Healthy Eyes in the Modern Workplace

Tri-Service Vision Conservation and Readiness Branch

May 2024

Disclaimer

- The views expressed in this presentation are those of the author(s) and do not necessarily reflect the official policy of the Department of Defense, Defense Health Agency, or the U.S. Government.
- The mention of any non-federal entity and/or its products is for informational purposes only, and is not to be construed, implied, or interpreted, in any manner, as federal endorsement of that non-federal entity or its products.

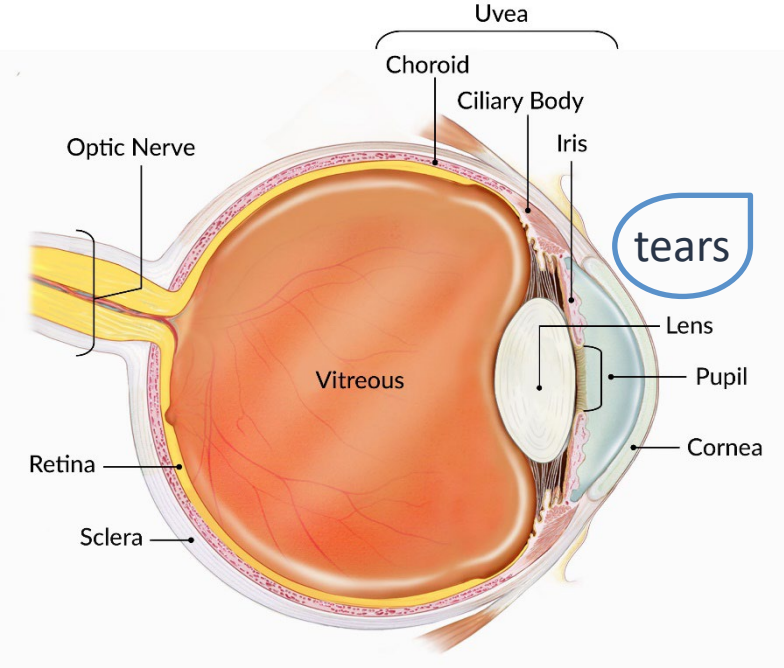
Computer Vision Syndrome (Digital Screen Syndrome)

"The complex of eye and vision problems related to near work which are experienced during or related to computer use." American Optometric Association (AOA)

Digital Screens – What is different?

- Image quality
  - Paper is usually better than digital screens.
  - Less/no glare and reflections
- Working distance (i.e., focusing distance)
  - 22–40 inches for laptop or computer screen displays
  - 16 inches for papers
  - 8–12 inches for phones
- Lower blinking rate
  - Normal: ~18–22 blinks/minute
  - Computer use: ~ 7 blinks/minute

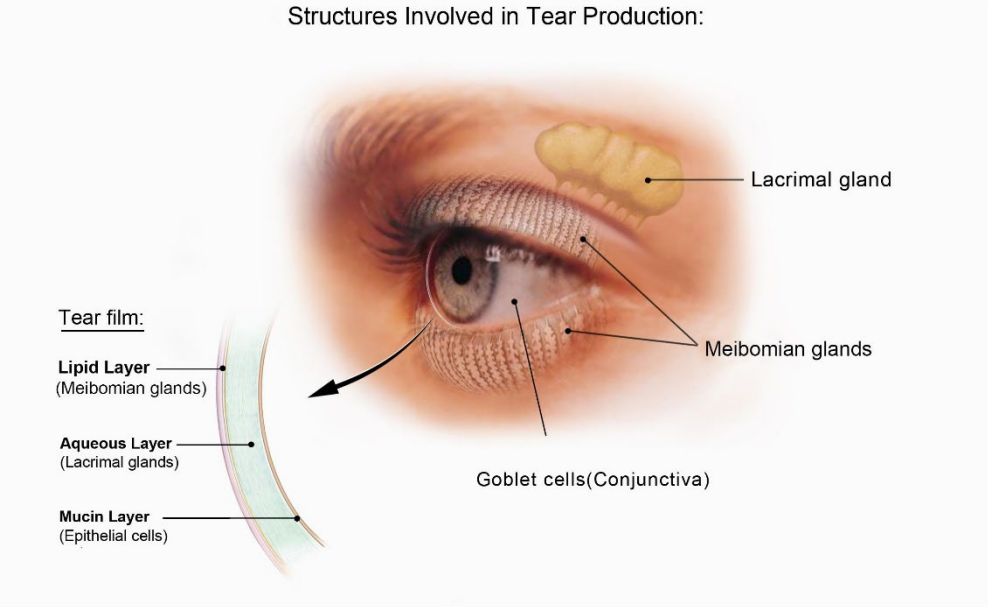
Anatomy and Physiology of the Eye



- **Tears, cornea, aqueous lens,** and **vitreous** focus light on retina
- **Iris** makes pupil big or small to regulate amount of light
- **Retina** (rods, cones and lots of "wiring") receives light and sends to brain

