

Training Outcomes

1. Reframed approach to accessible design (undo past trauma)
2. Knowledge about accessible design to bring into our projects from the start
3. Tools to check our own work as we iterate
(software tools as well as a self-audit checklist)

Today's Agenda

Part I:

Reframing accessible design 30 mins

1. The history of accessible design
2. Reframing our approach

Part II:

Empathic training on disabilities & digital design 30 mins

1. Introduction to empathic design
2. Designing for different disabilities

Designing for Accessibility

Part 1: Reframing our approach

First, some inspiration...



Matt King Engineer at Facebook

<https://www.youtube.com/watch?v=tsUGTdJhBOs>



**Marlee Matlin
Oscar Winner,
Best Actress 1987**

<https://www.youtube.com/watch?v=BoB5nJRE1MM>

**And a miniature pony
wearing sneakers...**



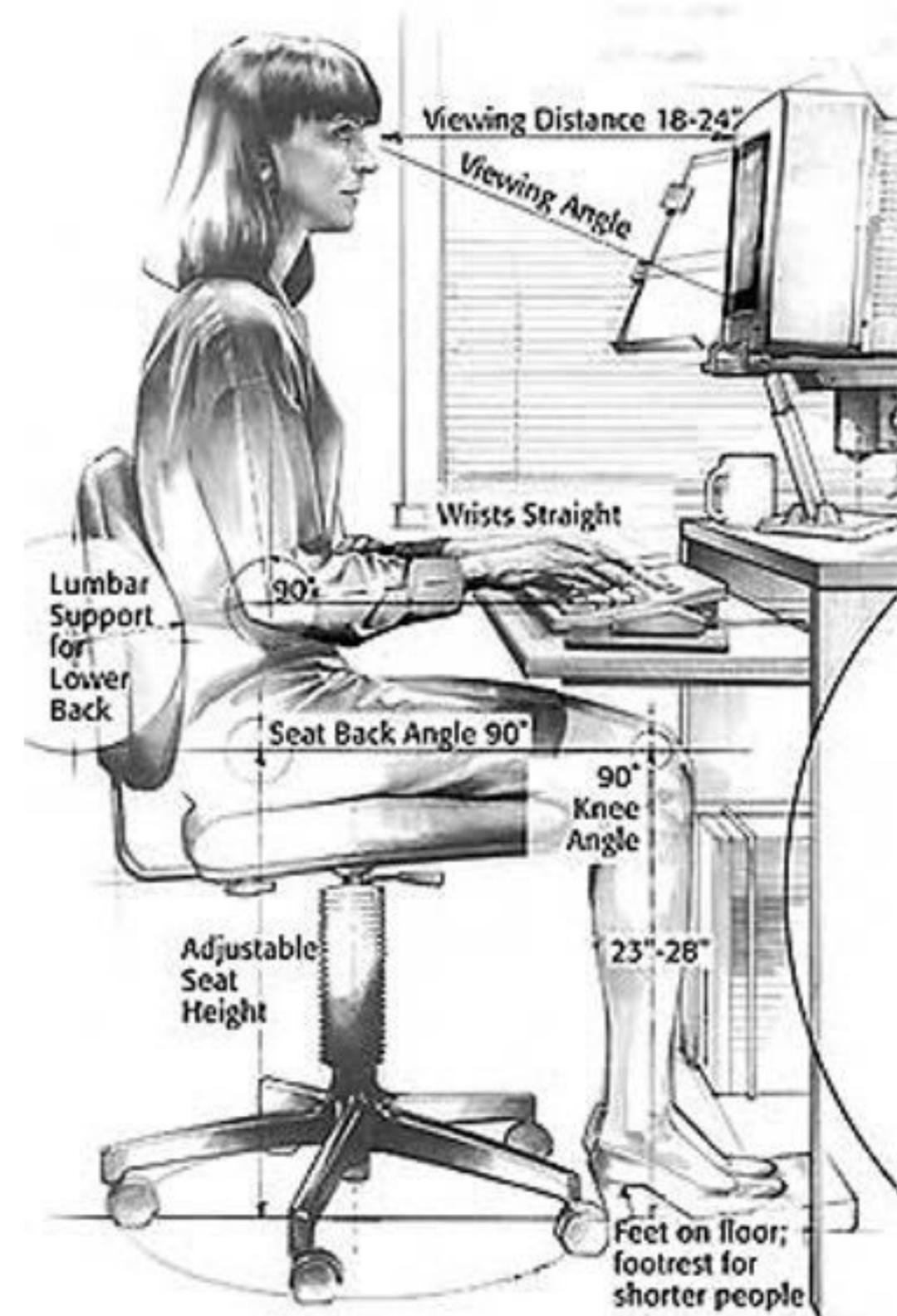
(more on this later)

**A quick history of
accessible design...**

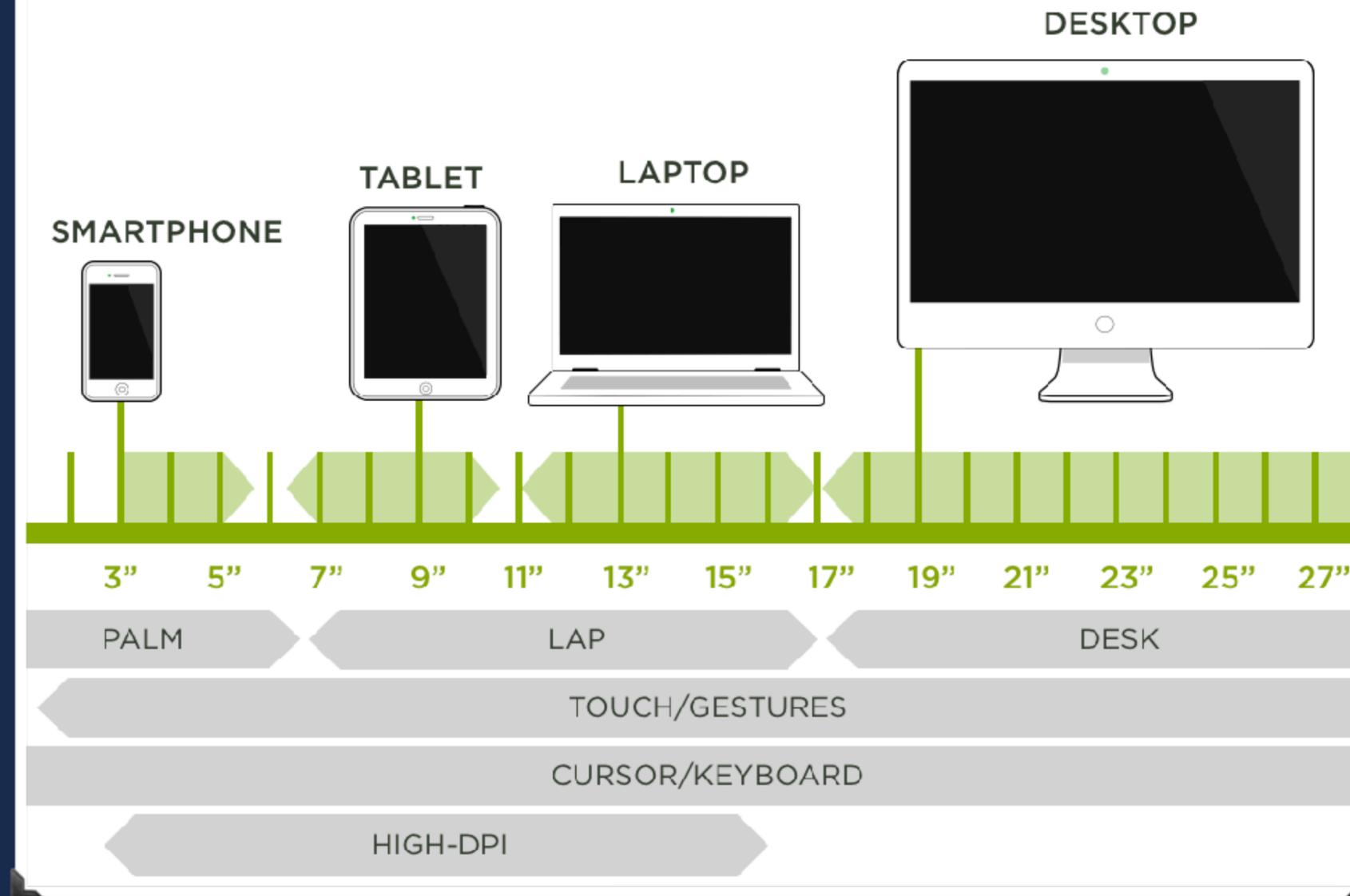
**Designing for
multiple
affordances and
adjustability is
nothing new to
design**



Designing for multiple affordances and adjustability is nothing new to design



Designing for multiple affordances and adjustability is nothing new to design



Universal Design

Architect Ronald Mace



Universal Design

“The concept of designing all products and the built environment to be aesthetic and **usable to the greatest extent possible by everyone**, regardless of their age, ability, or status in life.”

Universal Design

7 Principles:

- equitable use
- flexibility in use
- simple and intuitive
- perceptible information
- tolerance for error
- low physical effort
- size and space for approach and use

Some laws...

The Americans with Disabilities Act (ADA)

The Americans with Disabilities Act of 1990 (42 U.S.C. § 12101) is a US labor law that prohibits unjustified discrimination based on disability. It affords similar protections against discrimination to Americans with disabilities as the Civil Rights Act of 1964,[1] which made discrimination based on race, religion, sex, national origin, and other characteristics illegal. In addition, unlike the Civil Rights Act, the ADA also requires covered employers to provide reasonable accommodations to employees with disabilities, and imposes accessibility requirements on public accommodations.

