

HCI: ACCESSIBILITY

Dr Kami Vaniea

First, the news...

- Sketch of two Scottish guys stuck in an elevator
- Accessibility from a different angle
- https://www.youtube.com/watch?v=sAz_UvnUeuU

Accessibility

Many types of disabilities

Fitts Law

Visual impairments

Accessibility

Accessible systems help everyone, not just disabled people

- Well structured text is easier to read and easier for computers to parse
- Flexibility in inputs improves accessibility and makes it easier for everyone else

Curb Cuts

Dips in the sidewalk so that a pedestrian does not need to step up or cross uneven terrain to reach the sidewalk.



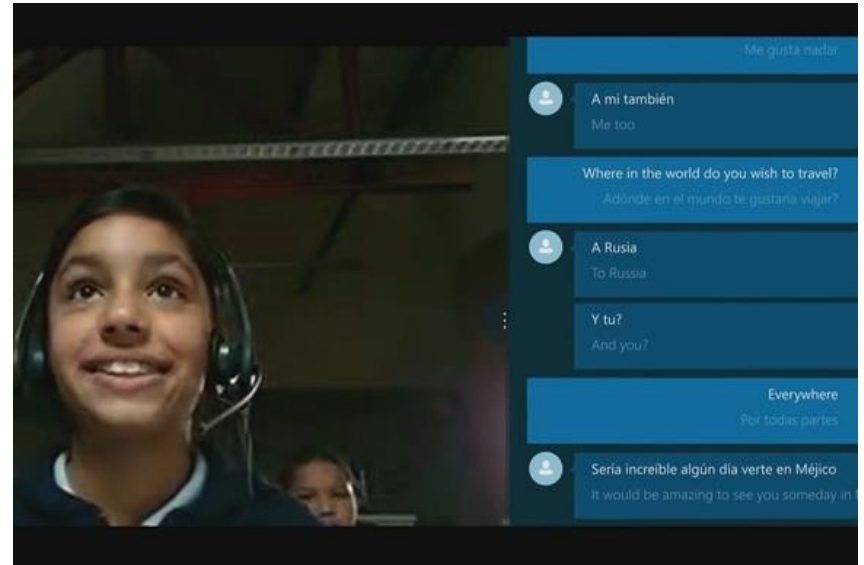
Many types of disabilities

Many types of disabilities

- Visual impairment
- Hearing impairment
- Physical impairment
- Speech impairment
- Dyslexia
- Autism
- Age groups (older, younger)

Hearing impairment

- Audio commonly used for feedback and situational awareness
 - Gesture-based interfaces
 - Games
- Increase in video without captions means less accessibility
- Computers can help people with hearing loss through auto transcription



Physical impairment

- Limited control over movement.
- Fine mouse movements difficult.
- Precise motions difficult.
- Speech or eye tracker input an option.



<http://parkinsonsdysarthria.weebly.com/aac-assessment.html>

Speech impairment

- Inability to speak at all
- Accents (Scottish), non-native speakers, or people with hearing loss
- Spoken communication is much faster than typing
- Computing technologies quite helpful for:
 - Synthesized speech, helping a user speak
 - Typing instead of speaking

Dyslexia

- Cognitive disability which impacts reading, writing, and spelling
- Understand spoken content, but struggle with same content written
- “It's estimated that up to 1 in every 10 to 20 people in the UK has some degree of dyslexia.” (NHS)
- Spelling correction is helpful, but most spell checkers are not trained on dyslexic's spelling patterns
- Dyslexic person may have difficulty pulling the correct spelling from a list



<http://edition.cnn.com/2017/07/18/health/dyslexia-technology-apps-students/index.html>

Autism

1. Social interaction – issues relating to others
 2. Communication – issues understanding verbal and textual language including expressions
 3. Imagination – problems with rigidity of thought processes leading to repetitive behavior
- Computers help because they are often consistent, predictable, and impersonal.
 - User is in control allowing management of the repetitive behavior and inflexibility
 - Text-to-speech, or speech-to-text help with language issues

