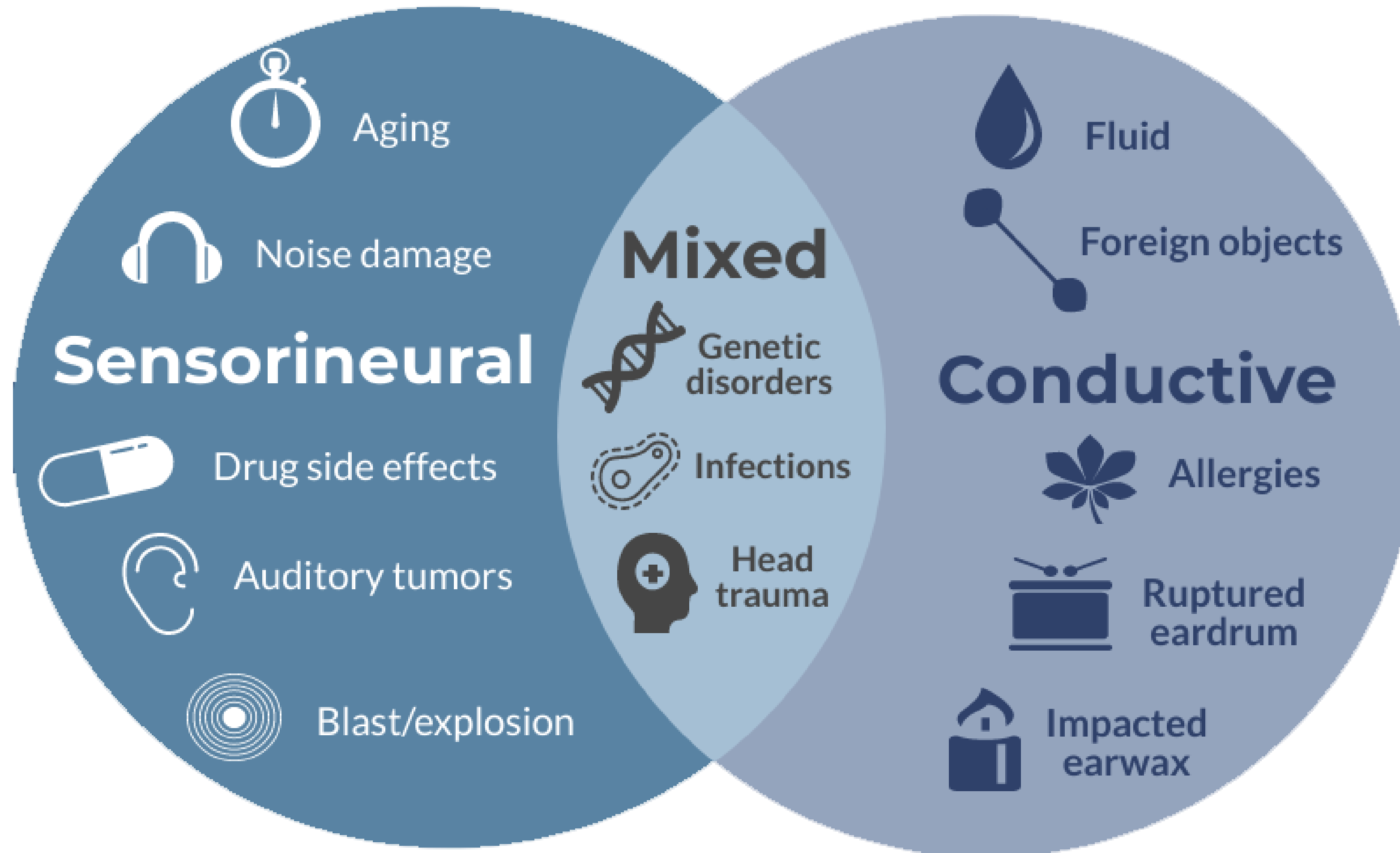
Modern assistive  
technology

# 1 in 6

People in the United States  
are affected by some level of  
hearing loss



# Types of Hearing Loss



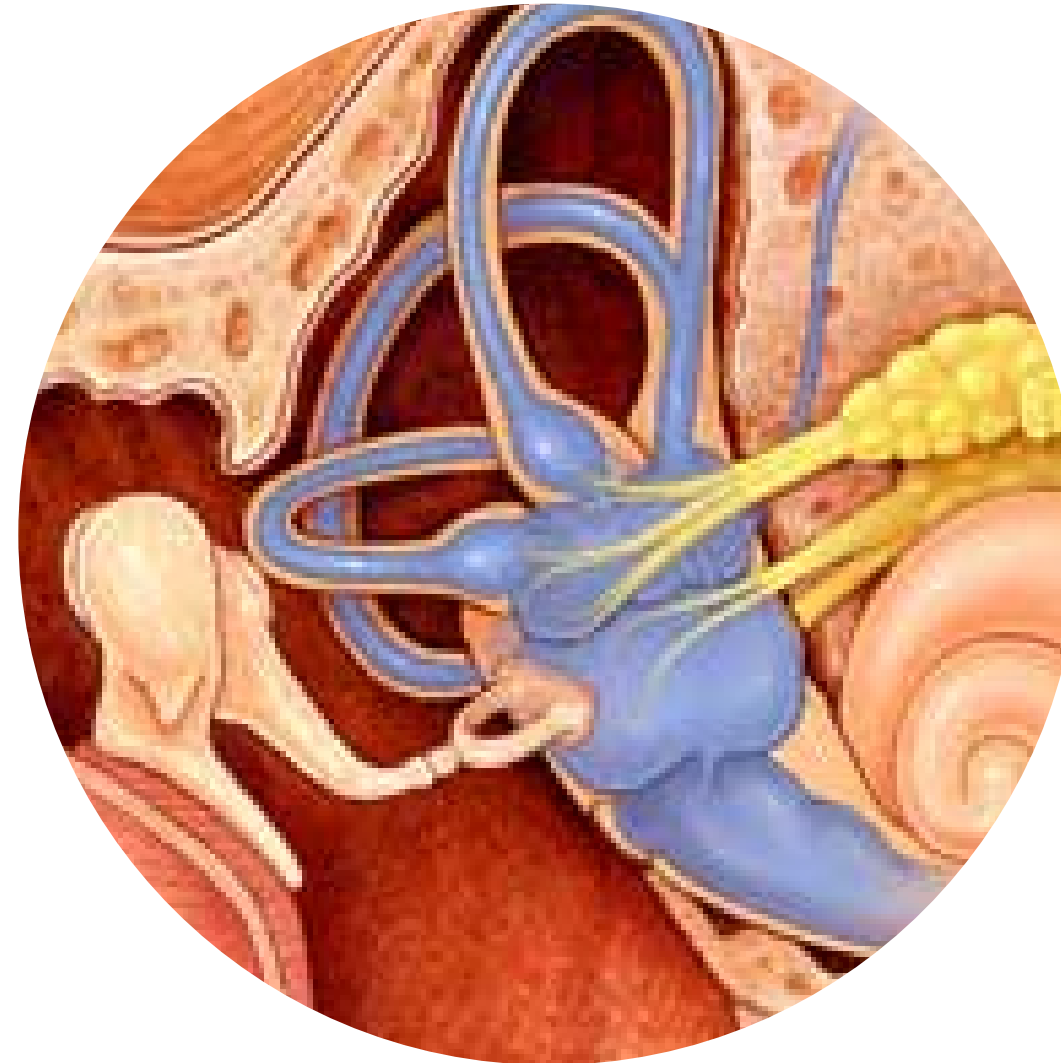


# Other Disorders of the Ear



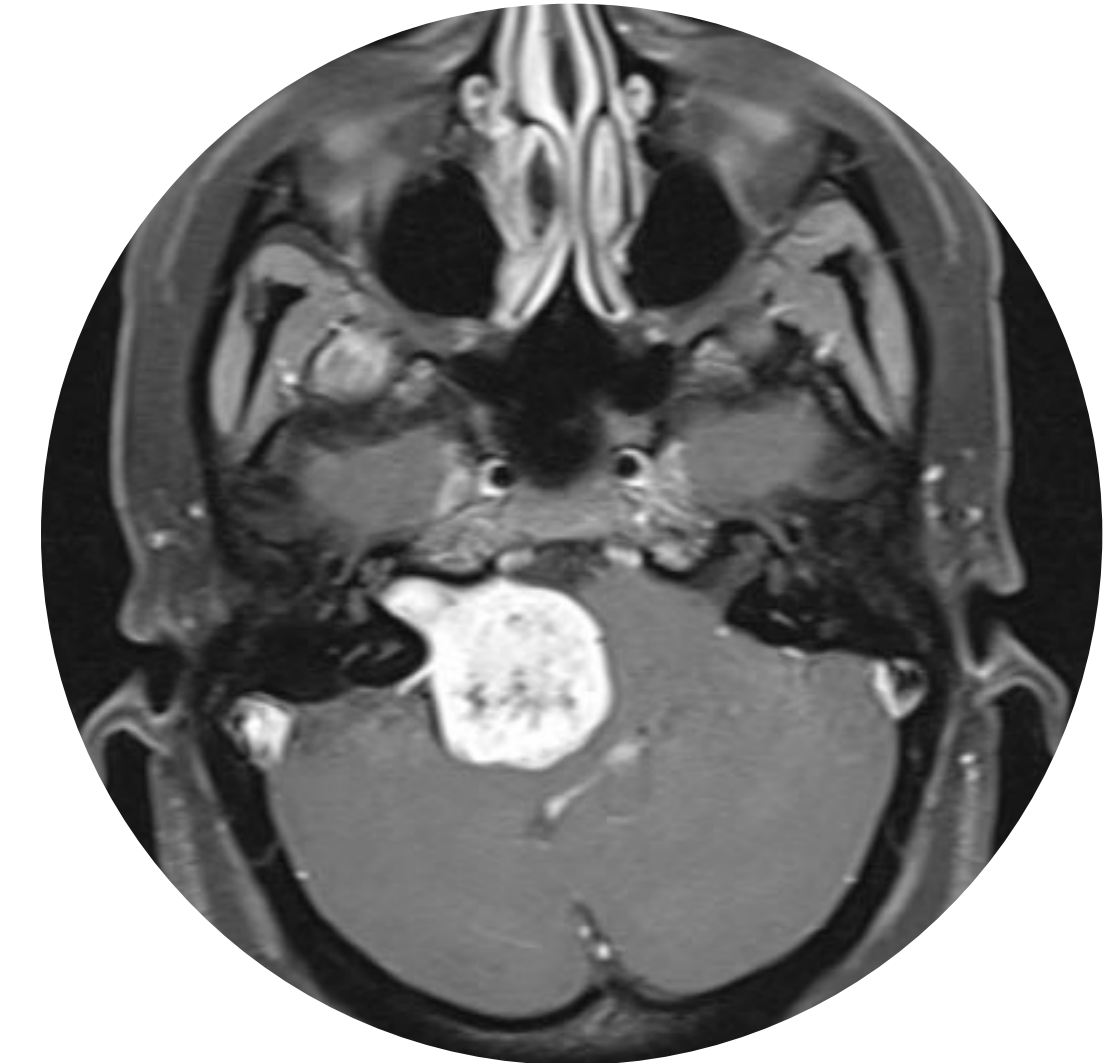
## Tinnitus deafness

- Ringing or other noises in one or both of your ears
- Not caused by an external sound, and other people usually can't hear it.
- Affects about 15% to 20% of people, and is especially common in older adults.



## Meniere's disease

- Symptoms- Muffled hearing, a feeling of pressure in the ear, sudden dizzy spells, ringing in the ears
- These four symptoms affect most people with Meniere's disease, usually in Just one ear.
- These episodes will last anywhere from 20 minutes to four hours.



## Acoustic Neuroma

- Unsteadiness or loss of balance.
- Dizziness (vertigo)
- Facial numbness and weakness or loss of muscle movement.
- Ringing (tinnitus) in the affected ear.

# Words Describing Deafness and Hearing Loss



# Difficulties Affecting the Hearing Impaired

Sign Language misunderstandings

Public announcements

Fewer educational and job opportunities due to impaired communication

Social isolation, loneliness and stigma

Going to movies and other social events

Being in the dark

Low in self-esteem and confidence causing emotional stress

Caring for hearing aids



# **Earlier Technological Tension in Deaf Community**

# Earlier Technological Tension in Deaf Culture



- No access to telephone network until the teletypewriter (TTY) was developed in the 1960s