Section 508 Legislation

- “In 1998, Congress amended the Rehabilitation Act of 1973 to require Federal agencies to make their electronic and information technology (EIT) accessible to people with disabilities...under Section 508, agencies must give disabled employees and members of the public access to information that is comparable to access available to others.”
- 16 guidelines that define compliance
- Fairly un-specific, meant to last through future changes in technology
- See <http://www.section508.gov/>

W3C'S Web Content Accessibility Guidelines (aka WCAG)

- Developed to provide a detailed baseline, guidance, and strategies for meeting 508 requirements
- Divided into 4 sections: Perceivable, Operable, Understandable, Robust, with 3 levels of compliance: A, AA, AAA
- Detailed, written by coders, largely for coders
- Last update was 2008. Has stood admirably over time, but may not specifically address new interactions that could pose accessibility challenges
- See <http://www.w3.org/TR/WCAG20/#text-equiv>

Who has to follow the guidelines?

Technically...

“The law (29 U.S.C. § 794 (d)) applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology”

A growing trend...

Most companies assume they're not bound by accessibility guidelines but...

- Target lawsuit 2006, settled out of court 2008
- Other lawsuits: airlines (Southwest, JetBlue), banks (Bank of America, Bank One), entertainment (Netflix, Disney), retail (CVS, RadioShack, Target), utilities (Pacific Gas & Electric)...and others
- More here:
<http://www.karlgroves.com/2011/11/15/list-of-web-accessibility-related-litigation-and-settlements/>

Why do we need to care?

- We sell products to agencies that, as publicly funded organizations, have to use tools following the guidelines or they can be sued for not being equal opportunity employers (and may sue us for claiming that our tools are accessible)
- Limiting our customers' teams to people without disabilities is definitely f*cking the customer, not to mention not very cool of us
- While WAC isn't the actual products, we are selling the products which means that customers are in some way going to evaluate products based on our site.

Reframing the design problem

**1. Designing for
accessibility doesn't have
to be a buzzkill**

Buzzkill 1: Usually introduced and/or evaluated too late in the design process

Often designers get a list of violations of guidelines from an audit at the end of the design process...

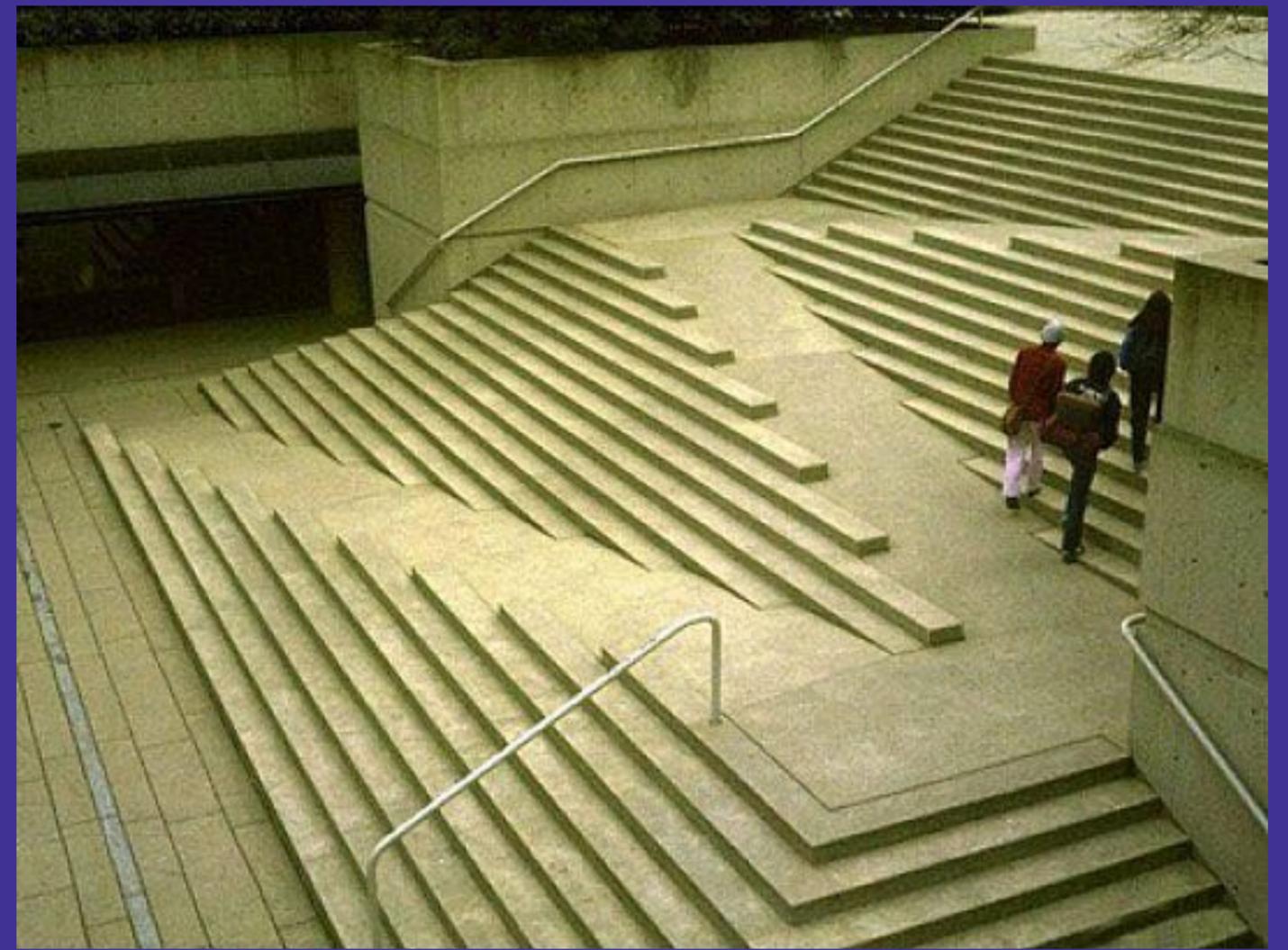
- when it's too late to implement in an elegant way
- often results in a need to retrofit or degrade the design
- threatens deadlines and/or complete re-work.

~~Kill the buzzkill:~~

Learn what we need to know **before** we design so we can build from the beginning for the best solution



Audit after design



Knowledge before starting design

Buzzkill 2: The guidelines were written by and for developers, mostly prescriptive or as a list of things you can't do

While this may work great for developers (who also need the guidelines), it's not well suited to the way designers tend to think and work

- Designers like to stretch the limits of “can”
- Designers orient their approach based on empathizing with their users

~~Kill the buzzkill:~~

Learn how disabled users experience the things we design in such a way that allows us to really understand and empathize, empowering us to come up with the best solutions we can

**2. Designing for
accessibility ultimately is
good design for everyone**

Everyone is
“temporarily
disabled” at
different points
throughout the day



Carrying stuff



Everyone is
“temporarily
disabled” at
different points
throughout the day



Rolling, not walking

Everyone is
“temporarily
disabled” at
different points
throughout the day



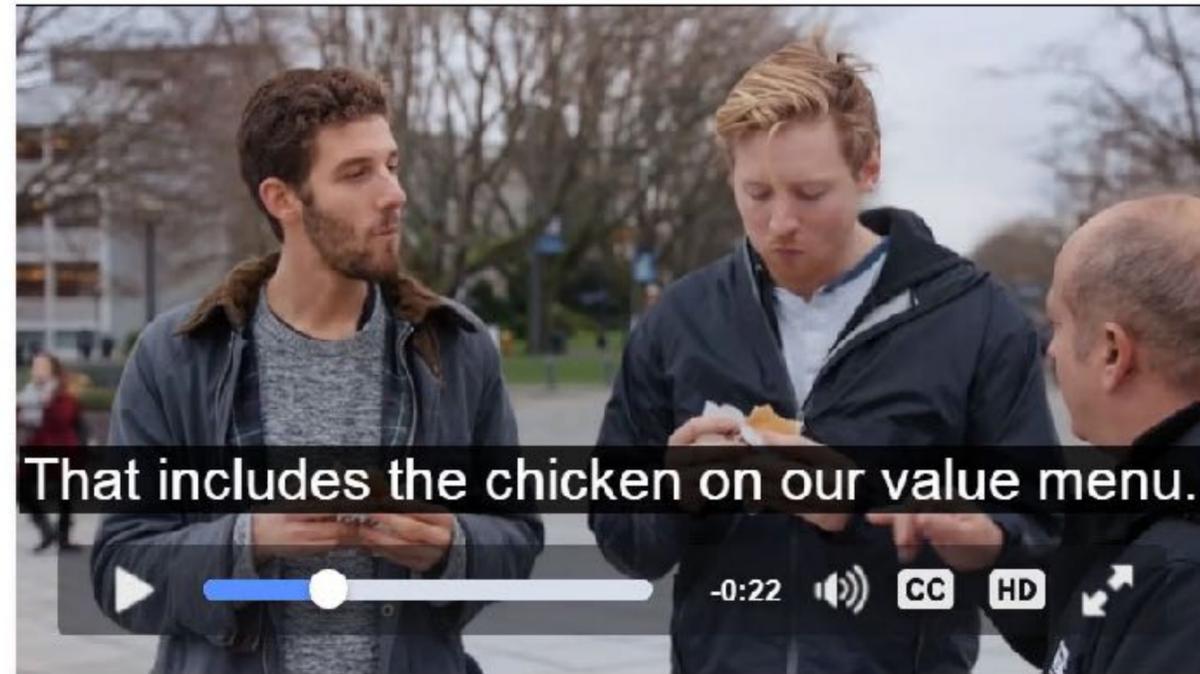
Driving - limited mobility/visual attention

