



Occupational
Health Clinics
for Ontario
Workers Inc.

Centres de
santé des
travailleurs (ses)
de l'Ontario Inc.

When Technology Hurts

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Presentation Overview

- ❖ **Statistics**
- ❖ **Types of New Technology**
- ❖ **Challenges of New Technology**
- ❖ **Musculoskeletal Disorders**
- ❖ **Review of Literature**
- ❖ **Solutions**
- ❖ **What you can do**
- ❖ **Questions**

New Technology





Internet Use in Canada

- Canadian Internet use is shifting from desktop Internet to mobile devices
- 3 out of 4 Canadians own smartphones and 49% of the time online is spent on mobile devices
- Social media is the top activity performed on portable devices
- Tablets have overtaken desktop computers as the preferred gaming platform
- The June 2014 Ericsson Mobility Report predicted there could be as many as 5.6 billion smartphone subscriptions globally by the end of 2019
- 1.3 million Canadians use only mobile devices to access the Internet

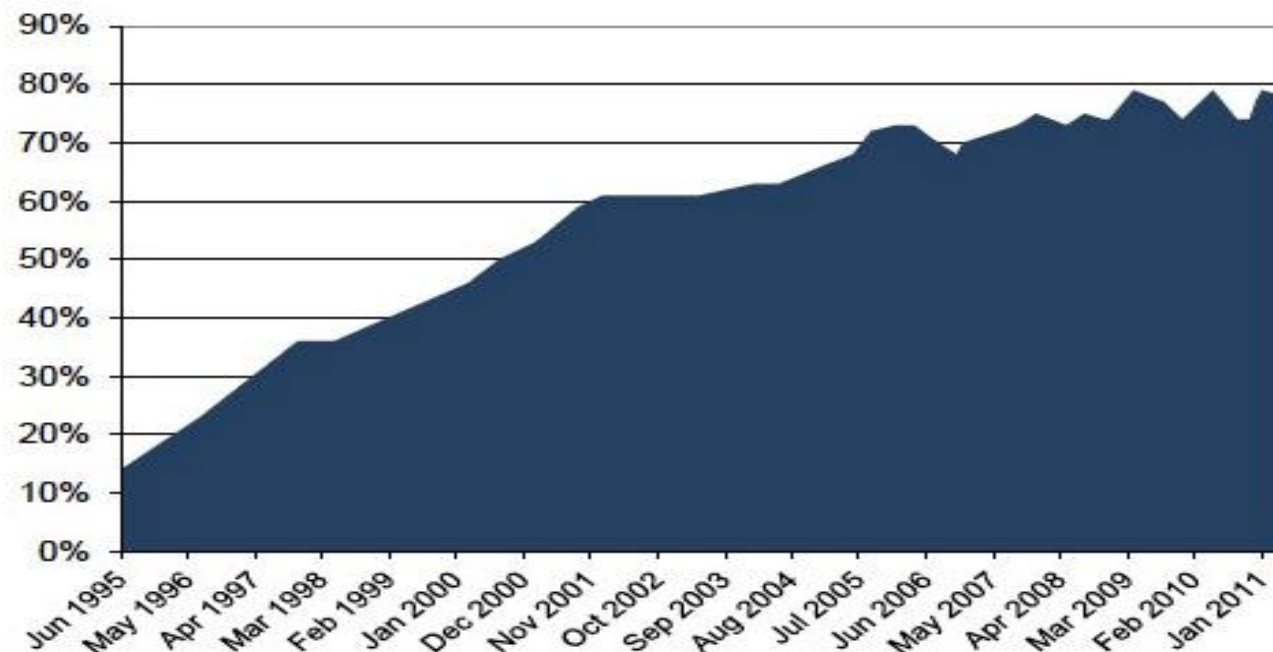
Source: Canadian Internet Registration Authority (CIRA),
Factbook 2015



Internet Use

Internet adoption, 1995-2011

% of American adults (age 18+) who use the internet, over time. As of August 2011, 78% of adults use the internet.



Source: Pew Internet & American Life Project Surveys, March 2000-August 2011.