https://www.nei.nih.gov/learn-about-eye-health/healthy-vision/how-eyes-work

A Little More on Tears



- A healthy tear film forms a smooth layer of moisture over the cornea – it's not just water.
- If your eyes are dry, then that surface is rough, making your vision blurry.
- Dry eyes make your eyes hurt/irritated/red.

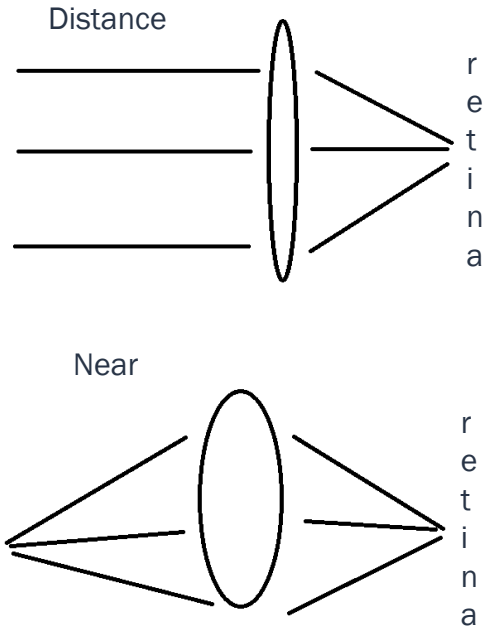
https://medialibrary.nei.nih.gov/search?keywords=tear%20film#/media/1812

Refractive Error Correction for Clear and Comfortable Vision

- Nearsightedness (Myopia) – eyes are too long in length
  - ✓ When the eye is fully relaxed, the lens focuses the image in front of the retina (too near), so distance images are blurry.
- Farsightedness (Hyperopia) - eyes are too short in length
  - ✓ When the eye is fully relaxed, the lens focuses the image too far beyond the retina, so near images are blurry.
  - ✓ Additional focusing power provided by lens or glasses is needed to make vision clear, even at distance.
- Astigmatism – single eye has different focal powers
  - ✓ Light is focused in different spots on the retina.

The Lens

- Roughly the size and shape of an M&M® (10 mm diameter and 4 mm thick)
- Lens has to flex forward and “squish” to focus up close
- As we age, lens loses flexibility (less “squishable”)
  - Ahh, to be young again, but. . .
  - Young people can have issues as well, with constant near work/hyperopia



Presbyopia

- "Old eye" in Greek = more experienced
- Usually occurs in mid-40s to early 50s… arms aren't long enough
- Reduced ability to focus up close
  - The lens becomes less flexible with age.
  - We need to hold things farther and farther away ("Short Arm Syndrome").
- Reading glasses provide additional focusing power up close.
  - Bifocals
  - Progressive lenses (no line)
  - Computer or near vision-only glasses

The Modern Workplace

- The modern workplace can be problematic:
  - Lighting is often not set up for the digital environment we find ourselves working in now.
    - ✓ Buildings, spaces, lights usually not set up for modern workplace
  - Everything (computer, phone, paperwork, etc.) is close to our eyes.
    - ✓ Working our accommodation (focusing) all day long
    - ✓ Constantly focusing at near can put a strain on the system
  - As we stare at screens (computer, phone, tablet, etc.) and our concentration level goes up, our blink rate goes down.
    - ✓ Tears evaporate before the next blink, causing blurriness and irritation.
    - ✓ Be aware of this and remember to blink more!

Illumination

- Incandescent → Fluorescent → Light Emitting Diode (LED)
  - Cost, efficiency, and lifespan improvements
  - Illumination standards still in the past
- LED
  - Efficient, no mercury, lifespan of ~25 years
  - Adjustable color and brightness for Function
- What to do:
  - Change light fixtures as well as the lights.
    - ✓ LED lights used without a proper hood or diffuser will often create shadows and glare.
  - Adjust your office/workspace setup.