Everyone is
“temporarily
disabled” at
different points
throughout the day

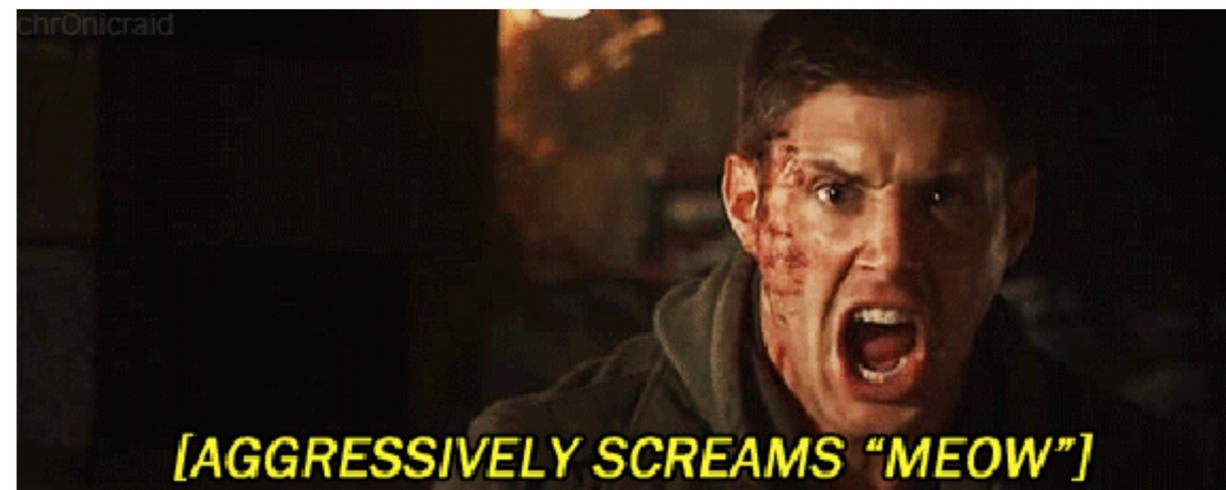


A&W Canada

January 11 at 10:57am · 🌐



216K Views

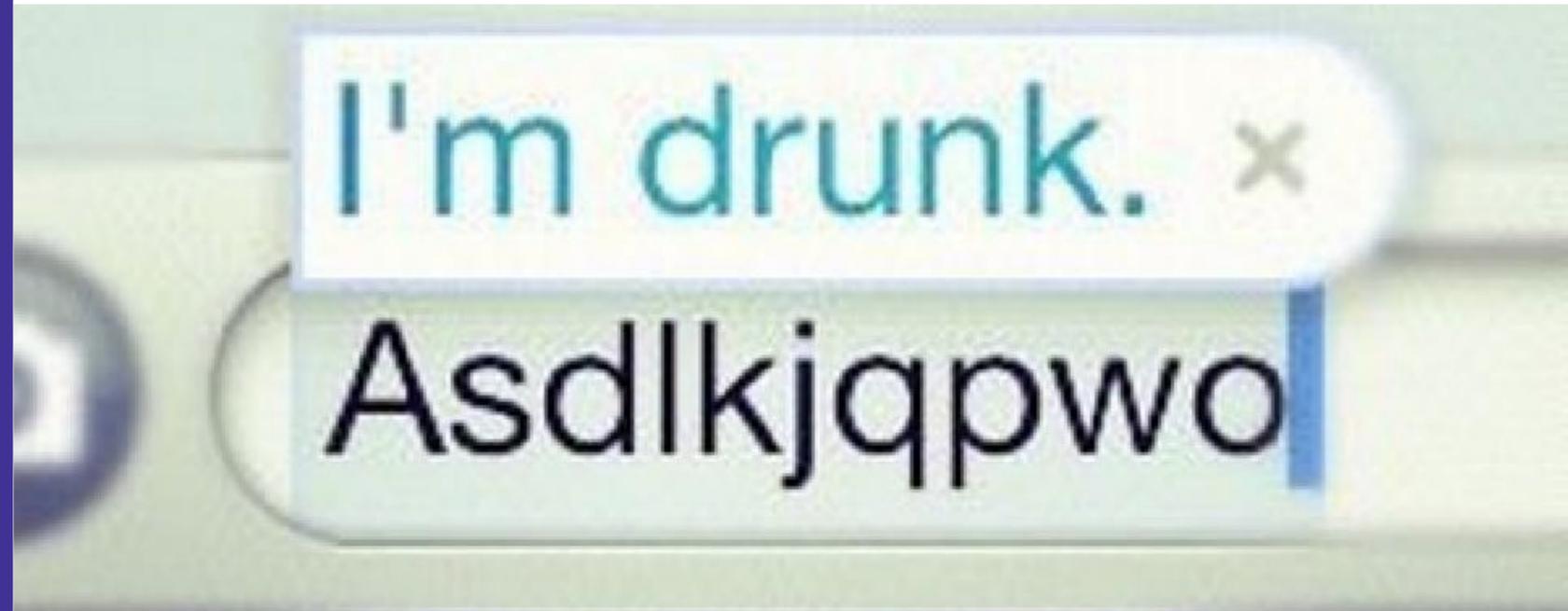


No headphones/loud public environment

Everyone is
“temporarily
disabled” at
different points
throughout the day



On a boat or other unsteady environment.



Or drunk.

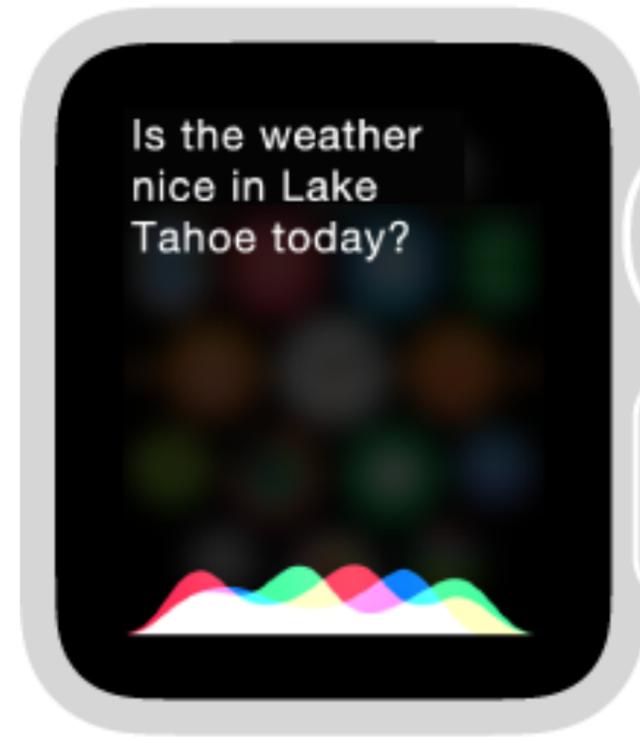
Everyone is
“temporarily
disabled” at
different points
throughout the day



Outside in the sun

Everyone is “temporarily disabled” at different points throughout the day

Press and hold to activate Siri.



Using a special device

**Some things just
make life easier**



Originally developed for arthritis sufferers

Some things just
make life easier



making cheese	
making cheese at home	653,000 results
making cheesecake	315,000 results
making cheese sauce	1,270,000 results
making cheese from raw milk	482,000 results
making cheese recipes	1,260,000 results
making cheese without rennet	167,000 results
making cheese dip	928,000 results
making cheese video	694,000 results
making cheese from yogurt	531,000 results
making cheese popcorn	419,000 results

[close](#)