<https://www.youtube.com/watch?v=gsNaR6FRuO0>



Laptop Statistics

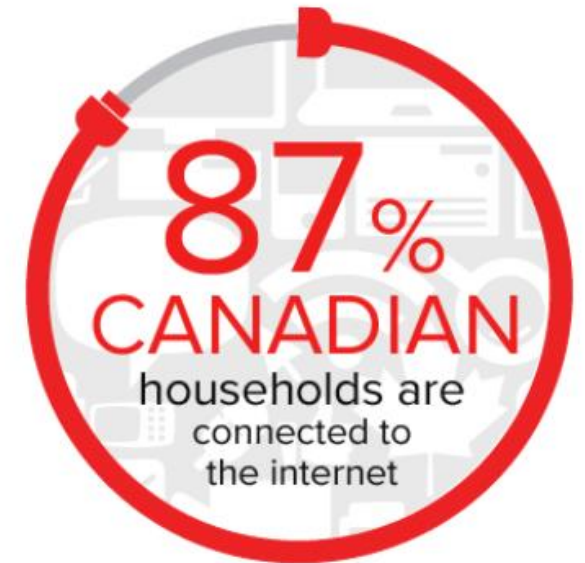
- Price gap between laptops and desktop computers has fallen to \$50
- 68% laptop usage in the workplace (mobility, small space, work from home)
- A lot of laptops now are incorporating a touch screen component to them





Tablet & Smart Phone Statistics

- 2/3 of Canadians own a smartphone
- In 2014 49% of Canadians owned a tablet; up 10% from 2013
- 28.8 million Canadians are wireless subscribers
- More Canadians own cellphones than have land lines
- Canadians are consuming more data; each person averages 1 gig per month



Source: Canadian Radio-television and
Telecommunications Commission (CRTC), October 2015



What Does 1 GB of Data Look Like?

Data Usage	Amount
Surfing the Internet	44 hrs
Facebook	51 hrs
YouTube Videos	68 videos played
Email	34, 133 emails
Google Maps	17 hrs
Skype	4 hrs
Spotify	256 tracks



You **Tube**





Implications

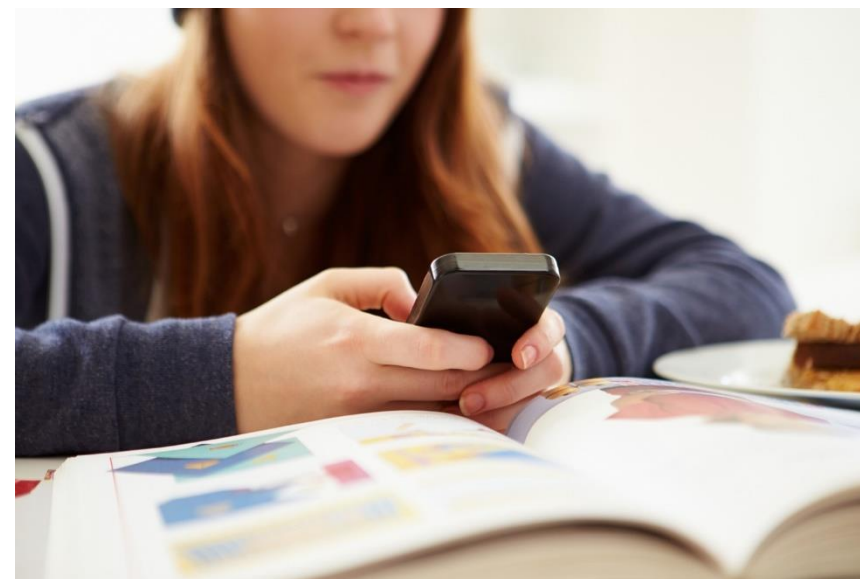
- Cellphone, tablet and wireless technology is increasing the risk of musculoskeletal disorders
- Neck and shoulder pain is more prominent with the use of small devices
- Not taking into account proper positioning of these devices that were not designed for long duration use





