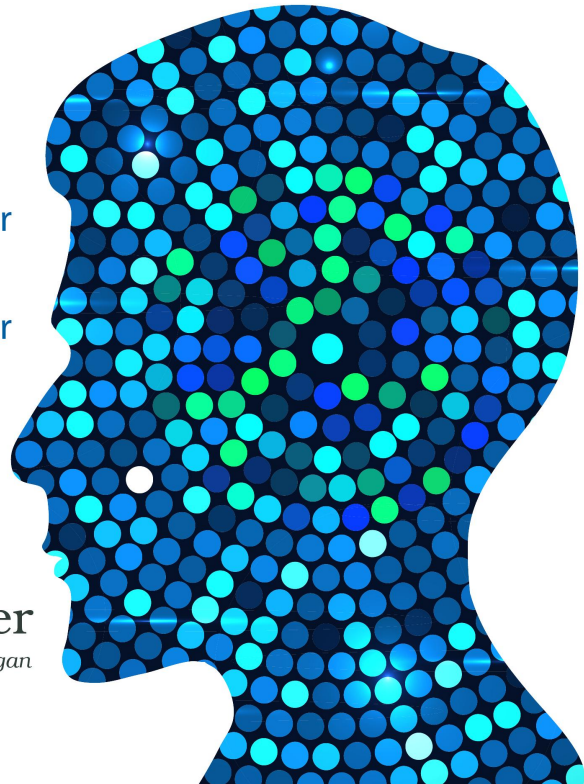# The Healthy Programmer

Second Edition

Refactor Your
Fitness
Improve Your
Mind

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edited by Brian P. Hogan

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Unit-Testing Your Vision

There is no substitute for a professional eye exam by an optometrist or oph-thalmologist, and getting one is your goal for this chapter. In fact, you should get one every year or two because many eye diseases are asymptomatic, which means they could become dangerous before you realize they exist. But even in the absence of a professional examiner, you can still run some basic eye tests using an application on your phone or computer.

Most apps will test visual acuity (via reading an eye chart from a distance), retinal function (via detection of visual disturbances caused by changes in the retina) and color-blindness. Go find one right now and try it out—some good apps are listed at https://healthyprog.com. Using them takes only a few min-utes, and they might reveal something surprising about your eyes: if you haven't had an exam recently, there's a good chance you'll need a new pre-scription for glasses.

Having the correct prescription lenses is important because without them your eyes will have to work harder to focus. This fatigues the muscles around the eyes, which can lead to headaches and even more problems with your vision.

Many factors, including your glasses, can lead to headaches but some of those factors aren't actually deficiencies of your vision as much as deficiencies of your office. That's why you're going to run some more tests that don't involve the receiving end of your vision. Instead, they'll test the target of your vision—your computer. Some of these tests are directly related to headaches and others are related to your general eye health, but they are all important if you want to be a healthy programmer.

Go sit in front of your desk or workstation right now. Set things up as though you're working—adjust the room lighting, screen brightness, chair position, and such. Now answer the following questions:

How far is your face from the computer screen?   Your monitor should be no further away than 30 inches (75 cm) and no closer than 16 inches (40 cm).[3] This is roughly the length of your arm, so you can test this by reaching out toward your monitor. If you can give your screen a high-five, you might be too close. If you can't touch your screen, you might want to move closer.

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3. *Effect of an ergonomic intervention involving workstation adjustments on musculoskeletal pain in office workers-a randomized controlled clinical trial [LDDD21]*

Viewing distances that are too long force your eyes to strain when reading small text. Viewing distances that are too short can cause eye fatigue because the muscles around the eye have to work harder to focus. This can even lead to convergence disorders, which are characterized by an inability of the eyes to turn toward each other or sustain convergence.

Is the monitor brighter than the rest of the room? Brightness may sound difficult to judge, but it's not. Take this book (or some other printed book if you're reading this onscreen) and hold it up against the screen. If it becomes illuminated as you bring it closer to the display, then your monitor is too bright (or your room is too dark).

A high disparity between the room's brightness and the monitor's brightness will quickly fatigue your eyes. It may also force you to squint at your monitor if your pupils have dilated while looking away from it. If your office has natural lighting, you may need to adjust your display's brightness throughout the day.