Originally developed for people with limited mobility

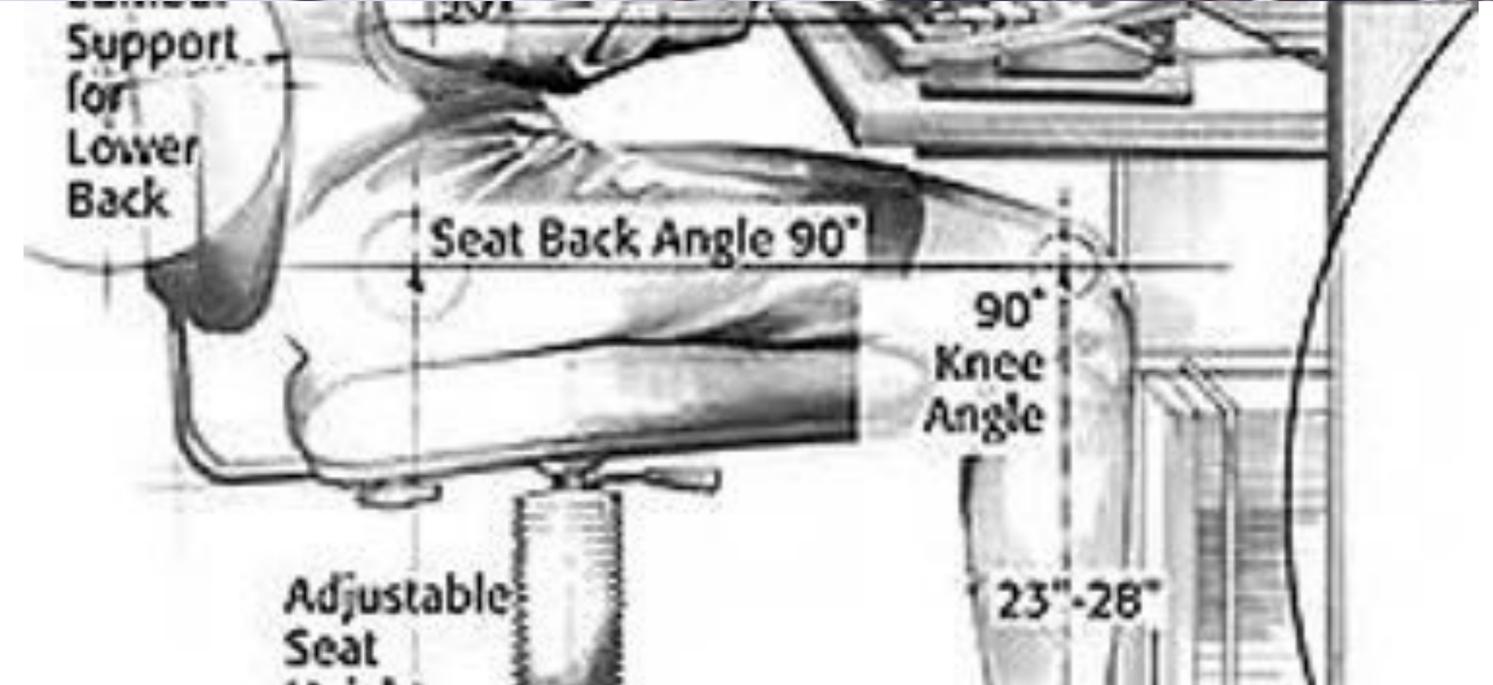
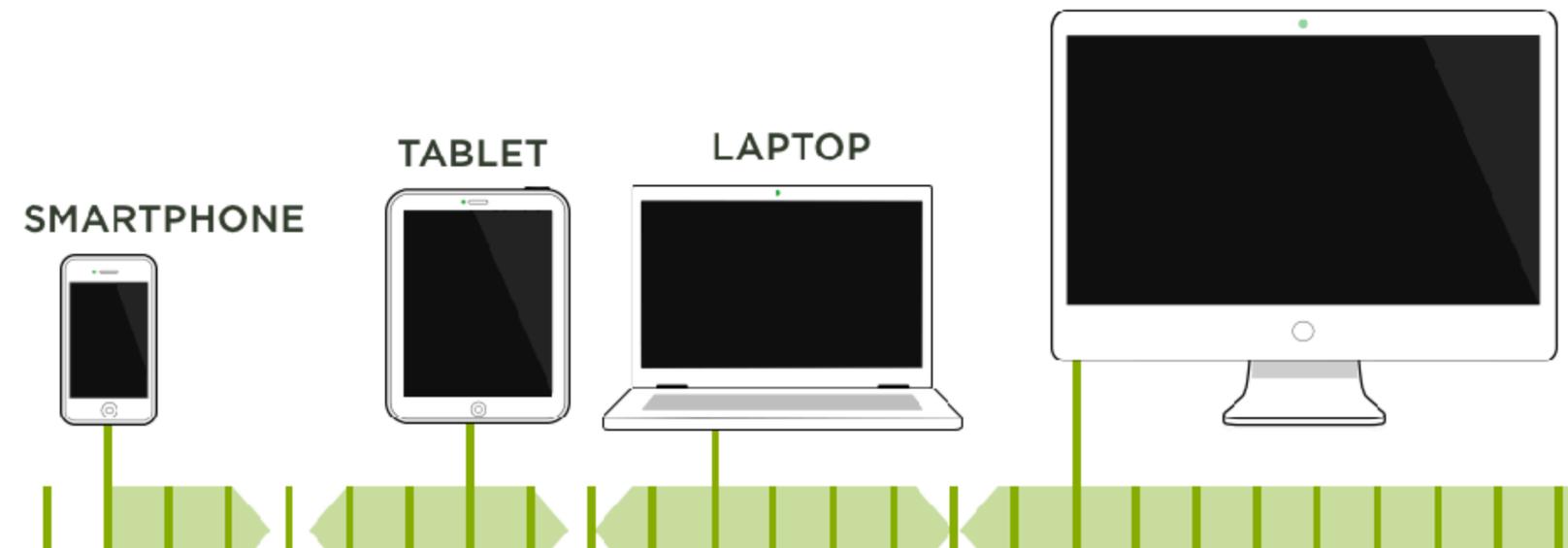
Some things just
make life easier



People with motor disabilities depend on tabbing through forms and navigation as well as keyboard shortcuts

Think of it as another dimension of adjustability.

We adjust to our users' needs, including options for physical affordance

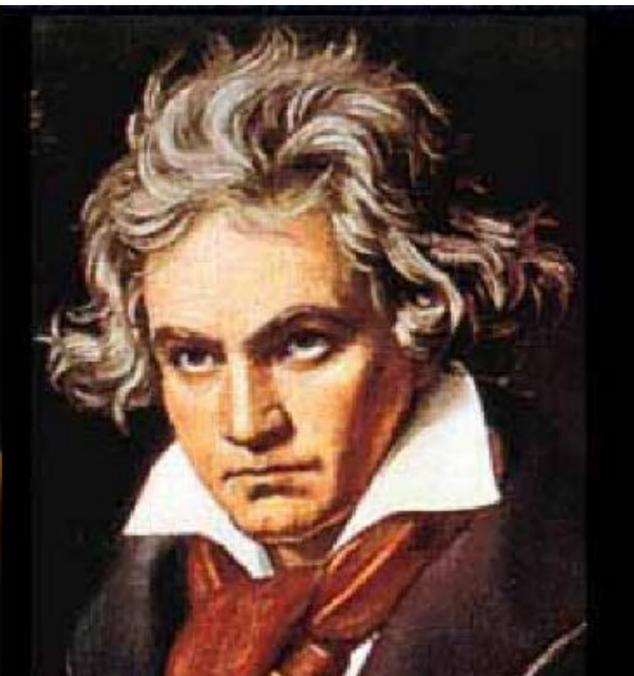


**4. Oh, yeah...and the
“duh” part:
it’s the right thing to do**

As designers of
tools used to get
work done,
we have a say...



...in who gets to participate and
doesn't get to participate in that
work



Designing for Accessibility

Part 2: Empathic Training on Disabilities and Digital devices

Empathic design

- Understanding how users with different disabilities access our digital experiences makes the guidelines more relatable which makes them easier to remember and more fun to design for.
- Knowing the source and reason for the guidelines helps us develop appropriate work-arounds especially as technology evolves

**How does empathic
design enable us to
be better designers?**

A silly example

For example...

If you were assigned the problem:

*“Design a new to-go container for
a new beverage at 7-Eleven”*

How does empathic design enable us to be better designers?

And I gave you only a guideline without explaining why...

“NO SPOONS”



...you might say:

“okay, FINE, a straw then”



How does empathic design enable us to be better designers?

But if we better understand what we're designing for and how someone will use the tool we're designing...

“It's for an Icee”



How does empathic design enable us to be better designers?

You have to try and Icee to understand that it is...

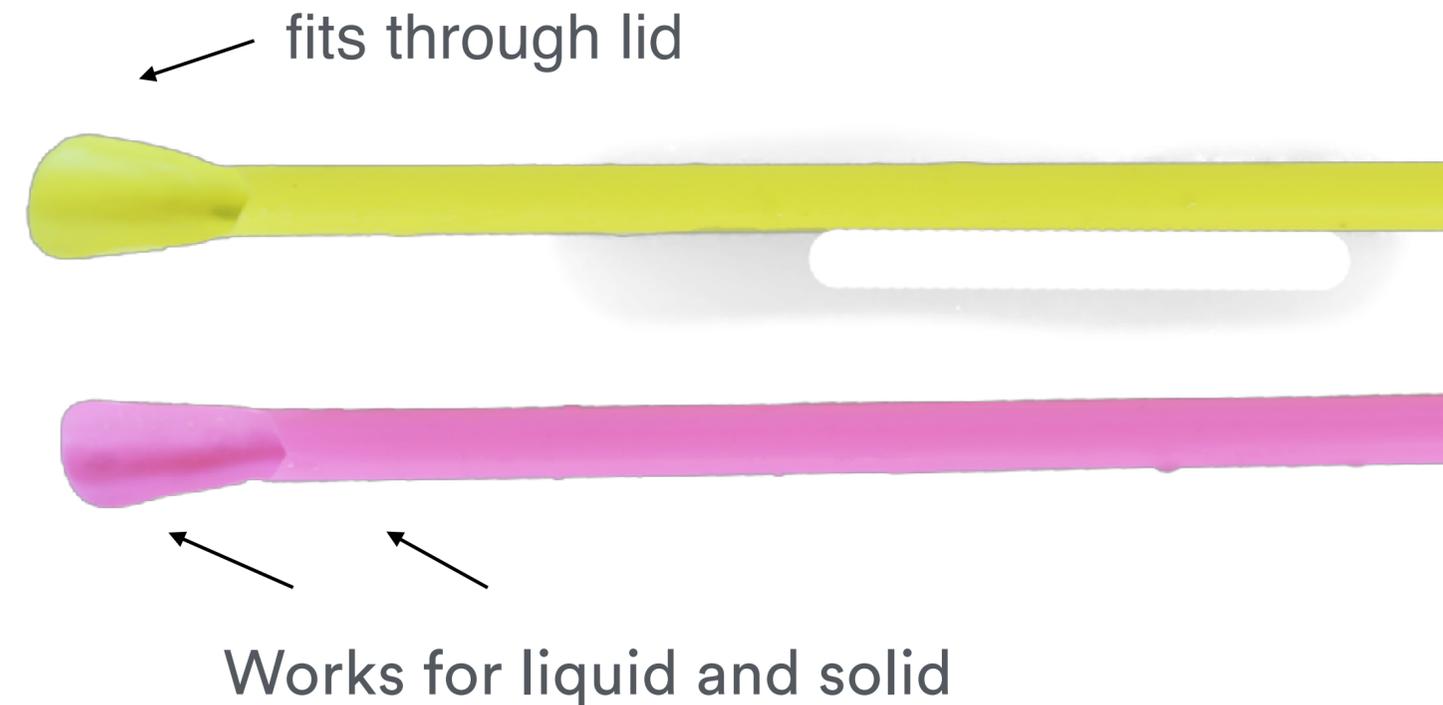
sometimes liquid,
sometime solid,
sometimes somewhere in between
and can quickly become one or the other



...AND since our tool needs to make it through a standard beverage lid, that's why no spoons!