Fluorescent vs. Full Spectrum

All light is not equal. Full spectrum LED lighting mimics natural sunlight and is cleaner and easier on the eyes.

Illumination (cont.)

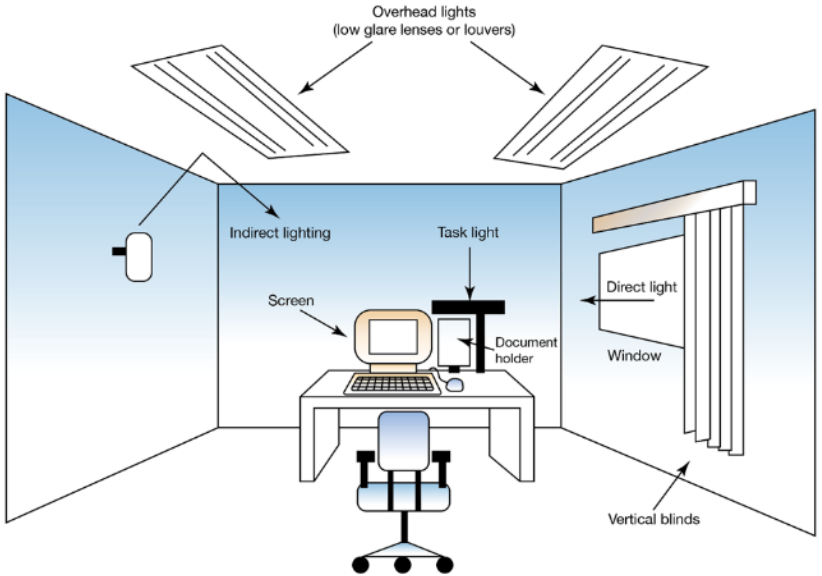
Lighting accounts for about one third of vision symptoms in an office workspace.

- Most offices are too bright for computer screens.
  - Designed for desktop, paper-and-pencil
- Room lighting is the most significant factor to adjust.
  - More than screen time, stress, age, and fitness
  - May not be easy to adjust in a cubicle farm situation
  - Various individual preferences

Reduce overhead lighting to reduce glare on computers.
AND
Use task lighting on desktops.

Reduce Glare: Set up your Space for Success and Comfort!

- Place monitors perpendicular to windows.
- Use adjustable blinds on windows.
- Use louvers to diffuse light to minimize shadows.
- Use indirect lighting to minimize reflections.
- Place monitors between and parallel to overhead light fixtures.
- Use task lighting as needed.
- Wear glasses with an anti-glare coating.



Direct Glare

Sitting in front of a window without blinds or a shade is the most common source of direct glare in an office setting.

Indirect Glare

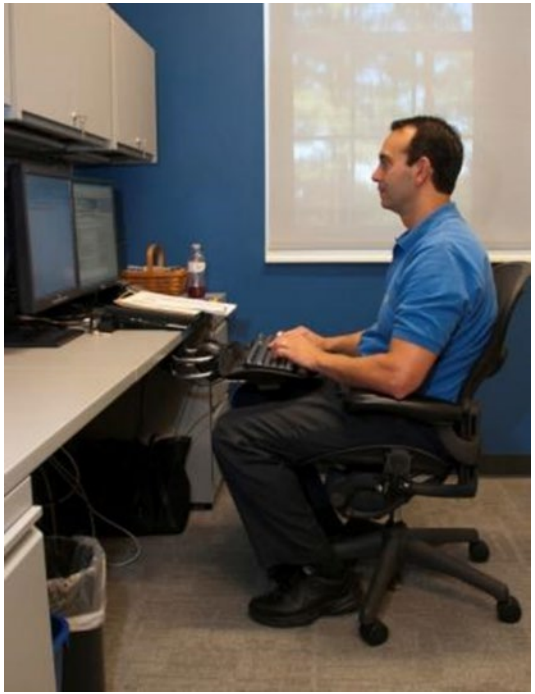
Reflected light off monitor surface

Tip: Turn off your computer monitor and see where the reflected light is coming from. This will aid you in moving the light or the monitor to reduce reflections and glare.