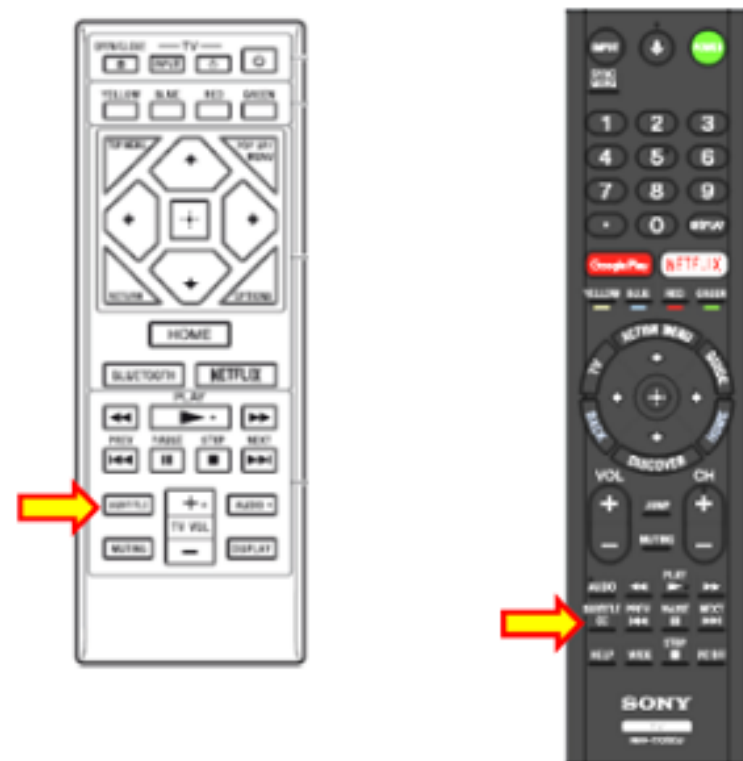


- Nationwide relay services (providing communication assistance) began in the 1990s.

# Earlier Technological Tension in Deaf Culture



- Development of captioned film prints in the 1980s and caption display systems in the late 1990s.