The Younger Generation

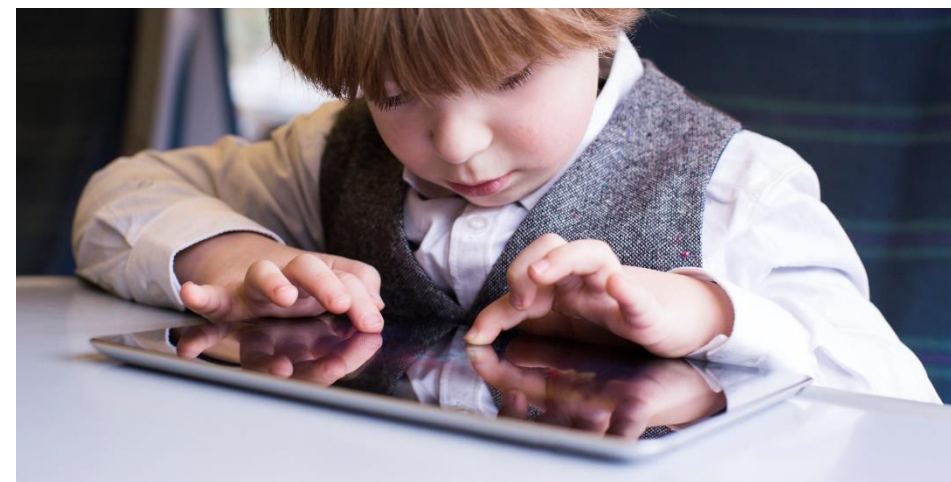
- Concerning for the younger generation because they use these devices much more frequently and could cause permanent damage
- College students with high smartphone usage are more likely than those with low usage to experience impaired hand function, thumb pain and other issues
- Increasing use of this type of technology in the school system from kindergarten to grade 12





The Younger Generation

- Study compared tablet, desktop computer and paper tasks among children with a mean age of 5.6 years
- Measured 3D muscle activity around the neck and shoulder and found that tablet and paper tasks were similar with less neutral spinal posture, more elevated scapular posture and greater upper trapezius and cervical erector spinae activity
- Tablet use associated with different MSD stresses



Source: Straker et al. (2008). A comparison of posture and muscle activity during tablet computer, desktop computer and paper use by young children. *Ergonomics*, 51 (4), 540-555.



MSDs

- MSDs related to cellphone and tablet use are on the rise due to the increased time spent on these devices; awkward postures assumed while using them and the forces on the joints
- Common MSDs related to new technology:
 - Blackberry Thumb (de Quervian's Tenosynovitis)
 - Text Neck or IHunch
 - Cellphone Elbow (Cubital Tunnel Syndrome)
 - Eye Strain



Areas of Discomfort

Thumb:

- The thumb is responsible for 50% of the function of our hands
- Circumduction, abduction and adduction; works in opposition to the fingers

Neck:

- Long periods of excessive neck flexing can lead to fatigue and discomfort

Elbow:

- Prolonged and static flexion of the elbows can lead to nerve compression

Shoulder:

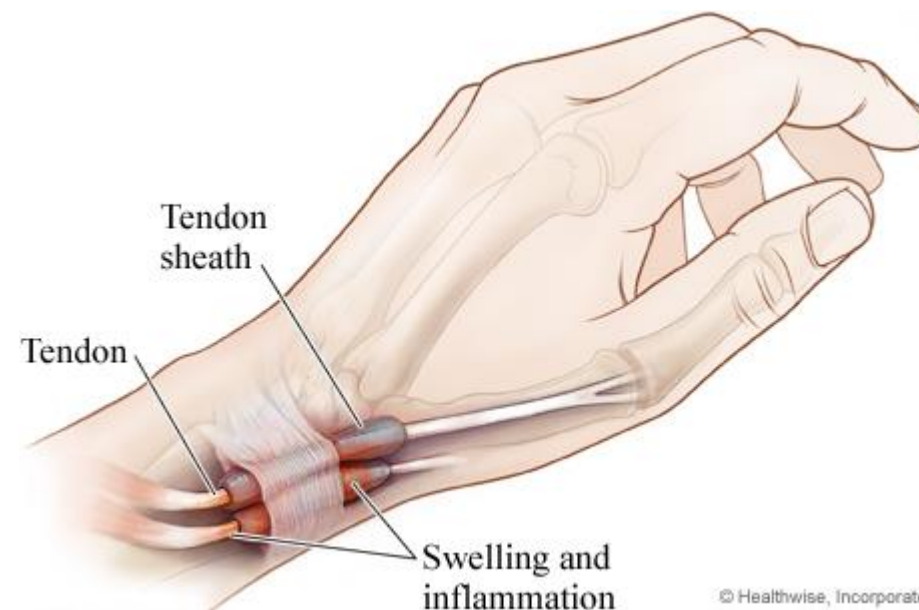
- Supporting the devices and reaching to the screen