Glare Control

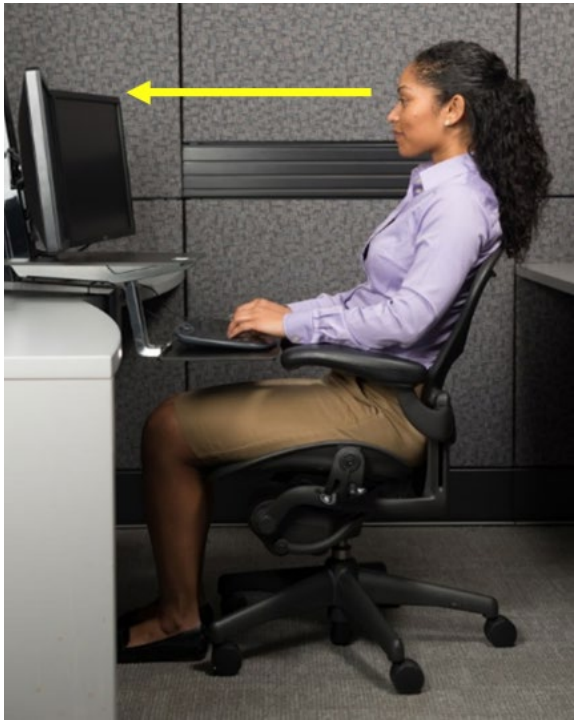
- Monitor location (Hint: Place monitor at 90° angle from window)
- Coverings at light source
  - Blinds
  - Louvers
- Coverings at the location
  - Screen protectors
  - Visor

Tip: Place the monitor(s) under a hutch or cabinet on your desk to help reduce glare from overhead lighting.



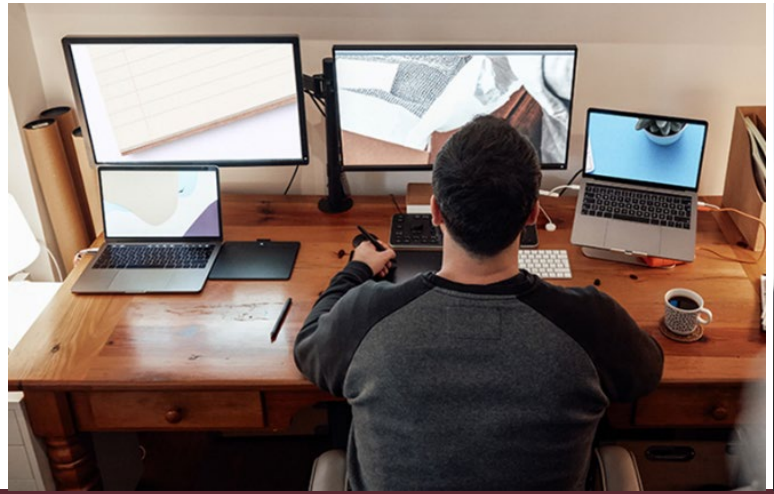
Ergonomics of Workstation – Monitor Positioning

- Start by placing monitors at arm's length directly in front of you; adjust accordingly.
  - Typically, farther away is better to lessen eye strain or focusing, as we have discussed.
- The top of the screen should be at eye level.
  - The eyes are more comfortable when you're looking down slightly.
  - Ensure the screen angle is perpendicular to the desk.
    - ✓ Some may prefer a slight tilt up, but check for indirect glare, i.e., reflected lights.
- Adjust text size, brightness, and contrast as desired.



Dual Monitor Positioning

- Place one monitor in front of you and the other to the side, or place both monitors in line with your nose so you need to twist your neck slightly to the left and right to see each monitor.
- The preference in the office is to keep your primary monitor in front of you and move programs from monitor to monitor to help maintain a neutral neck posture.



Vision and Musculoskeletal Issues

- Our body adapts to ensure the best vision, as the primary sensory system.
  - Poor posture can cause head, neck, shoulder, and back musculoskeletal issues
  - Don't be a T-Rex! Maintain good posture by setting up your workspace for success.

- Bifocals (Adjust them, not you.)
  - Get an eye exam.
  - Get the option(s) that work best for you.
    - ✓ Bifocals, computer Rx, computer bifocal, no-line multifocals (transition lenses)
      - – Lens/segment height and size
      - – Monitor distance
      - – Adjusted to you, so you don't have to
      - – Lower monitor if needed

"Dinosaur" posture

Types of Bifocals: Traditional vs. Progressive

Traditional ("lined") bifocals

The lined lens corrects for distance (upper lens) and close-up reading (lower lens).