Autism – common issues

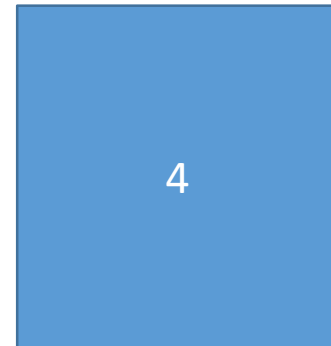
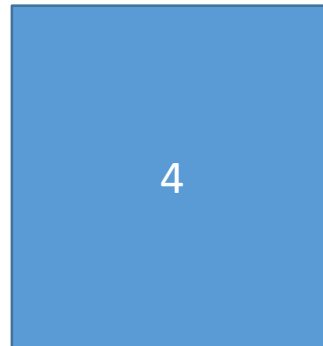
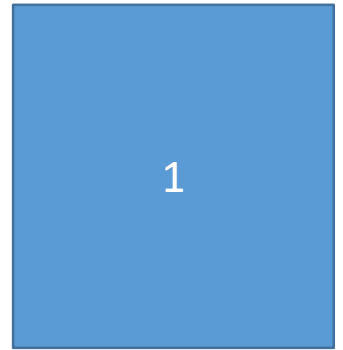
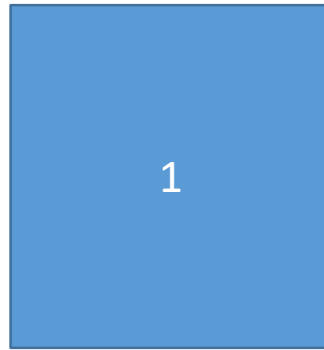
- Rigid interfaces (Heuristic: Flexibility)
- Sounds that cannot be controlled
- Lack of explanation (Heuristic: Help)
- Tend toward literal interpretation of content
 - Jokes or “funny” descriptions can be confusing

Fitts Law

Fitts Law

- Predicts the time required to point at an object using a device as a function of the object's distance and size.
- The further away and smaller the object, the longer the time to locate it and point to it.
- $T = k \log_2\left(\frac{D}{S}\right) + 1$
- Where
 - T = Time to move the pointer to the target
 - D = Distance between the pointer and the target
 - S = Size of the target
 - k is a constant of approximately 200ms/bit

For each pair of boxes, try and move your finger between the boxes as fast as possible without accidentally clicking outside the box



Basic application

Phone app
with 4 buttons.
Accurately
clicking these
buttons is
challenging
they are small
and widely
spaced



Basic application

Grouping them
would make it
easier to move
between
them.

Putting them
next to a
thumb might
also be helpful.