De Quervian's Tenosynovitis

Inflammation of the tendons that connect the thumb to the wrist

- Thumbs were not designed for forceful, repetitive motions; they were designed to stabilize



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De Quervian's Tenosynovitis

Symptoms:

- Painful snapping when bending the thumb, tenderness, pain, tingling, and loss of sensation or strength

Treatment

- Anti-inflammatories, heat or cold packs and braces, physical therapy, steroid injections or surgery



iHunch or Text Neck

- MSD related to looking down at tablets, cell phones and other wireless devices for too long
- Strain on neck muscles increases 3-5 times when using a tablet compared to sitting with the head in neutral position
- Neck positions increase the mechanical loads in the neck





Text Neck

- Average human head weighs between 10 and 12 lbs; shifting the neck forward 15 degrees increases the strain on the neck to 27 lbs

The burden of staring at a smartphone

Effective weight on the spine as forward tilt increases

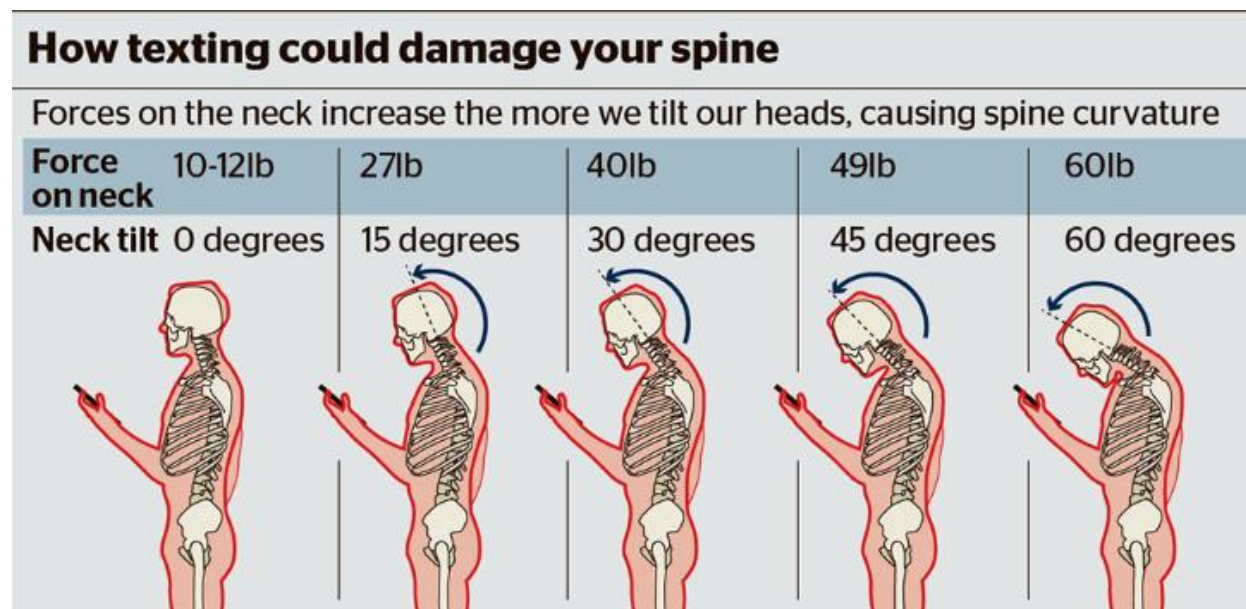
0° 12lb	15° 27lb	30° 40lb	45° 49lb	60° 60lb
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Text Neck