How does empathic design enable us to be better designers?

Now you're more likely to come up with a smarter, more useful solution...



Who are we designing for?

For learning purposes, our audience with disabilities can be roughly grouped into:

- Visual disabilities
 - Color blindness
 - Legal blindness
 - Other vision problems
- Motor disabilities
- Cognitive disabilities
- Hearing disabilities

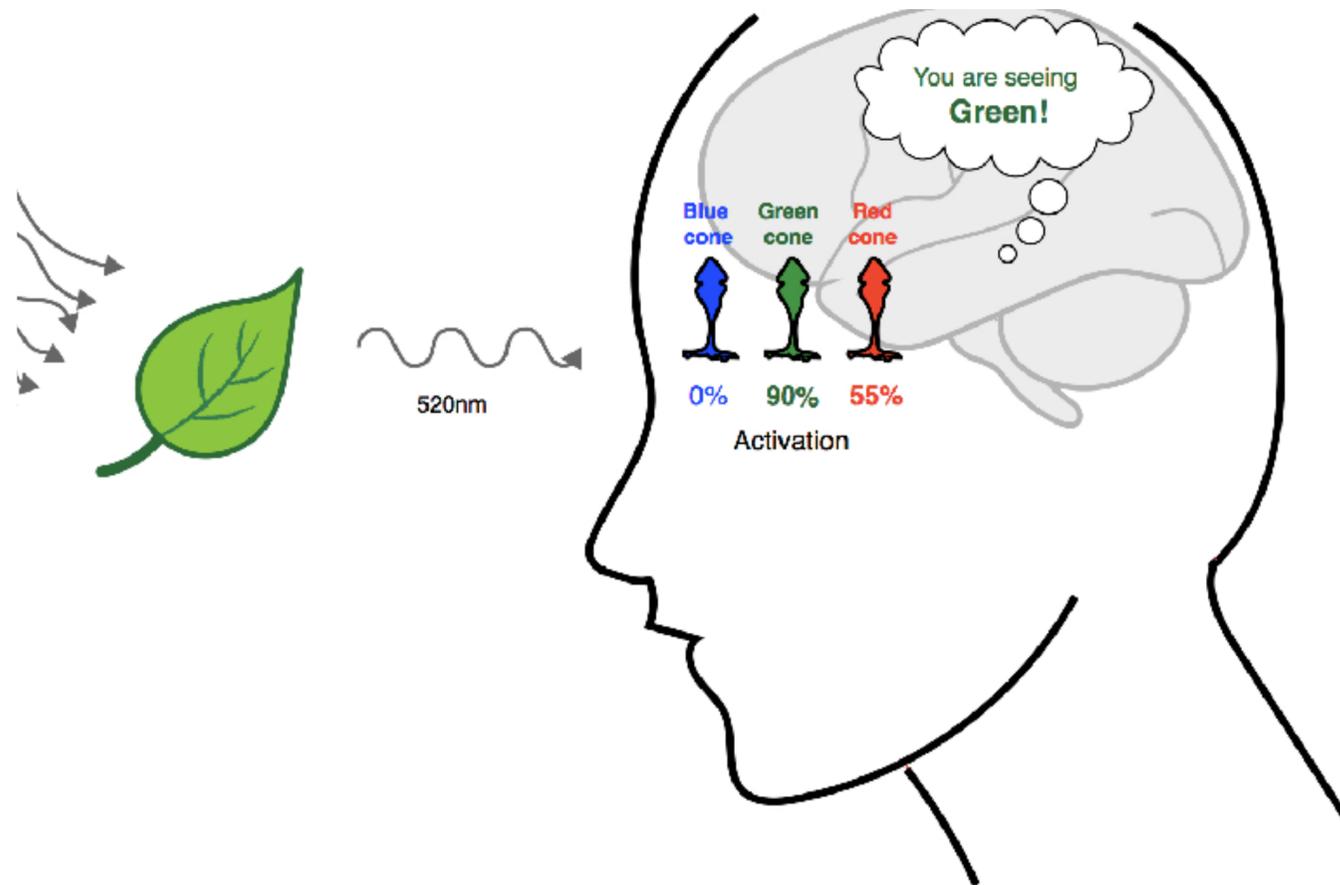
What do we need to know about these users?

1. How does this group experience the interfaces we design?
2. How can we simulate this experience in order to understand and evaluate our work?
3. Common myths and misunderstandings
4. Specific considerations for each role (UX and visual design, content, dev)
5. How does designing for this group likely make experiences of our designs better for everyone?

Color blindness

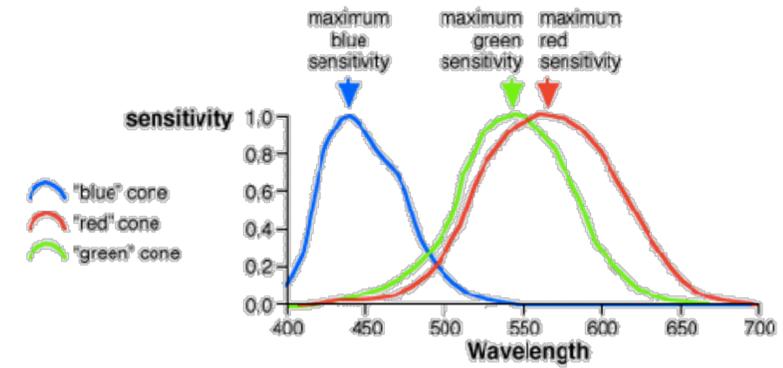
What is color blindness?

Blue, green and red receptor cones in our eyes perceive their respective color's light. Combined, they create the color spectrum.

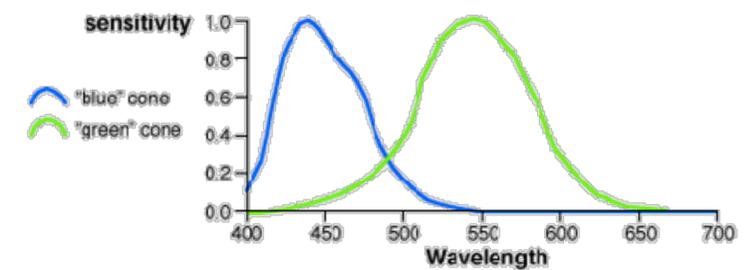


A color-blind user has one type of cone that does not work properly or is missing.

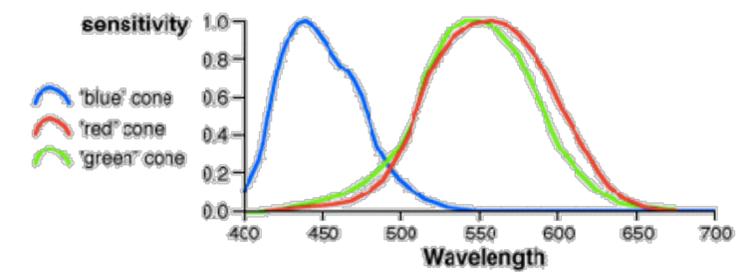
Normal well differentiated colour perception



Colour blind perception with the red receptor missing



Poor red-green response separation



Types of color blindness

Deuteranopia/Deuteranomoly: 3.26% of the population. Lowered or loss of sensitivity to green cones, which presents weakened ability to distinguish between some hues of red and green. Depending on severity, green may appear dim or blackish-brown.



Protanopia/Protanomaly: 1.25% of the population. Lowered or loss of sensitivity to red cones, which presents weakened ability to distinguish between some hues of red and green. Depending on severity, red may appear dim or blackish-brown.