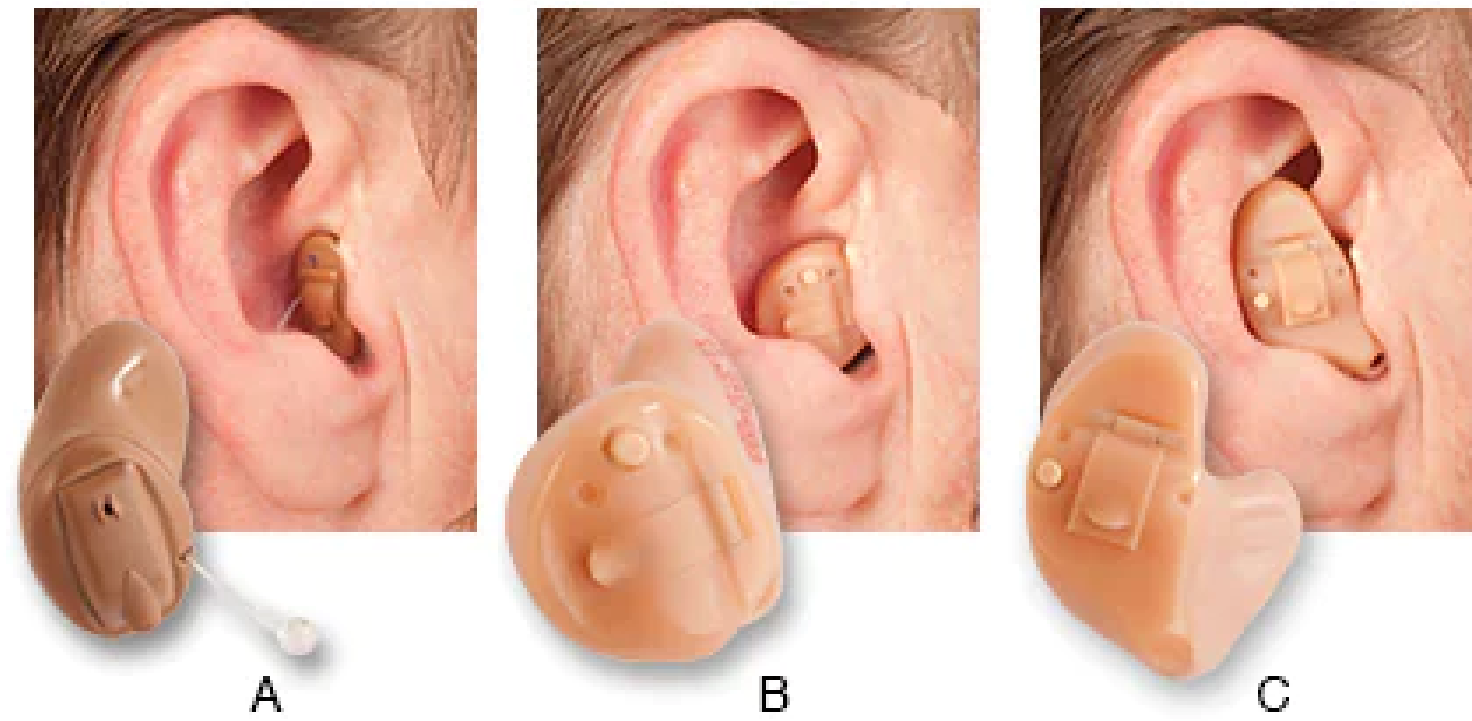


- Closed captions for television were developed in the 1970s and were finally made available through built-in television caption decoder systems in the 1990s.



# **Existing Technologies and Applications that aid Deafness**

# Hearing Assistive Technology: Hearing Aids



## How do they work?

1. Small microphones collect sounds from the environment
2. Computer chip with an amplifier converts the incoming sound into digital code
3. Analyzes + adjusts sound based on listening needs
4. Amplified signals converted back into sound waves and delivered to ears through speakers.

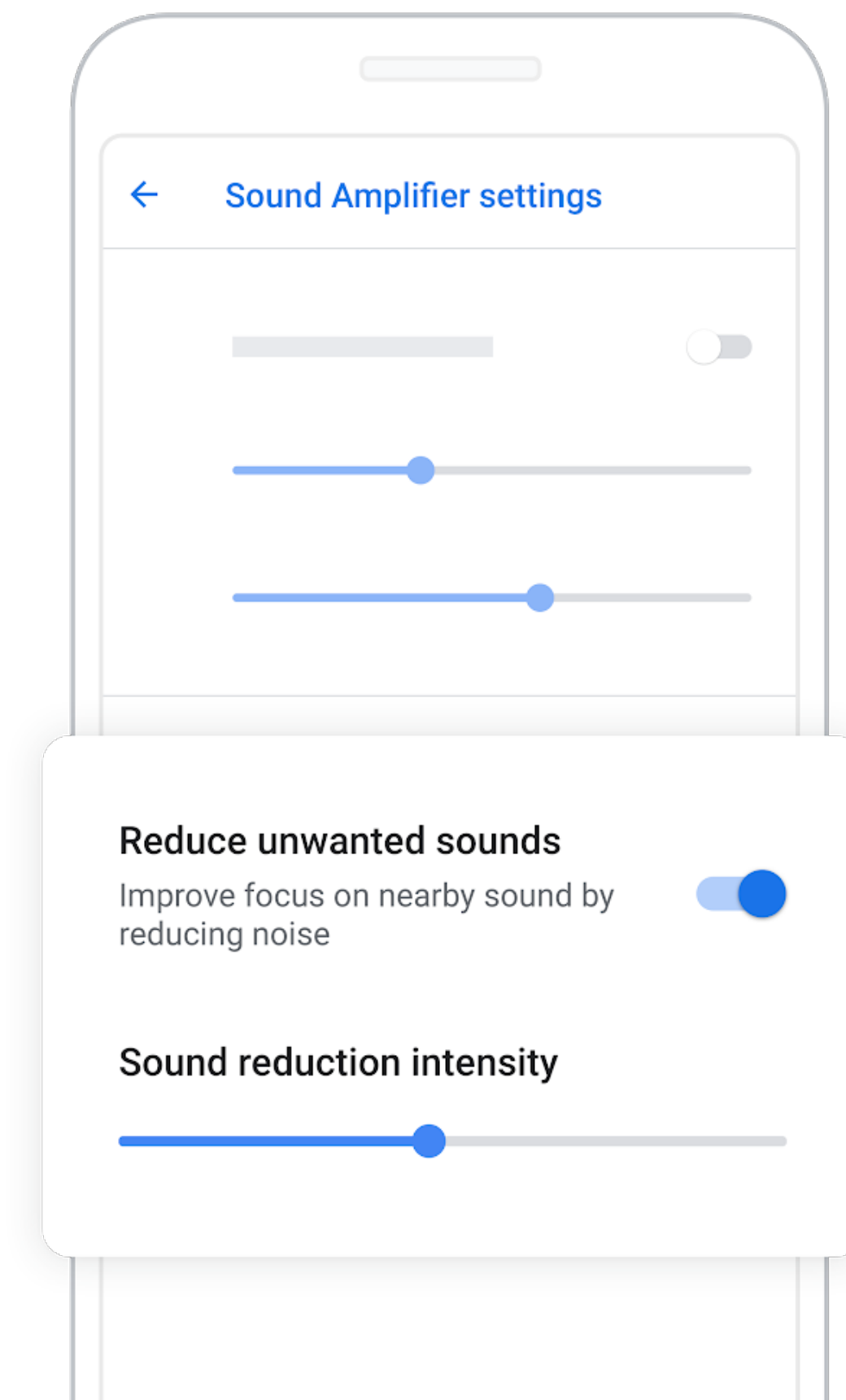
## Additional features:

- Noise reduction
- Directional microphones
- Rechargeable batteries
- Wireless connectivity
- Remote controls
- Direct audio input
- Variable programming
- Synchronization

# Google's **Sound Amplifier** a good backup for hearing aids

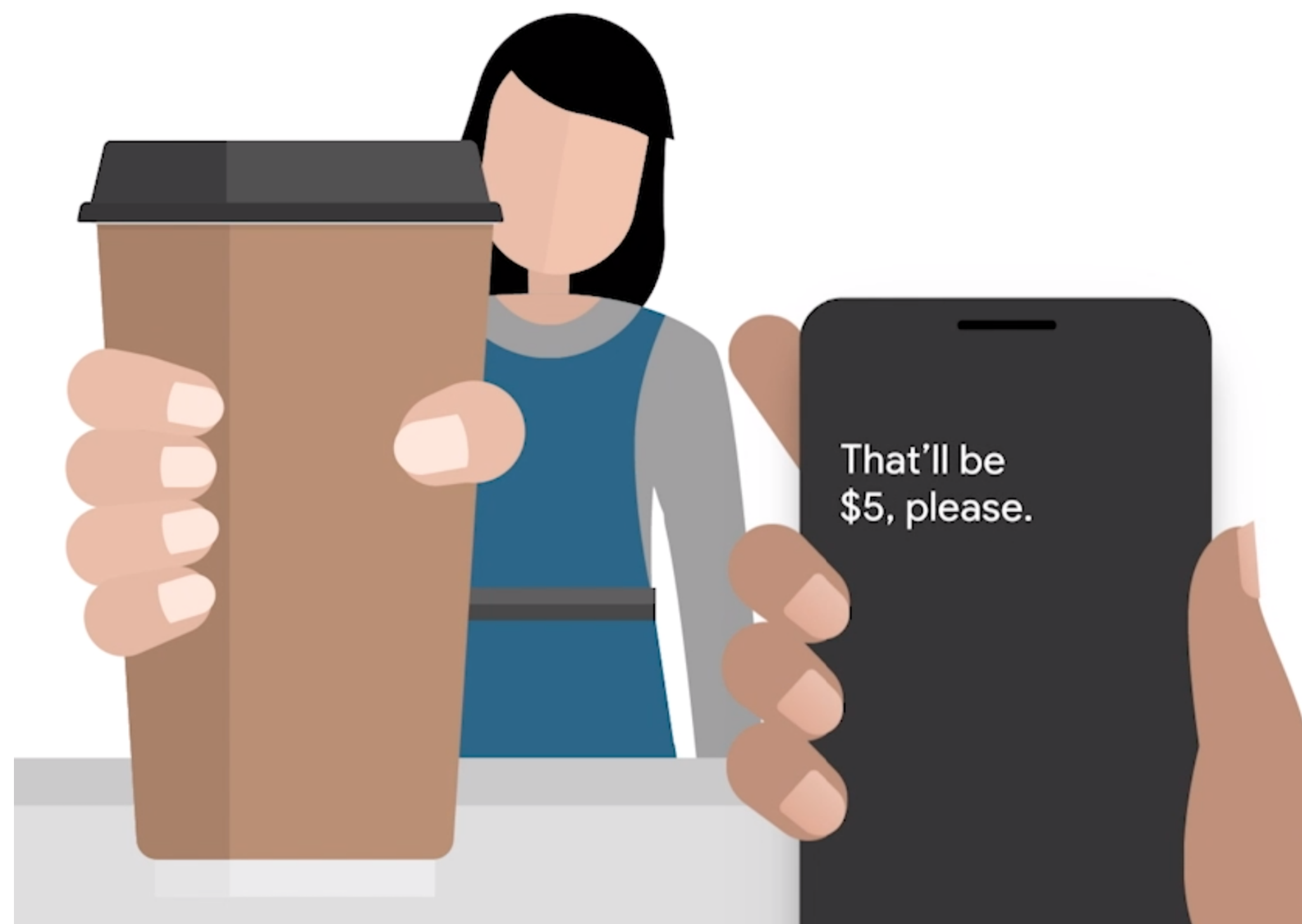
Sound Amplifier, first announced in May at Google's I/O developer conference, requires an Android phone and headphones. It isn't a standalone app, but a tool you can access in your settings. It lets you manipulate the sound around you by moving slide toggles on your phone. You can boost sounds or experiment with different fine tuning settings to reduce unwanted noise nearby.