- Benefits:
  - Quick adaption to reading or distance
  - Less expensive than progressive lenses
- Cons:
  - Does *not* correct "intermediate" vision (e.g., computers, dashboard in car)
  - Line can be aesthetically unappealing

Progressive bifocals

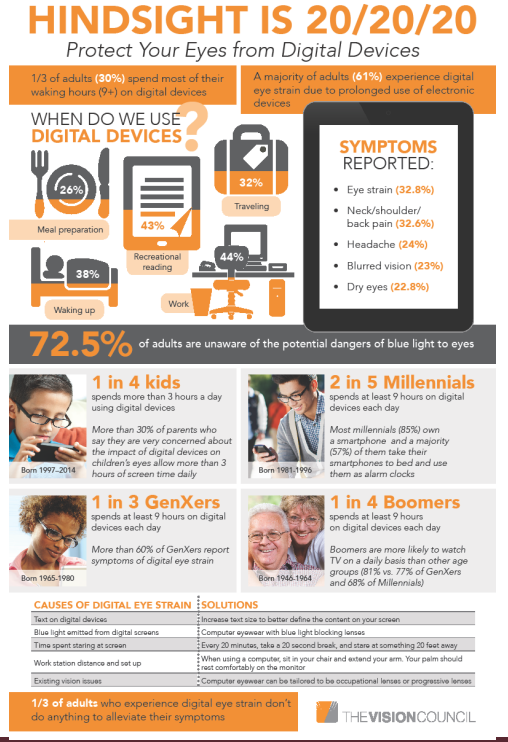
The no-line lens provides gradual correction for distance, intermediate, and near vision.

- Benefits:
  - Multiple prescriptions in one lens include intermediate vision
  - No lines more aesthetically appealing
- Cons:
  - Slower adaption time for different distances
  - More expensive than traditional lenses

Reducing Digital Screen Syndrome

- 20/20/20 Rule: Every 20 minutes, take a 20-second break and look at something about 20 feet away to relax your eyes.
- Stand up and move about periodically!
  - The National Institute for Occupational Safety and Health (NIOSH) recommends a 15-minute break every 2 hours.

Tip: Adding short breaks every hour to include movements and stretching helps to increase work productivity and comfort.



Making Life Easier and More Comfortable

- Reduce glare by setting up your workspace properly.
- Get an eye exam at least every 2–3 years or more often if symptoms occur.
  - Make sure the prescription is up to date.
- Talk to your doctors about computer issues such as eye strain/tiredness at the end of the day, dry eyes, headaches and neck/shoulder pain.
- Consider glasses for near work (single vision or multifocal computer-only Rx).
  - Computer bifocals have two focal distances:
    - ✓ The top is for computer use (distance will be a little blurry).
    - ✓ The bottom is for up-close activity (paperwork, phone use, etc.).
  - An anti-glare coating and/or slightly tinted lenses may also help (i.e., 5% rose tint).
- Apply the 20/20/20 Rule, and don't forget to blink!

Sleep Deprivation and Human Health Effects

- Three out of five Americans report insufficient sleep.
- One out of three average less than 6 hours of sleep per night.
  - Fifty years ago, only 3 out of 100 had such little shut-eye.
  - Negative impact on mood, social life, activities
  - Decreased concentration
  - Decreased physical and mental performance
- Over a third admit to driving while drowsy.
  - Performance and attention can be similar to driving while drunk.
- Worldwide, children today sleep 1.2 hours less than 100 years ago.

Sleep deprivation is being recognized as a public health issue with significant impact on overall health.

Vision-driven circadian rhythm may be the key!

Source: Better Sleep Council, 2021.

Blue Light

- Blue light influences the human circadian clock; you need some — but not too much!
- Too much exposure to blue light before bedtime may negatively impact your sleep.
- Blue light-blocking glasses *may or may not help.* Current research is inconclusive.
  - Some find these glasses help reduce eye strain as well.
- Recommendation:
  - Use the "Night Shift" function on your smartphone.
  - If wearing "blue-blocking" glasses seems to help you or make you more comfortable—go for it!

Additional Sources

National Eye Institute: https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/refractive-errors#:~:text=Nearsightedness%20(myopia)%20makes%20far%2D,objects%20look%20blurry%20or%20distorted

MEDLINE: https://medlineplus.gov/ency/imagepages/19511.htm

Branch email: dha.apg.pub-health-a.list.org-cphe-63@health.mil