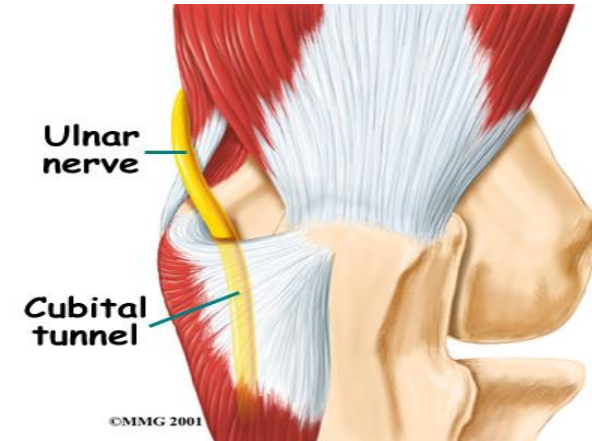
- Increases forces on the cervical spine
- 45 degrees is typical when texting
- Stretching your tissue for long periods of time causes them to get sore, inflamed and leads to muscle strain, pinched nerves, herniated discs and over time can remove the necks natural curvature



Cellphone Elbow/Cubital Tunnel Syndrome



- Caused by prolonged flexion of the elbow
- Ulnar nerve that crosses the inside of the elbow gets pinched
- Symptoms: numbness, tingling and pain in the elbow
- Symptoms may worsen to hand fatigue and weakness, difficulty gripping, curling of the pinky and ring finger
- Causes:
 - Leaning on your elbow while talking on the phone
 - Typing for hours with arms bent at 90 degrees





Eye Strain

- Computer Vision Syndrome (CVS)
- Affects 50%-90% of computer, smart phone and tablet users and is expected to grow as more people begin using these devices
- We hold digital devices closer to our eyes than books
- Eyes constantly need to re-focus and work harder in order to focus on tiny font sizes and images
- Blink less often when staring at a computer screen (typically blink 18/min but with computer use only half this, so eyes are not getting re-coated with tear film)
- Symptoms: tired, dry, itchy, blurred vision and burning eyes





Literature

- Chiang & Lio (2016) investigated the use of tablets and the variations of neck posture associated with different tablet tilt angles and the association of tablet use with users' MSD discomfort
 - Tablet use is associated with increased neck discomfort
 - Steep tilt angles (60°) may cause tablet users to decrease their head and neck flexion leading to more neutral postures
- Young et al. (2012) investigated head and neck postures when using 2 media tablets in 4 common user configurations,
 - Head and neck postures during tablet computing can be improved by placing the tablet higher to avoid low gaze angles and through the use of a case that provides optimal viewing angles



Literature

- Yong et al. (2013) assessed postures of the shoulders and wrists as well as their associated muscle activity during touch screen tablet use
 - Touch-screen tablet users are exposed to extreme wrist postures that are less neutral than other computing technologies and may be a greater risk of developing MSD symptoms.
 - Tablets should be placed in cases or stands that adjust the tilt of the screen rather than supporting and tilting the tablet with only one hand



Cellphone Screen Size

Apple has unveiled iPhone SE, its first 4-inch smartphone since 2013. As the company says, “this light and compact phone is designed to fit comfortably in your hand.”

Steve Jobs famously believed phones should match the ergonomics of your hand. In 2010, as competitors were selling larger devices, he mocked a big phone: “You can’t get your hand around it... No one’s going to buy that.”