It isn't meant to be as effective as an actual hearing aid or other medical device, but it could be a good backup if someone forgets their aid,





# Google's **Live Transcribe** aim to help the hard of hearing



# Zoom: Accessibility for Deaf and Hard-of-Hearing



Zoom has added accessibility features that will let users with hearing loss rearrange windows to see a sign language interpreter better while viewing presentations.

People can also rearrange the windows that show up on their grid, allowing users with hearing loss to place the sign language interpreter in the best corner for them.

# Hearing Loop Technology

Loops provide the greatest benefits to people who rely on assistive listening systems, and to venues required by the ADA to provide hearing accommodation.



**Hearing Loop**  
Switch hearing aid to T-coil

The universal symbol that identifies a venue as being equipped with loop technology welcomes people with hearing loss and communicates that their needs will be met in the best way possible.

## User Benefits

- Easy to Use
- Quality Sound
- Better Hygiene
- Discreet
- Versatile
- Transient Solution



# Soundwatch: Smartwatch App Alert

New smartwatch app alerts d/Deaf and hard-of-hearing users to birdsong, sirens and other desired sounds

**Technology provides people with a way to experience sounds that require an action such as getting food from the microwave when it beeps. But these devices can also enhance people's experiences and help them feel more connected to the world**

SoundWatch informs users about three key sound properties:

- Identity
- Loudness
- Time of occurrence through customizable visual and vibrational sound alerts





# Soundwatch: Smartwatch App Alert



"Opening screen with a button to begin recording audio"



"The notification screen with a "10-min" mute button"



"The main app screen with more mute options"



"The paired phone app for customizing the list of enabled sounds"



# Hear with Eyes: Smart movie experience devices

Wika lets people enjoy Movies, TV shows and Videos, in their own Language including different sign languages



## 1. Glass Sign

GlassSign is a Smartglass that detects what the viewer is watching, then displays a synchronised sign language video.

## 2. Sub Hub

Subhub is a set-top box that overlays captions, or subtitles, in the viewers preferred language.

## 3. Dub Hub

DubHub detects what the viewer is watching, then delivers a dub track, in the viewer's language, synchronised to the video.





## Hear with Eyes: Smart movie experience devices







SquareGlow is an intelligent accessibility system revolutionizing accessibility and giving everyone complete control over all aspects of it with their innovative devices and helpful app!



## 1. SquareGlow Lights

SquareGlow light allows you to control 8 color lights from anywhere in your building, home, school, more. So you can ensure safe accessibility for everyone at all times.

## 2. Tap It

Tap It is a portable vibrating alert unit that can be worn by the user on their belt, in their pocket, or around the neck. An emergency calling device for people who are deaf/blind or have visual impairments.

## 3. SquareGlow App

SquareGlow App is so easy and convenient because it can be personalized, have schedules set up with multiple accessories activated without having to step foot in front of them!

# Conclusion



**Types of hearing  
impairment**



**Cultural  
implications**



**Difficulties faced by  
hearing impaired**



**Early assistive  
technology**



**Modern assistive  
technology**

# Conclusion

## Acquired hearing loss

People who were born with hearing but have lost some or all of their hearing

## Congenital hearing loss

People who were born with hearing loss which may become progressively worse.

# Conclusion

**Acquired hearing  
loss**

**New reality**

Congenital hearing  
loss