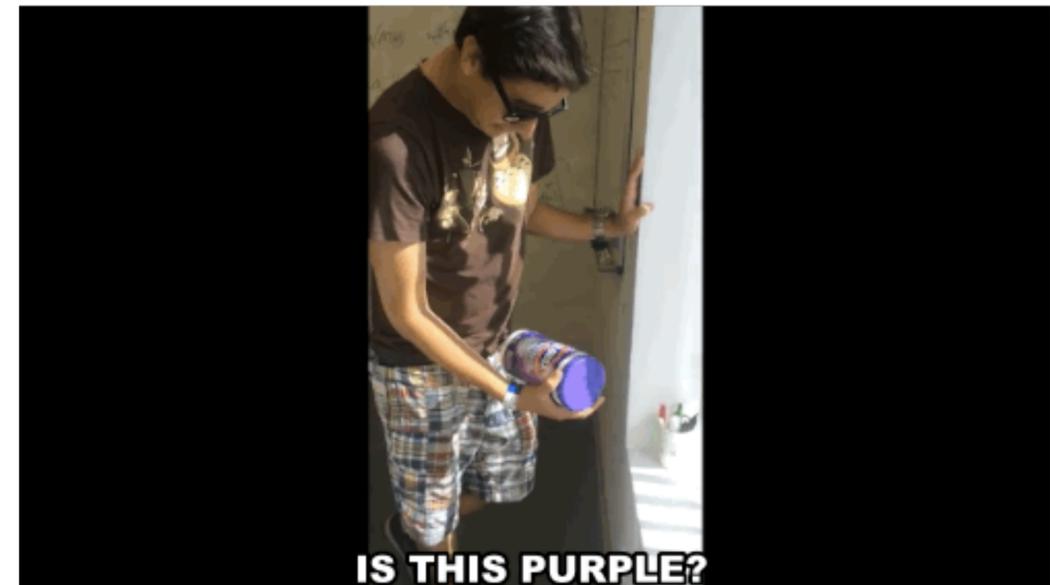
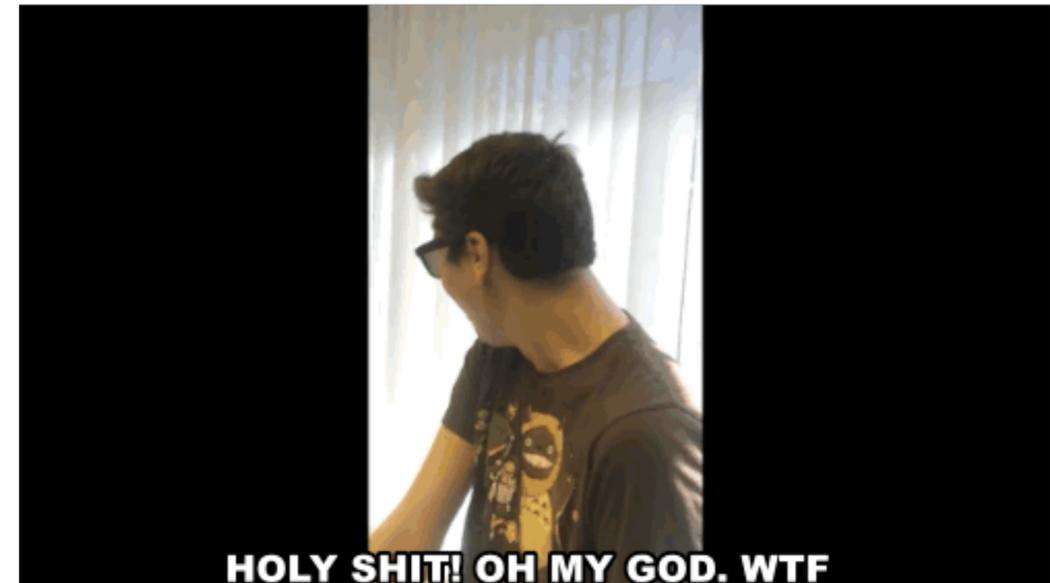
Tritanopia/Trianomaly: 0.026% of the population. Very rare. Lowered or loss of sensitivity to blue cones, usually resulting in confusion between blue/yellow/green and sometime yellow vs. purple.



Achromatopsia: Extremely rare <0.0001% of the population. Little or no function of the cone cells.



IRL



- Enchroma color blindness correction glasses demo
- ...and explanation

Common myths/ misunderstandings

Ask the color blind guy in the office to check the comp



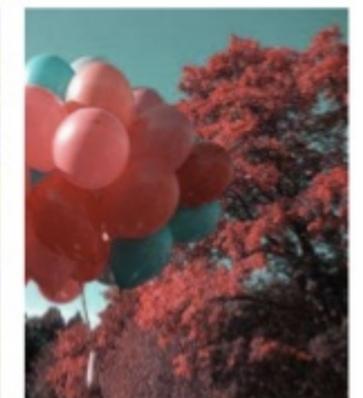
Normal vision



Red-Blind/ Protanopia



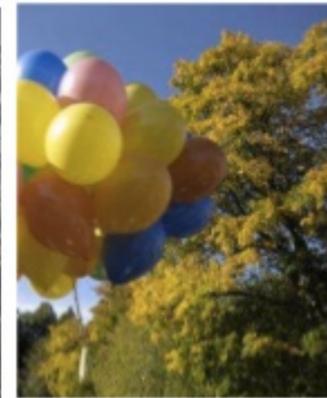
Green-Blind/
Deuteranopia



Blue-Blind/Tritanopia



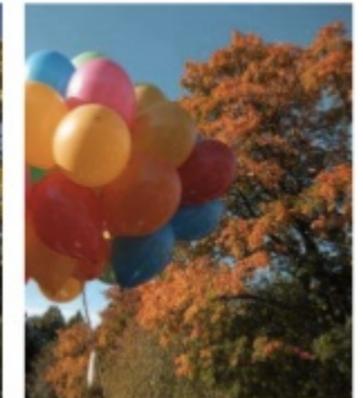
Monochromacy/
Achromatopsia



Red-Weak/
Protanomaly



Green-Weak/
Deuteranomaly



Blue-Weak/
Tritanomaly

Simulator: <http://www.colblindor.com/coblis-color-blindness-simulator/>

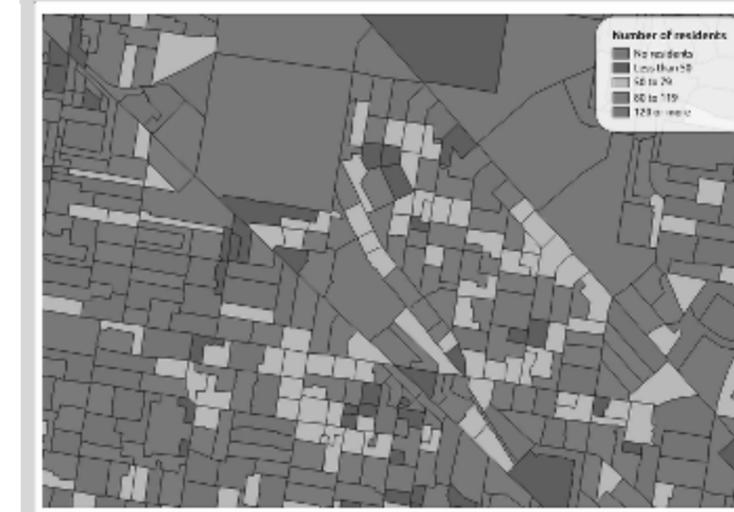
How Ed sees things

Common myths/ misunderstandings

Put it in grayscale



Normal



Grayscale



Protanope

How can we simulate users' experience to assess our own work?

- Photoshop tool
- Online tools, e.g. <http://www.color-blindness.com/coblis-color-blindness-simulator/>
- Additionally audit to avoid green or red on dark colors.

Design considerations

- Use a simulator to check for problematic color combinations
- Avoid red or green on dark backgrounds and vice-versa.
- Make sure maps, charts, and other data visualizations can be understood without color and in color-blindness simulations
- Don't rely on color alone as an indicator (e.g. "errors marked in red")

Dev considerations

- Avoid red or green on dark backgrounds and vice-versa.
- Make sure maps, charts, and other data visualizations can be understood without color and in color-blindness simulations
- Don't rely on color alone as an indicator (e.g. "errors marked in red")

How does designing for color blind users make the Web better for everyone?

- Forces more readable color combos
- Allows multiple affordances for understanding visual information

Tools

- Photoshop tool
- Online tools, e.g.
<http://www.color-blindness.com/coblis-color-blindness-simulator/>

Other Vision Problems

4 ways vision can be affected

- Color perception
(see previous section on color blindness)
- Visual acuity
- Contrast sensitivity
- Usable visual field

Visual acuity

Ability to see fine details of objects.
Sometimes correctable with glasses/contacts,
but not always (e.g. macular degeneration)