<https://www.youtube.com/watch?v=O99m7lebirE>

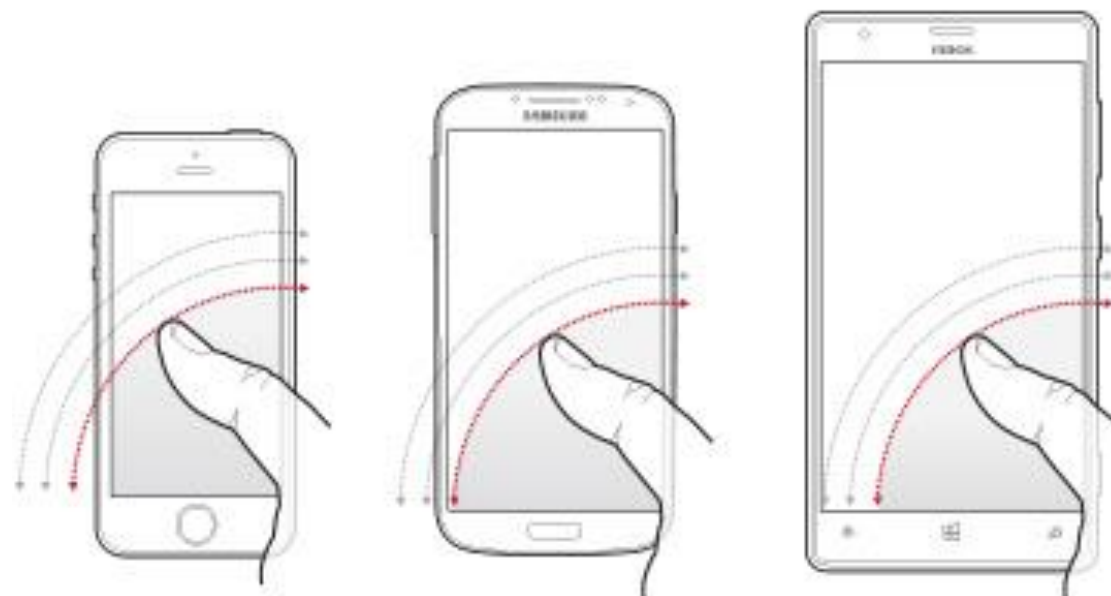


Cellphone Screen Size

3 Factors to Consider:

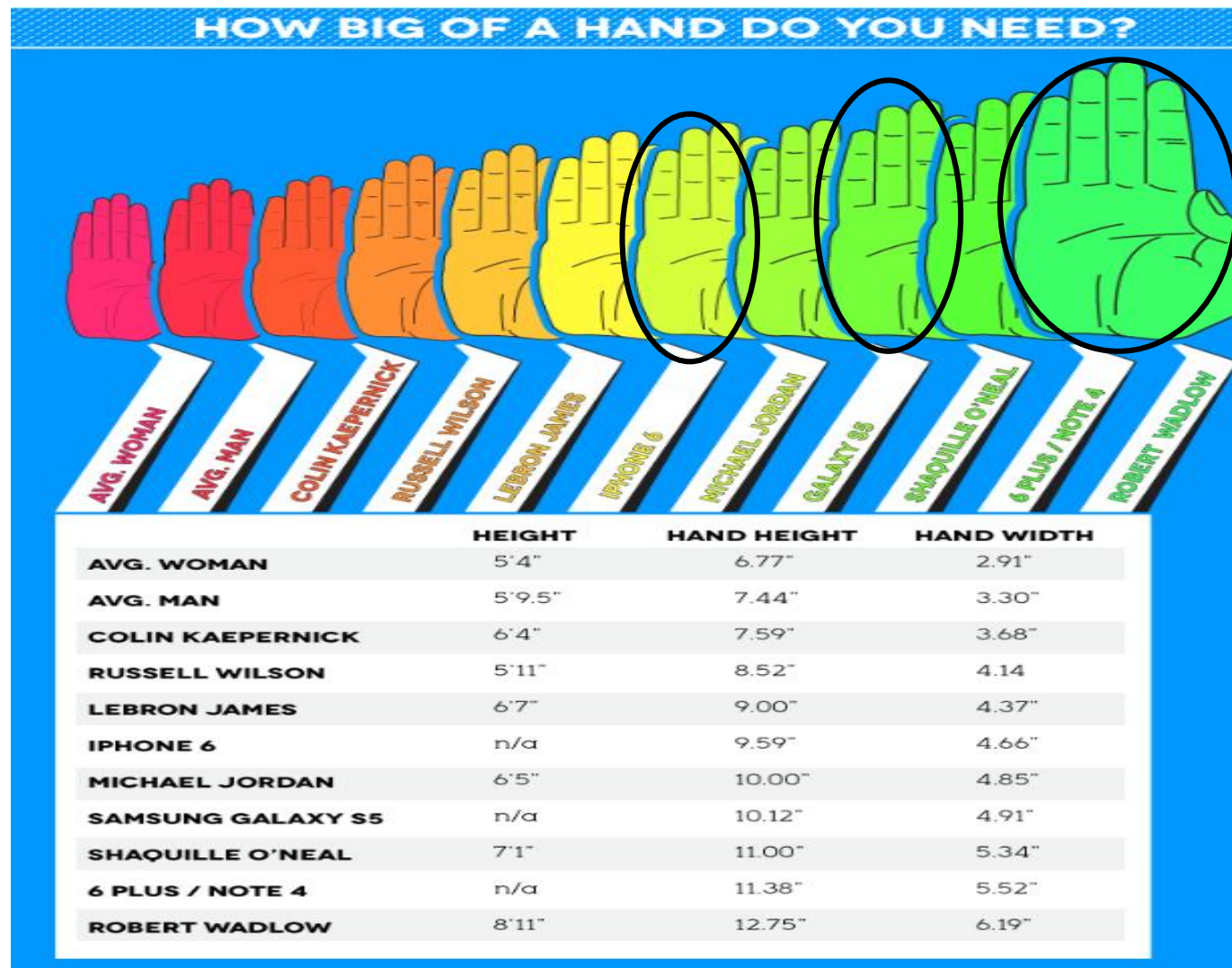
- What you can see
- What your thumbs can reach
- What can you comfortably hold