Is there excessive glare on the monitor? You can test this by relaxing your vision—focus your eyes as though you are looking at something behind the monitor. What do you see? If you see the window behind you, then there is excessive glare. Glare affects your eyes in the same way as a monitor that's too bright.

Is the room dry or cold? Dry eyes, which may be made worse by cool or dry conditions,[4] are a common contributing factor to headaches. If your eyes feel dry, try raising the room temperature by a single degree, which may be enough to make a difference.

> \|/ **Joe asks:**
> ̈ʅ **What about blue light?**
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> In the first edition of this book, I called attention to the risks associated with blue light and recommended reducing your display's color temperature so that it would emit less blue hues. There wasn't a lot of research on this topic at the time the book was published, but there were some studies showing that blue light may be toxic to cellular structures.[a,b]
>
> Today, most studies suggest that blue light is no more harmful than any other color of light. You should set the color tempurature of your screen to whatever makes your eyes comfortable.

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4. *A Comprehensive Analysis of the Influence of Temperature and Humidity on Dry Eye Disease [SLPK23]*

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a. *Action spectra for the photoconsumption of oxygen by human ocular lipofuscin and lipofuscin extracts [PRZL02]*
b. *Blue light-induced reactivity of retinal age pigment. In vitro generation of oxygen-reactive species [RJKB95]*
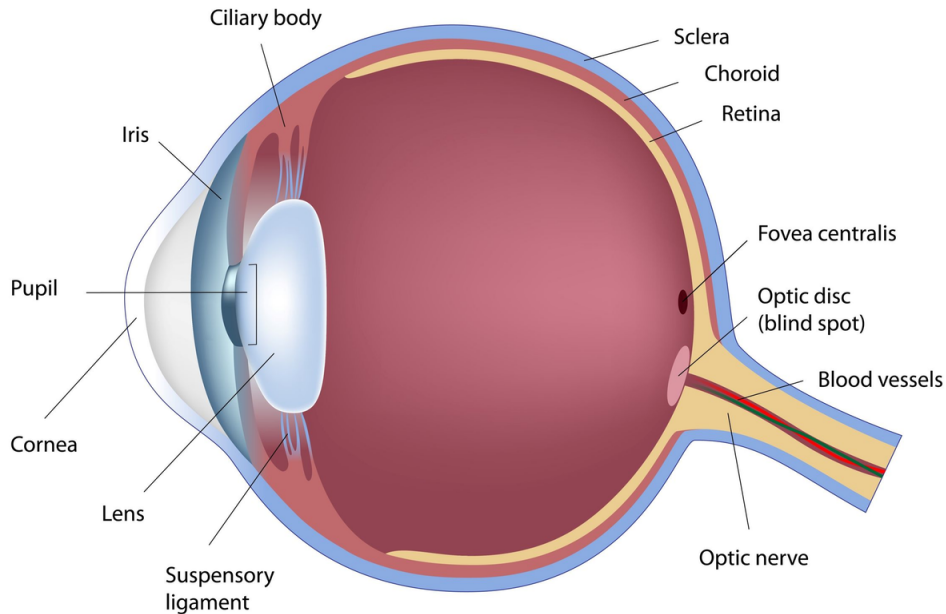
The lens and cornea at the front of the eye filter ultraviolet light, which would otherwise damage your retina, the light-sensitive tissue lining the inner surface of the eye.

Basic anatomy of the human eye

Based on your answers to these questions, you may want to make some adjustments to your workstation. The right distance, brightness, and color can reduce eye strain and headaches. But there's no way to avoid the problem entirely—you have to look at your screen for eight hours each day. With the right technique, however, you can make this experience more pleasant and avoid Computer Vision Syndrome.

<div style="text-align:right">Goal 10</div>

Get an eye exam

A comprehensive eye examination is a series of tests that check your vision and eye health. It should be performed by a professional licensed optometrist or ophthalmologist. The exam includes tests for visual acuity, three-dimensional vision, peripheral vision, pupil function, and color-blindness, among other things.