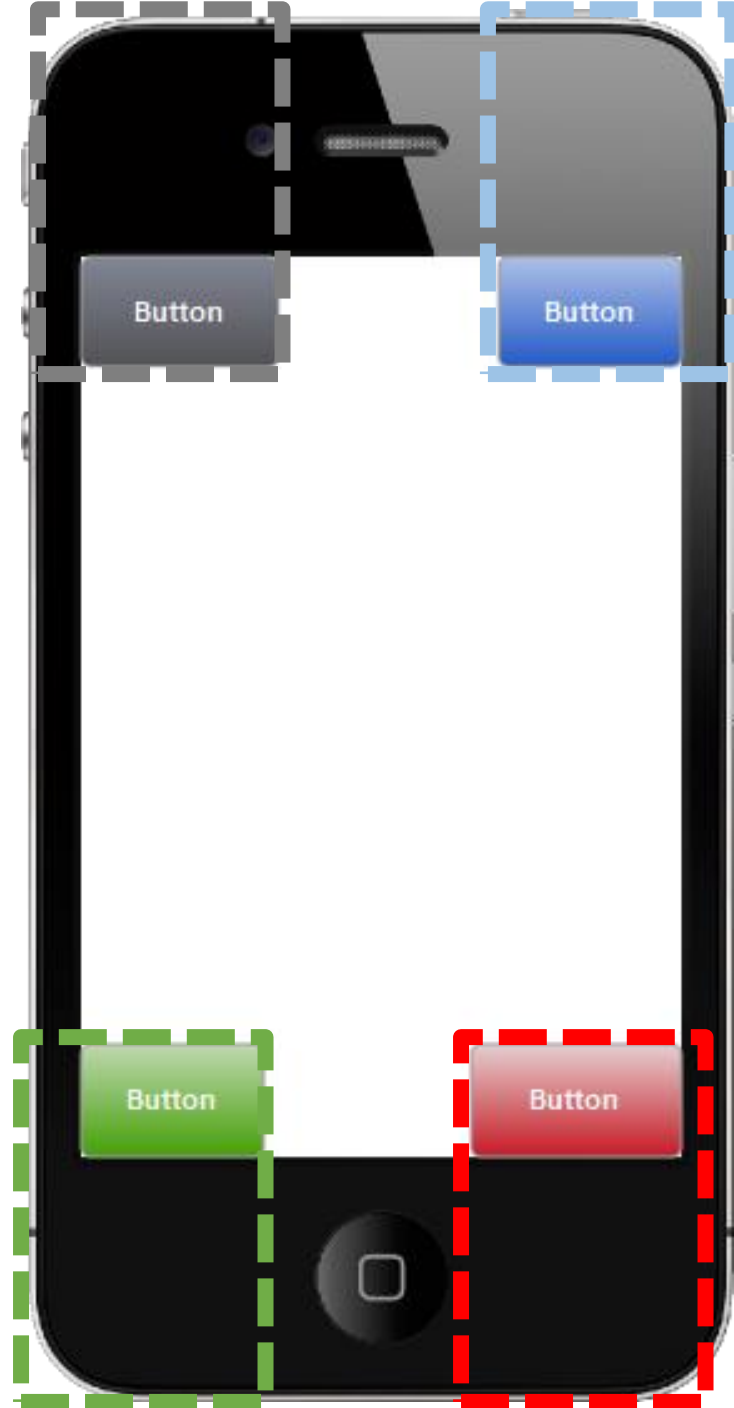
Basic application

Also making
them larger
would make it
easier



Basic application

Locating them next to the screen edge also helps because it makes the target much larger. Screen edges are the easiest to click.

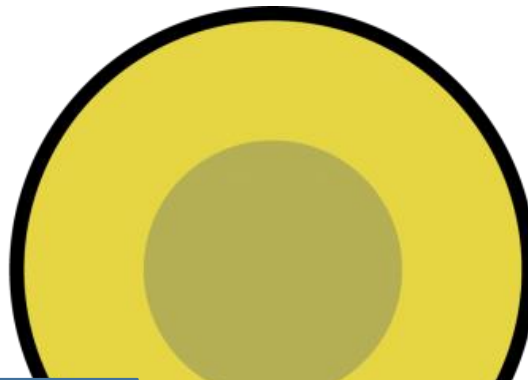
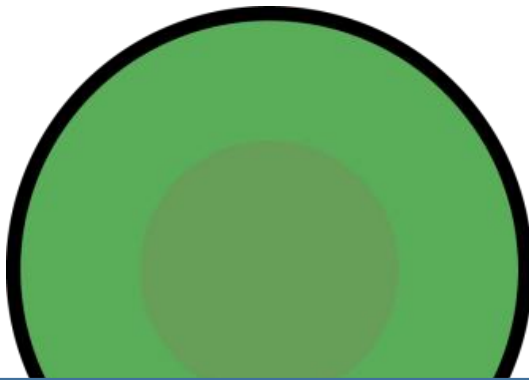