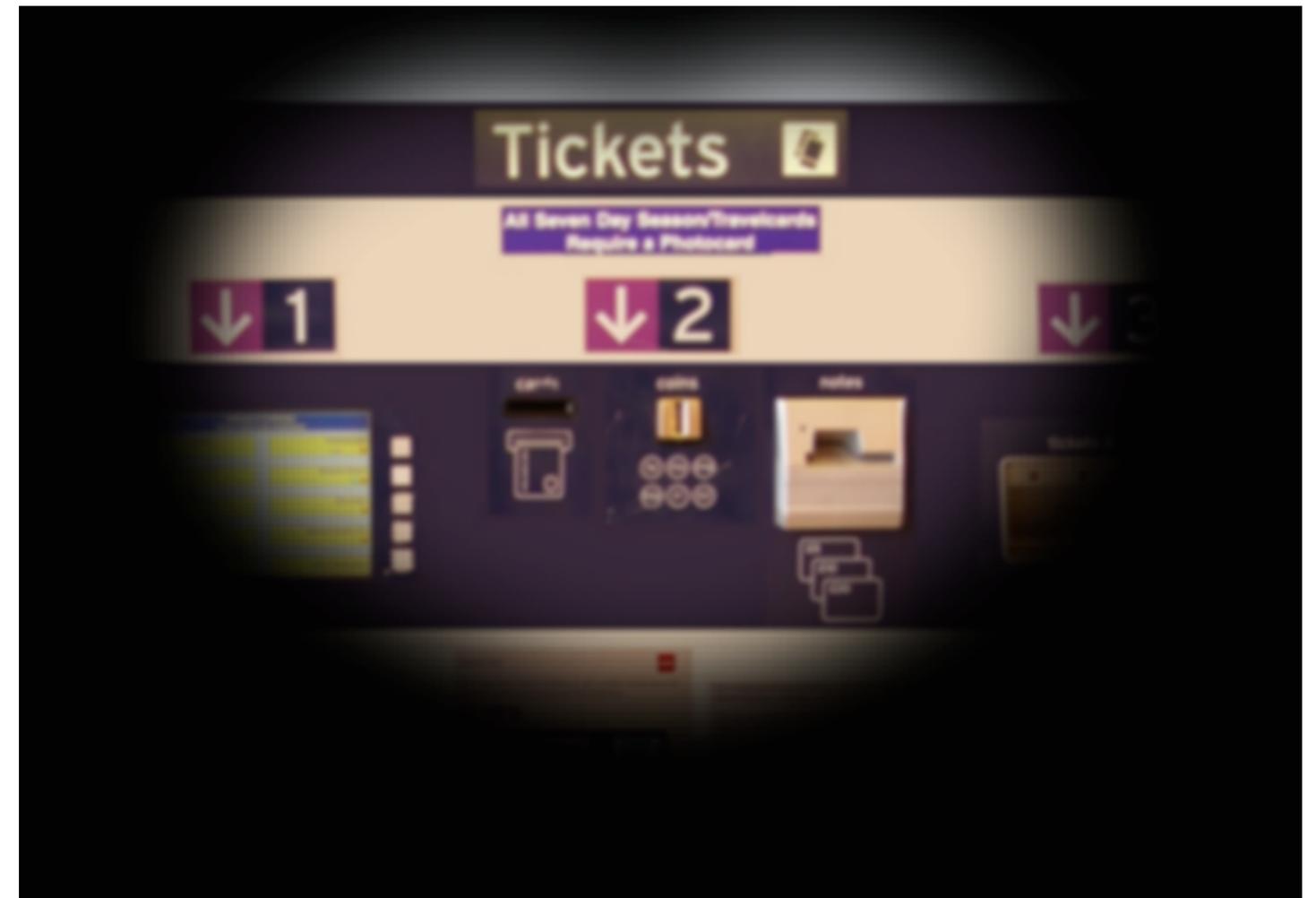
Contrast Sensitivity

Ability to discriminate between different brightness levels. Sometimes helped with yellow-tinted lenses. Contrast perception can be affected by eye problems such as cataracts that can also cloud vision.



Visual field

Ability to use the whole of the visual field to perceive detail in the area being looked at and the surrounding area



Low Vision Simulations

<http://www.inclusivedesigntoolkit.com/betterdesign2/simsoftware/simsoftware.html>

How does someone with vision problems access Web sites?

- Change size of text or browser window to accommodate a smaller field of vision.
- Disable CSS
- Apply own CSS stylesheet to a page so colors, size, font, line spacing, and/or contrast are more legible

Design considerations

- Consider multiple viewport sizes
- Ensure contrast ratio between page elements and their background are high enough for readability.
- Consider legibility of font choices, sizes, and spacing
- Accommodate for potential of text resizing within the visual layout
- Avoid images of text (except for elements such as logos)
- Consider multiple viewport sizes
- Consider layout absent of CSS Style — does the page structure and hierarchy make sense?

Content considerations

- Less to read = better

Dev considerations

- Content is coded with accurate H1, H2, H3 tag hierarchy
- Text can be re-sized, page scaled up to 200% without breaking the design
- CAPTCHA is offered in an alternative format
- Page content is organized so it can be read without the stylesheet (doesn't have to be pretty)

Tools

Contrast calculators:

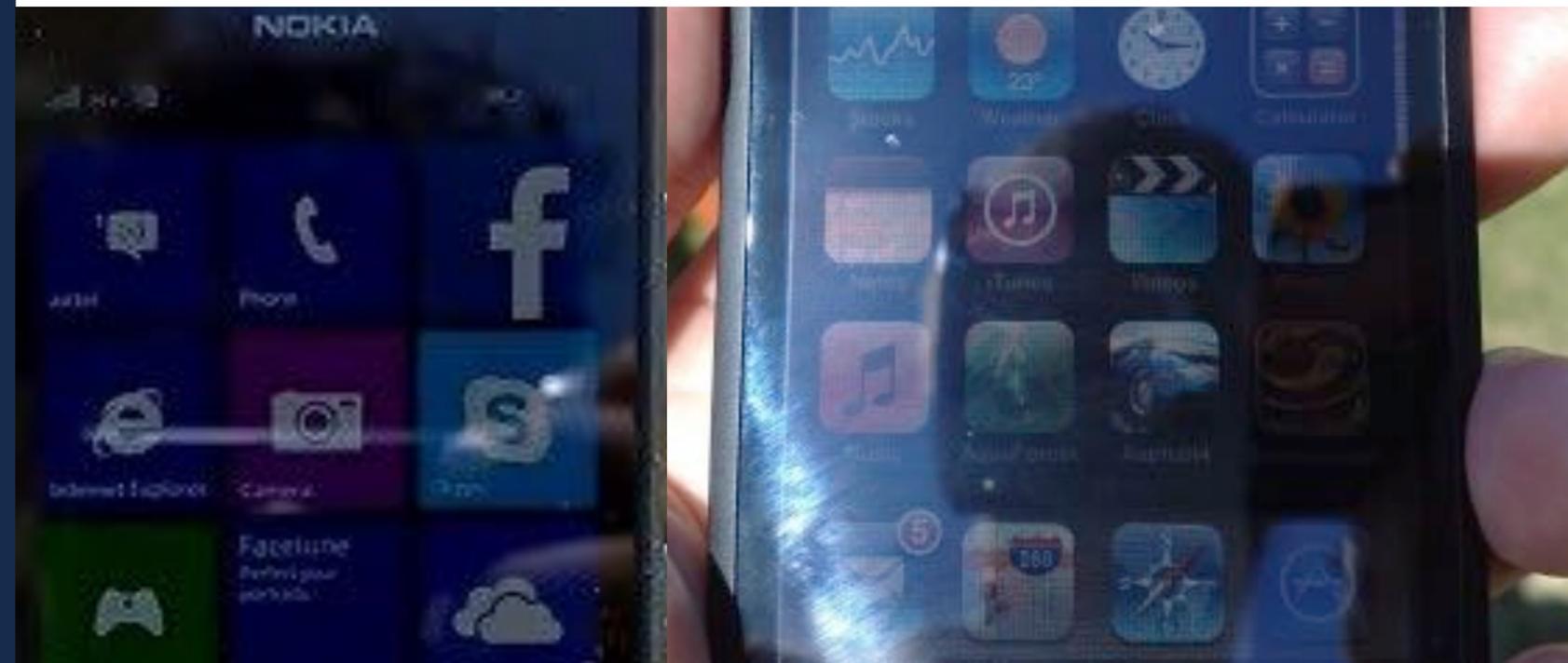
- [WebAIM](#)
- [snook.ca](#)

Chrome extensions:

- [Stylish](#)
- [Web Developer extension](#)
- [What font](#)

How does designing for someone with vision problems make design better for everyone?

- Adequate contrast in glare and sunny environments
- Designs that are portable regardless of viewport size
- Robust content hierarchy
- Fluid layouts that can also accommodate globalization



Legal Blindness

What does it mean to be legally blind?

May not be completely without vision, but cannot rely on vision for daily tasks such as reading, driving, and manipulating visual interfaces and objects.

How does someone legally blind access the Web?

Screen Readers:

- VoiceOver on Mac
[Key Command Guide](#)
- JAWS or NVDA on PC

See also:

[Video of someone using a screen reader](#)

How does someone legally blind use a mobile device?

Example demos:

[Overview, Twitter](#)

[Facebook](#)

How does someone legally blind watch a video?

Examples of audio-described video:

[Clip from Frozen](#)

[Google self-driving cars](#)

See also:

<https://www.netflix.com/browse/audio-description>

Design considerations

- Logical tab order
- All interactive elements need to be operable by keyboard in case mouse/trackpad isn't an option
- Use clear information hierarchy, properly nesting heading levels
- Skip-to mechanisms for repeating/persistent nav elements
- Affordances besides purely visual for interaction and understanding (e.g. image maps, sliders, charts and graphs)
- Touch targets for smartphone devices need to be large enough for accessibility touch navigation
- Consider media with elements that are purely visual. May need to be accompanied by a transcript/audio description (note: transcript is WCAG level A, audio described level AA)
- Alt tags
- Charts and graphs may need annotations/ accompanying information

Dev considerations

- The purpose of a link can be determined by the content of the link on its own (e.g. no “click here” “follow this link”) or is tagged to read additional information
- A mechanism is provided to allow users to skip past repeated content on the page (like the navigation)
- Page elements are ordered in a logical sequence on the page
- Underlying page structure accurately represents information hierarchy (e.g. H1, H2, H3, etc tags)
- All elements are navigable by keyboard-only
- If tab focus of a page is changed, it’s moved/returned in a logical way
- If an action is dependent on timing, the user is given an expiration warning and ability get more time
- If an input error is auto-detected, it’s also represented in text and recommendations for correction provided
- Alternative to CAPTCHA provided
- ALT tags for images
- Alternatives/text provided for rollover interactive images/maps

How does designing with consideration for legally blind users make the design better for everyone?

- Tabbing order/fast keyboard access
- Enforces clear information hierarchy
- Especially for products/apps, allows users to operate without paying full attention to a screen
- Proper image and chart description helps with SEO
- Graceful degrading (old browsers, slow speeds)

Tools

- [Key Command Guide](#) for Voiceover

Motor impairments

What does it mean to have a motor impairment?