According to the National Institutes of Health (NIH), adults between the ages of twenty and thirty-nine should complete a full exam every five to ten years, with regular checkups as needed. Adults who wear contacts should have an examination every year. Adults over the age of forty should have an exam every one to three years.[5]

Avoiding Computer Vision Syndrome

In 1779 Benjamin Franklin was on a diplomatic mission to France when he received a letter from an optician in Paris—his new glasses had been delayed. The optician explained that the delay was caused by the lens having broken three times during cutting, which suggested that Franklin was ordering something unusual. Indeed, most historians agree that this correspondence is the earliest evidence of a famous Franklin invention: bifocals.

In Franklin's time—and up until recently—bifocals solved the essential problem of sight: your eyes focus differently when looking near and far. But in the last century we've developed a new problem: middle-sightedness. The ideal distance for computer viewing is 16 to 30 inches (40 to 75 cm), as you read in the previous section, but this range is not covered by the standards optometrists use to measure vision—they primarily emphasize myopia (nearsightedness) or presbyopia (the difficulty focusing on near objects that comes with age). As a result, your prescription can be wildly off when applied to computer-viewing. Some researchers believe that this is a contributing factor to Computer Vision Syndrome (CVS).[6]

CVS is a temporary condition that results from prolonged focusing of the eyes on a computer screen. Its symptoms include headaches, dry eyes, irritated eyes,

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5. https://medlineplus.gov/ency/article/003434.htm
6. *Computer Vision Syndrome: An Ophthalmic Pathology of the Modern Era [PBDA23]*

redness in the eyes, blurred vision, neck pain, fatigue, double vision, and difficulty refocusing the eyes. Thus, CVS is what most programmers refer to as *life*.

All of the factors you examined in your unit tests can exacerbate CVS, and that's why it's important to resolve them. But in addition to changing your workstation, you can change the way you use your workstation. Following the guidelines below will reduce your susceptibility to CVS:

Blink Often Blinking moistens your eyes and replenishes the protective film that coats the cornea. When working at a computer, you tend to blink less often—about five times less than normal. This causes your eyes to dry out more rapidly. As a result, you need to force yourself to blink—ideally remembering to blink intentionally every twenty minutes. Close your eyes slowly, as though you're falling asleep, and repeat ten times.

Exercise Your Eyes The primary reason your eyes become tired or fatigued is that they are focusing at a single depth for a long period of time. Think of holding a heavy object—after a while you need to shift it around. That's exactly why it's good to exercise your eyes. Rely on the 20-20-20 rule. That is, look away from your computer every 20 minutes, focus on an object that is 20 feet (6 meters) away, and look at it for 20 seconds.

Take Breaks Often You're probably getting tired of being told to take breaks. But here's one more reason: according to the National Institute for Occupational Safety and Health, discomfort and eye strain were significantly reduced when computer-workers took four additional five-minute "mini-breaks" throughout the work day.[7]

Limit Screen Use While most of your development work is probably done in front of a traditional computer, your cumlative time spent in front of screens determines your risk of developing CVS and other issues. High volumes of recreational and occupational screen use are associated with an increase in headaches,[8] eye strain,[9] and poorer mental health.[10] When possible, avoid screen use when you're not working. Try playing board

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7. *"Give me a break!" A systematic review and meta-analysis on the efficacy of micro-breaks for increasing well-being and performance [AMRS22]*
8. *Increased screen time and its association to migraine and tension-type headache: a cross-sectional investigation among Bangladeshi students [RICP24]*
9. *Digital Eye Straining: Exploring Its Prevalence, Associated Factors, and Effects on the Quality of Life [BAAA24]*
10. *"Give me a break!" A systematic review and meta-analysis on the efficacy of micro-breaks for increasing well-being and performance [AMRS22]*

games instead of video games, or listening to podcasts instead of reading on your phone.

> **Tip 6** Use the 20-20-20 rule: Every 20 minutes, focus on something 20 feet (6 meters) away for 20 seconds.

If you stick with these suggestions and make them habits, there's a good chance you'll have fewer headaches and prevent CVS. But your eyes aren't the only culprit when it comes to headaches—there are many other triggers.