Visual impairments

Partially sighted users

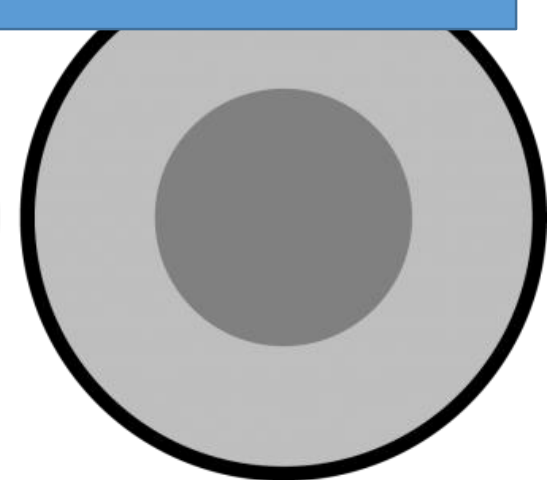
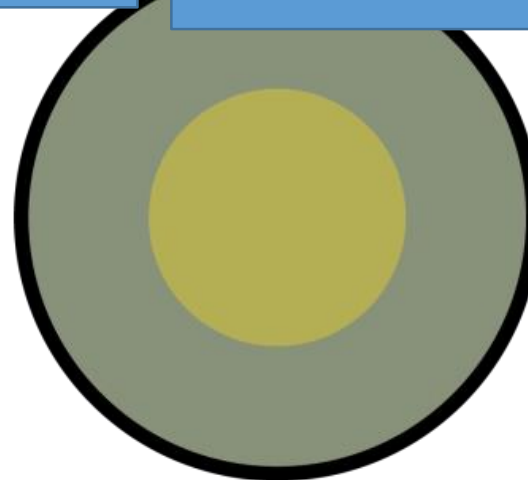
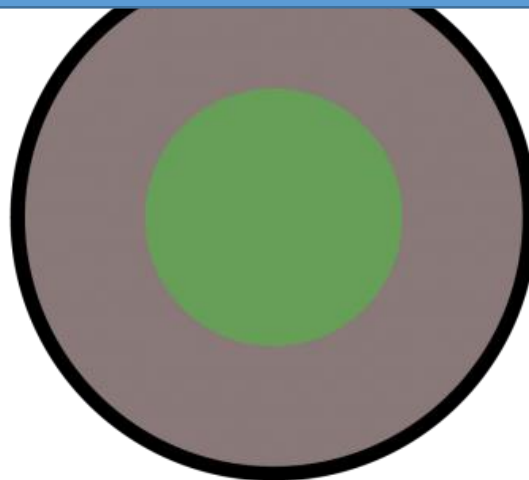
- Most people experiencing sight loss are not blind and most previously had good sight
- As of 2015, over two million people in the UK are living with sight loss¹.
- One in five people aged 75 and over are living with sight loss¹.

Color is a huge issue



The centers of the circles are all the same color.

The human eye is complicated which makes color blindness non-trivial to handle.



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Customise your Homepage



Remembrance Sunday: Services honour war dead

UK



Tsunami hits after powerful New Zealand quake

ASIA



England face Australia in crucial Four Nations match

RUGBY LEAGUE

News headlines >



Nato chief's warning for Trump

US ELECTION 2016



France 'to extend state of emergency'

EUROPE



Iraq 'retakes ancient Nimrud from IS'

MIDDLE EAST

Sport headlines >



England draw Test as India cling on

CRICKET



Will Rosberg win the battle in Brazil?

FORMULA 1



Murray wants to end season 'on a high note'

TENNIS

Basic approaches

- Fix the usability problems typically developing people have, particularly
 - Poor sign posting and navigation
 - Content structure that make sense
 - Flexibility of interaction
- Play with your interface a bit
 - Try zooming the text large and small to see what happens
 - Try turning on the screen reader and hearing what it sounds like
 - Ask yourself if all non-text elements are labeled with alt text
 - Could someone navigate with only a keyboard?

Basic approaches cont.

- Alt text for images
- Headings are clear and a computer could identify them as headings (`<h1>title</h1>`)
- Beware keyboard traps where someone with only a keyboard can get in but not out
- Use a “Skip to Main Content” link at the beginning of each page
- Create significant contrast between your text and background
- Use an accessible template
- Enable scanning by putting important words at the front of paragraphs and links

Pair-share

- I am about to show you a website
- Is it accessible to people with limited sight?
- Why or why not?