 Does Your Hand Fit Your Screen?



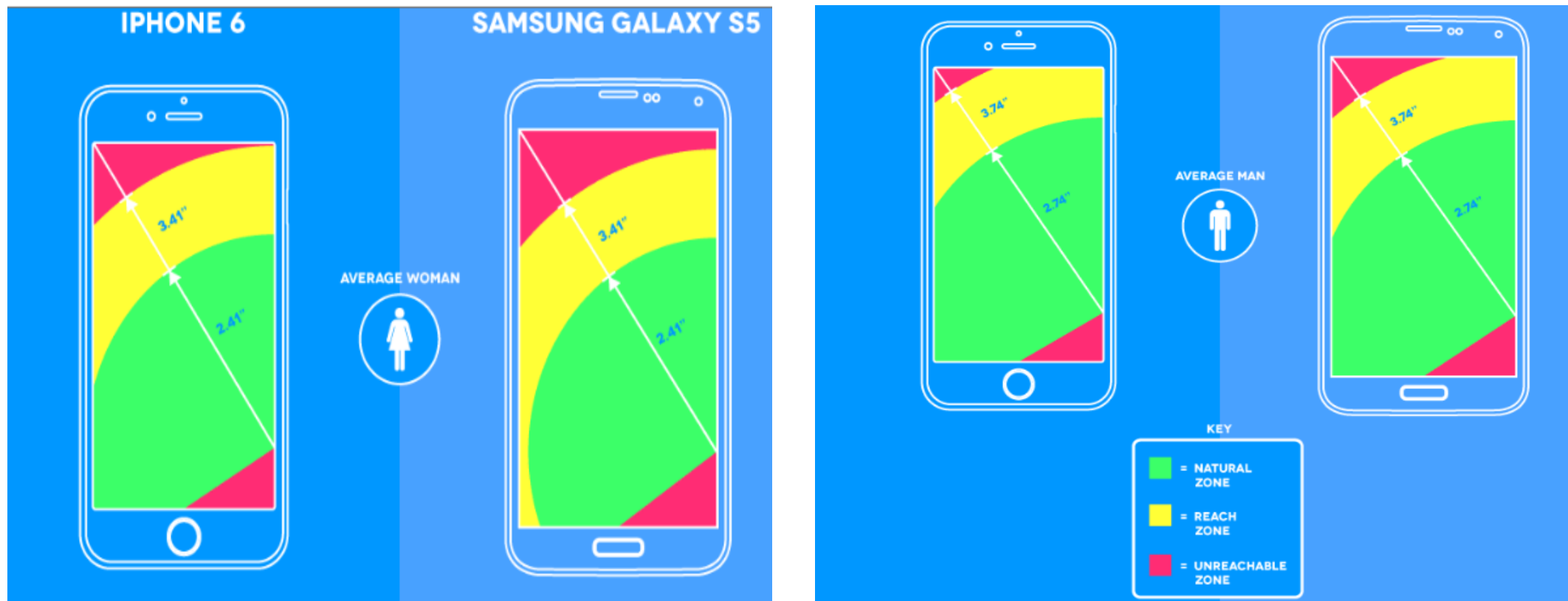


Hand Size



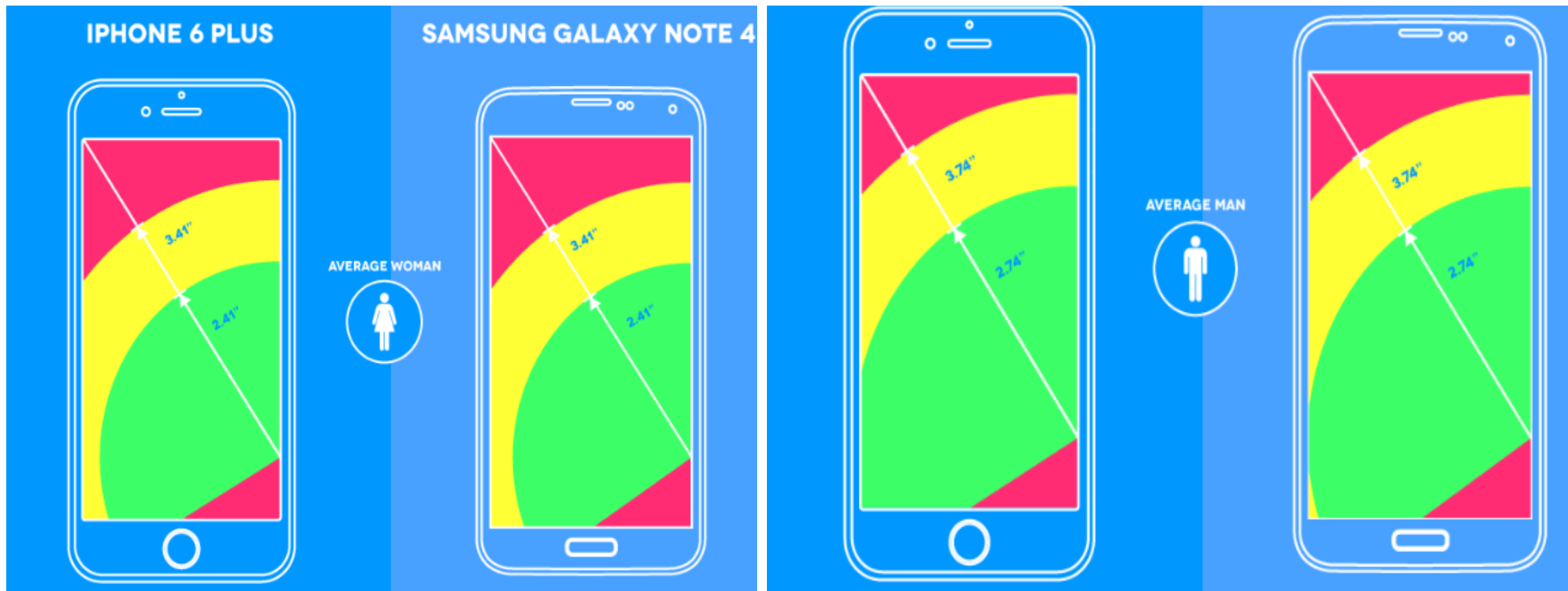


Cellphone Screen Size





Cellphone Screen Size





Cellphone Solutions

We need to learn how to use them better:

- Start paying attention to how you use your phone and how often.
- Make an effort to bring your phone up to **eye level** instead of always bending your head down.
- Get to know the **voice activated features** so you can take your eyes off the phone.
- Use **earbuds** with a speaker to free your head from your phone.
- Do neck and shoulder **exercises** to keep your neck mobile.





Laptop Solutions

- Use external input devices (keyboard & mouse)
- Use a laptop stand
- Adjust font size on the screen
- Docking Station





Tablet Solutions

- For Prolonged use synch your tablet with your desktop or laptop computer
- Use Bluetooth external devices: keyboard and mouse
- Use an inline document holder if referring to documents on your tablet
- Universal Tablet Cradle by Ergotron





Tablet Solutions





What can you do?

- Take a break
- 20-20-20 rule: to reduce eye strain, every 20 minutes look about 20 ft ahead for 20 sec
- Change your position
- Bring device closer to eye level
- Stretches



Questions