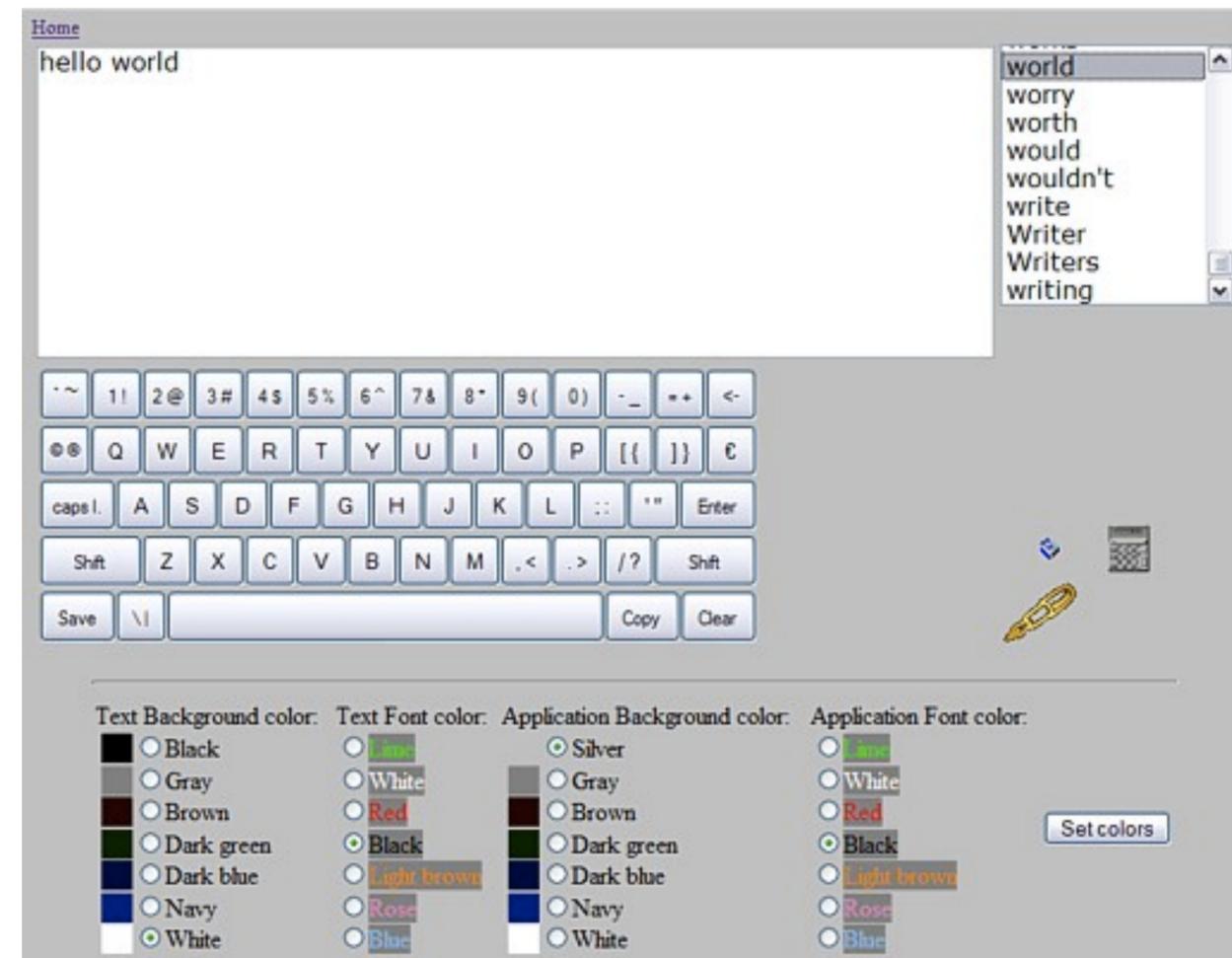
Conditions that make it impossible or difficult to use limbs for daily tasks.

Users may not be able to use their hands for mousing or touch surfaces with much degree of accuracy or at all.

Causes can include:

- Paralysis
- Tremors
- Arthritis
- Cerebral Palsy
- ...and others

How does someone with a motor impairment access the Web?



How does someone with a motor impairment access the Web?

- Tabbing/keyboard-only navigation
- Large enough targets
- Auto-complete and auto-correct assistance
- Voice commands

How can we simulate the experience of someone with a motor impairment?

- Navigation with keyboard-only
- Consider touch target size
- Consider fatigue from repeated adaptive movements.

Design considerations

- Avoid complex interaction and mechanisms that can't be operated without fine motor control (rollover menus, touch target sizes, etc.)
- Mechanisms and navigation should be navigable purely by keyboard (e.g. avoid drag-and drop as the only means for an interaction)
- Saved steps and pre-filled information saves work for users with motor impairments
- Include a visual indication of tab-focus on the page

Content considerations

- Keep content and number of links to the simplest set possible

Dev considerations

- Order of page elements coded in a meaningful way
- There is a visual way to determine current tab focus of the page
- All elements are navigable by keyboard only
- If tab focus changes, it's moved or return in a meaningful way
- Moving the tab focus does not initiate a change all on its own
- Use of auto-complete wherever logical and possible

How does designing for someone with a motor impairment make a design better for everyone?

- Walking/holding other objects while using your smartphone
- Keyboard navigation is faster than clicking in certain circumstances, e.g. forms
- Keyboard focus is clear
- Helps audit for simple and intuitive interactions (e.g. no narrow nested hover menu nightmares or poorly-designed scroll-hijacking)
- Autocomplete/pre-filled fields, especially on smaller devices where a fully sized keyboard is unavailable
- Voice commands

Cognitive disabilities

What does cognitive disabilities mean?

Cognitive disabilities as they relate to accessible Web/app design include:

- Attention/distractibility
- Reading comprehension
- Seizures
- General interface, interaction, and copy comprehension

Attention/ distractability

- Simulation
- Looping animations or videos that can't be hidden or paused can distract some users to the extent pages become unusable.

Reading comprehension

- President Obama signed the Plain Writing Act of 2010 on October 13, 2010. The law requires that federal agencies use "clear Government communication that the public can understand and use."
<http://www.plainlanguage.gov/>
- WCAG Guidelines suggest no higher than "lower secondary level reading comprehension" (roughly 6th grade)

Seizures

In general, if the content...

- flashes more than three times per second
- is notably large (a small animating image would not cause a seizure)
- has bright contrast in the flashes
- ...it may cause a seizure and should be avoided

Example:

(WARNING: MAY CAUSE SEIZURES. IN PHOTSENSITIVE INDIVIDUALS. PLEASE **DO NOT PROJECT IN A GROUP PRESENTATION**)

<http://webaim.org/articles/seizure/media/flicker.gif>

General interaction

- UI mechanisms that show responses to interactions and input are helpful

See examples:

[Google Material Design principles](#)

Page structure

- Clear visual hierarchy of headings and elements on the page.
- Chunking of content into easily digestible groupings



Design considerations

- Highlighting changes to a page state and alerts is helpful
- Interaction feedback (e.g. something is tapped or clicked and the interface reacts)
- Avoid overly complex interactions and processes
- Utilize templates and common patterns
- Avoid looping animations and distractions that can't be paused
- Test animations/videos with flashing for photosensitivity issues
- Use clear common language
- Transaction pages need a summary and confirmation page for completing a purchase

Content considerations

- Simple language
- Chunking of information
- Strong visual hierarchy
- Consider reading comprehension score

Dev considerations

- Page hierarchy meaningfully represents the information hierarchy of the page
- If an action is dependent on timing, user is given an expiration warning and ability to ask for more time
- If an input error is auto-detected, it is also described in text and a suggestion for fixing is offered

How does designing for cognitive disabilities make a design better for everyone?

- Simpler content and designs with limited distractions
- Plain language, no jargon
- Intuitive interaction with plenty of responsive cues
- Clear information hierarchy

Tools

- Reading comprehension scoring tool:
<https://readability-score.com/>
- Evaluation tool for flashing animations
(PC only):
<http://trace.wisc.edu/peat/>

Hearing impairments

What does it mean to have a hearing impairment?

- A hearing impairment is a hearing loss that prevents a person from totally receiving sounds through the ear.

How does someone with a hearing impairment access media on the Web?

- Closed Captions
- Transcripts
- ASL Interpretations
- Visual alternatives to alert sounds (e.g. flashes, highlighting, etc.)
- Day in a the life video

Common myths/ misunderstandings

- Consider context — transcripts aren't always a great substitute for closed captioning

Design & content considerations

- Alert sounds need alternative visual approach
- Consider important messages conveyed with sound are also available by visual means
- Content that is only accessible in audio format or video with audio needs to be transcribed and/or captioned (WCAG level A for video is transcription, AA is captioned)

How does designing for hearing impairments make a design better for everyone?

- Transcripts when you don't want to watch a whole video
- In a quiet or loud space, didn't bring headphones
- SEO
- Closed captions (e.g. [Facebook](#))

Non-Web examples:

- Can't have phone ringer on - vibrate
- Apple watch wrist taps while driving/navigating
- Police/emergency siren lights are a visual cue when your car stereo is too loud

What's next?

- Explore more on your own
- Online design accessibility audit guide
- In meantime, audit matrix
- Eventually, online training
- Teach others what you've learned!

What about the miniature pony?



Meet the guide ponies

- Mexicali
- Panda