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TENNIS

**Lets look at how the BBC website
handles accessibility**


Demo using Windows' default narrator


Add appropriate alt text to images

[Study](#) [Visit](#) [Research](#) [News](#) [About](#) [Alumni](#) [Staff](#) [Students](#)

 THE UNIVERSITY
of EDINBURGH

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```
▼<div class="col-sm-7 col-md-8">  
    
</div>
```




Fangs output for: BBC - Home

Reload

Preferences

[Help and tutorial](#)



Screen reader output [Headings list](#) [Links list](#)

Screen reader output

Page has ninety-six headings and one hundred fifty-one links BBC dash Home dash Internet Explorer Link Homepage **Heading level two** Accessibility links List of two items bullet This page link Skip to content bullet Link Accessibility Help List end Link Sign in This page link Notifications List of nineteen items bullet Link News bullet Link Sport bullet Link Weather bullet Link iPlayer bullet Link TV bullet Link Radio bullet bullet bullet bullet bullet bullet bullet bullet bullet bullet This page link More List end Link Search the BBC Edit Search the BBC **Heading level one** BBC Homepage **Heading level two** Welcome to the BBC Sunday, thirteen November Link Customise your Homepage Sign in with your BBC ID, or Register to see Weather, Local News and more. Link Sign in with your BBC ID, or Link Register to see Weather, Local News and more Link **Heading level three** Remembrance Sunday colon Services honour war dead From UK Link **Heading level three** Tsunami hits after powerful New Zealand quake From Asia Link **Heading level three** England face Australia in crucial Four Nations match . Live now. From Rugby League Link **Heading level two** News headlines Link **Heading level three** Nato chief's warning for Trump From US Election two thousand sixteen Link **Heading level three** France 'to extend state of emergency' From Europe Link **Heading level three** Iraq 'retakes ancient Nimrud from IS' From Middle East Link **Heading level two** Sport headlines Link **Heading level three** England draw Test as India cling on From Cricket Link **Heading level three** Will Rosberg win the battle in Brazil? From Formula one Link Watch video **Heading level three** Murray wants to end season 'on a high note' From Tennis Remove **Heading level two** three things we love today Link **Heading level three** How the internet reacted to an epic night of dance From BBC One Link **Heading level three** Hundreds join Walnut the whippet on his final 'walk' From England Link Watch video **Heading level three** Murray and Djokovic take on the mannequin challenge From Tennis Remove **Heading level two** Help us make the BBC Homepage better Want to opt in to our alternative page? Find out more Link here Dismiss Link Try it now **Heading level two** The BBC around the UK List of five items bullet Link Graphic slash pthree hundred six tteight .png Scotland bullet Link Graphic slash pthree hundred six trm.png ALBA bullet Link Graphic slash pthree hundred six tpeight .png Wales bullet Link Graphic slash pthree hundred six tpeight .png Cymru bullet Link Graphic slash pthree hundred six tqc.png NI List end Dismiss **Heading level two** Real dash life stories Link Listen to audio **Heading level three** Bataclan survivor colon It's changed me on every single level From BBC Radio five live Link Watch video **Heading level three** The teacher who has the world's loudest shout From Northern Ireland Link Listen to audio **Heading level three** Sole survivor 'miracle girl' tells of fatal air crash horror From BBC World Service Remove **Heading level two** Link Add more sections This

```

▼<div id="orb-header" class="orb-nav-pri orb-nav-pri-white
orb-nav-dyn"> ev
  ▼<div class="orb-nav-pri-container b-r b-g-p">
    ▶<div class="orb-nav-section orb-nav-blocks"></div> ev
    ▼<section>
      ▼<div class="orb-skip-links"> ev
        <h2>Accessibility links</h2>
        ▼<ul>
          ▼<li>
            <a href="#hp-bbc-homepage-content">Skip to content</a>
          </li>
          ▼<li>
            <a id="orb-accessibility-help" href="/accessibility/">
              Accessibility Help</a>
          </li>
        </ul>
      </div>
    </section>
    ▶<div id="mybbc-wrapper" class="orb-nav-section orb-nav-id
orb-nav-focus orb-nav-id-default"></div>
    ▶<nav class="orb-nav" role="navigation" aria-label="BBC"></nav>
    ▶<div class="orb-nav-section orb-nav-search"></div>
      ::after
    </div>
    ▶<div id="orb-panels"></div> ev
      ::after
    </div>
  </header>

```

Headers

Skip to
content links

Many examples
taken from this
nice writeup of
issues with
screen readers.

Guidelines for Accessible *and Usable* Web Sites: Observing Users Who Work With Screen Readers¹

(updated December 2006 to fix broken links and first author's contact information)

Mary Frances Theofanos
National Cancer Institute
Rockville, Maryland, USA
now at
National Institute of Standards and Technology
Gaithersburg, Maryland, USA
mary.theofanos@nist.gov

Janice (Ginny) Redish
Redish & Associates, Inc.
Bethesda, Maryland, USA
ginny@redish.net

The Communication Technologies Branch of the United States National Cancer Institute (part of National Institutes of Health and Department of Health and Human Services) has been conducting usability testing with people with disabilities, specifically blind and low-vision users, to

- understand the relationship between accessibility and usability
- understand how blind and low-vision users work with Web sites
- develop research-based guidelines for accessibility and usability
- assess the usability of specific Web sites for blind and low-vision users

Since June 2001, U. S. federal Web sites must comply with Section 508 of the Rehabilitation Act (29 U.S.C. §794.d). This law requires that agencies provide access to electronic information to people with disabilities. Section 508 identifies 16 specific standards for Web site accessibility.²

Meeting the required accessibility standards does not, however, necessarily mean that a Web site is *usable* for people with disabilities. And if a Web site is not usable, it is not really accessible, even if it has all the elements required by the law.

Why Accessibility?

Why should you design Web sites that are both technically accessible and also usable for people with disabilities? Here are six compelling reasons:

- 1. Disabilities affect many more people than you may think.** Worldwide, 750 million people have a disability and three out of every 10 families are touched by a disability [10]. In the United States, one in five people have some kind of disability and one in 10 has a severe disability. That's approximately 54 million Americans [8]. In 2001, 180 million people worldwide were blind or visually impaired, including 7.7 million people in the United States. This is a substantial consumer segment that should not be ignored.

Screen readers start with the first word in the line so repetition is annoying (for sighted people too)

530 Answers Found	
	Subject
1	Updated - What documents, identification, paperwork
2	Updated - Do I need a license to import something
3	Updated - What things should I consider before in
4	Updated - Documents, identification, paperwork re
5	Updated - How to use the HTS, determining duty
6	Updated - Do I need a Customs broker to clear m
7	Updated - How do I, as a traveler, bring back alco
8	Updated - Requirements for importing a car or car
9	Updated - What jobs are currently available with C
10	Pets - cats

The frequent repetition of "updated" at the front of links in this list makes the list very difficult for screen-reader users to scan.

ALT tags

- Use of alt tags is generally a good idea.
- Alt tags should be short and to the point.
- Use ALT="" to hint to screen readers that skipping the text is ok.
- Not all images need an alt

- [HHS Home](#)
 - [Questions?](#)
 - [Contact Us](#)
 - [Site Map](#)
-

alt="Decorative bullet image: Home"

alt="Decorative bullet image: Questions?"

alt="Decorative bullet image: Contact Us"

alt="Decorative bullet image: Site Map"

Users complained bitterly about listening to the repetitive and meaningless words "decorative bullet image." They said it kept them from getting the really meaningful words, "home," etc.

ALT tags

- Use of alt tags is generally a good idea.
- Alt tags should be short and to the point.
- Use ALT="" to hint to screen readers that skipping the text is ok.
- Not all images need an alt



Image looks nice, but adds very little to the actual content.

Spelling and punctuation matter because screen readers will use them to try and correctly pronounce the page.

JAWS is a text-to-speech reader

Chart 1

Word on the screen

homepage

LiveHelp

MEDLINEPlus (a very large
database of medical information)

FY (meaning "fiscal year")

VA (meaning "Virginia")

What JAWS says

hommapodge

livaahelp

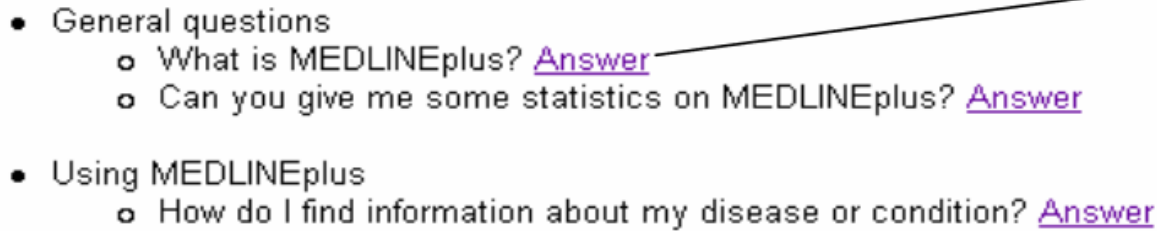
Medlynepalus

fie

va (like the Spanish for "go")

Make links descriptive

- Screen readers jump down a list of links often skipping the words
- Links with descriptive words will be more usable by both those with screen readers and those skimming the page

- 
- General questions
 - What is MEDLINEplus? [Answer](#)
 - Can you give me some statistics on MEDLINEplus? [Answer](#)
 - Using MEDLINEplus
 - How do I find information about my disease or condition? [Answer](#)

A screen reader set to Links List would say only "Answer," "Answer," "Answer" for this page. (Also see the example earlier in the paper in the section on "Screen-reader users scan with their ears.")

Make forms usable

Children's Program Consumer Survey

In order to create the most productive programs possible, your input and
continues to be an important part of this opportunity to fill out the
enclosed form is your chance to share your current and future needs
from the perspective of a consumer.

Use HTML elements to link labels to form boxes so screen readers read them properly

1. Name:
2. Current address:
3. Daytime phone number:

Figure 6. Example of a well-behaved form. After filling in the Name field, the user presses Tab. The cursor moves to the field box for Current address and JAWS says, "Tab. Current address colon. Edit type text." The user fills out that box and presses Tab again. The cursor moves to the next field box and JAWS says, "Tab. Daytime phone number colon. Edit type text."

Make forms usable

Step 2: Choose where to serve:

☒ Within US:

Zip:

(recommended)

-OR-

State:

☐ International

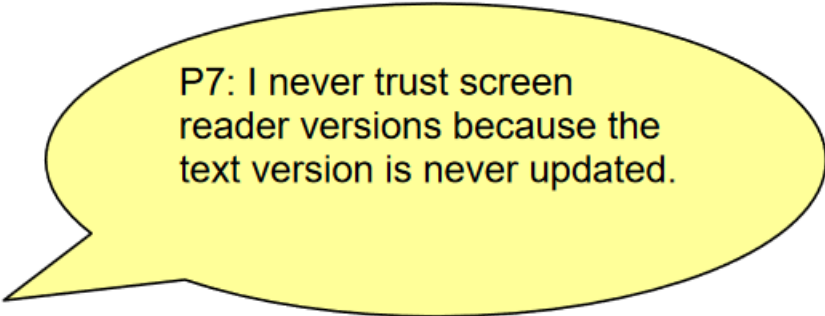
☐ From Home (Virtual)

“(recommended) –OR–” is not part of the label associated with the form so the screen reader skips it during text entry. So users end up filling out Zip and State.

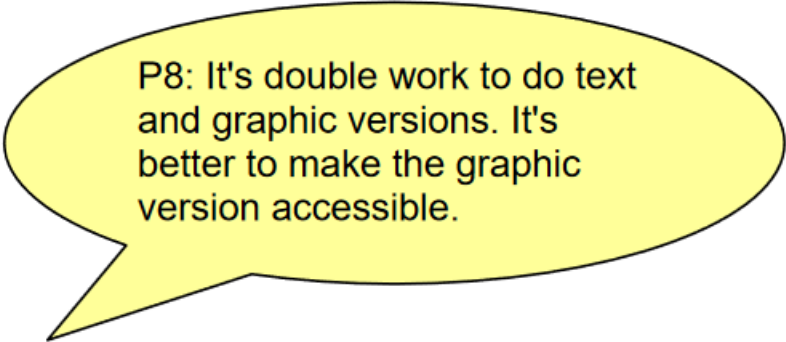
Figure 7. Users listening to JAWS did not hear "recommended or" and thus assumed they had to put in both zip and state.

Bad idea: Make an accessible version of your website or app

- Organization is unlikely to have the resources to maintain both
- Small updates likely to happen to accessible version and not the other
- Later editor likely to break the accessibility features by mistake



P7: I never trust screen reader versions because the text version is never updated.



P8: It's double work to do text and graphic versions. It's better to make the graphic version accessible.

Questions?