ADDRESSING Real-world Vision

As the eye ages, visual performance and contrast sensitivity decline. Here’s how you can help your patients live life to the fullest.

By Meredith M. Whiteside, OD, FAAO

**OVER TIME, THE EYE** naturally loses some of its ability to detect subtle differences in contrast. Contrast sensitivity is the ability to distinguish an object from its background. Someone who has poor contrast sensitivity may be able to recognize black letters on a white background (a high-contrast task), but they’ll have more trouble seeing gray letters on a white background. Research shows that the ability to see high-contrast objects usually remains stable in the aging eye. However, contrast sensitivity typically decreases later in life, due to age-related changes within the eye and some ocular pathologies. This reduction in contrast sensitivity can have a profound effect on the capacity to perform everyday activities. For example, simple tasks, such as driving and reading the newspaper, become increasingly difficult.

To ensure we're detecting these changes, it's essential to test the level of contrast sensitivity in older patients and in patients with certain associated conditions. Once you diagnose diminished contrast sensitivity, you can make environmental changes to minimize the effect low contrast visual acuity has on their quality of life.

**Companion Problems**

Reduced contrast sensitivity is a normal, gradual change that may result from a variety of physiological changes that occur with age. I find that even average patients with good eye and systemic health sometimes have this problem.
Yet, aside from age, certain ocular conditions can make patients more susceptible to low contrast sensitivity or cause them to experience it to a greater degree. If we add a problem like cataracts, diabetes or age-related macular degeneration (AMD), low contrast sensitivity can become significant and problematic.

As contrast sensitivity declines, many patients with otherwise healthy eyes can compensate for this normal age-related change. They can use more light when they read or take more care climbing stairs. On the other hand, patients with a marked decrease in contrast sensitivity due to ocular disease may not be able to compensate as easily, so the problem can have a substantial effect on their lives.

**Common Complaints**

At about age 50, decreased contrast sensitivity may begin to affect driving and other everyday activities. If you perform a standard exam, check the patient's vision, prescribe the right eyeglasses and find that Snellen visual acuity is good, he should have no visual complaints. But when a patient with good visual acuity complains of persistent vision problems, that disconnect may indicate he has an issue with contrast sensitivity.

Patients with good contrast sensitivity shouldn't have difficulty with the following activities, but reduced sensitivity may trigger complaints.

- **Driving.** Declining contrast sensitivity happens so slowly over time that people often don't recognize it. Driving problems may be the first red flag. What's more, studies show that reduced contrast sensitivity can have a significant impact on driving ability.

All of us perceive low-contrast objects less well in low light, so it's a real challenge for patients who have reduced contrast sensitivity. Patients may not be able to describe the problem to you exactly, but they'll complain about difficulty driving in low light at dawn, dusk or on cloudy days, driving at night or in fog or rain. These environmental conditions can make driving a challenge for these patients. For example, one of my patients told me he had to drive to his weekend cottage in the woods at midday because at other times of the day, the shade cast on the road by the trees made driving extremely difficult.

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<th>Contrast Sensitivity Affects Driving Ability</th>
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<td>Visual acuity isn't the only predictor of real-world vision with regard to driving. Both contrast sensitivity and visual field have a significant impact. In fact, studies of driving ability have had the following results:</td>
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<td>- Tests on 139 drivers of various ages and ocular pathologies showed that while older patients performed less well behind the wheel, results for motion sensitivity, useful field of view, contrast sensitivity and dynamic acuity predicted half of the driving differences.</td>
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<td>- Another study of all ages showed that everyone's visibility decreases at night, but especially that of older drivers. What's more, contrast sensitivity scores were a better indicator of visual ability in this situation than visual acuity.</td>
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<td>- According to another study, contrast and glare sensitivities start to decline after age 50, at a rate of 0.1 log per decade in contrast sensitivity test scores. Drivers with low visual acuity scores, as well as those who said they choose not to drive at night, had lower contrast sensitivity scores and more glare sensitivity.</td>
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<td>- Investigators noted that when they reduced the contrast in a video-driving simulator, subjects had a harder time judging the speed of vehicles in the scene. And when they viewed the same scene at high and low contrast, they often estimated that the vehicles moved more slowly in low contrast.</td>
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<td>- In another driving simulator, patients with glaucoma whose visual acuity was near normal or normal had more driving problems than their peers without glaucoma. Contrast sensitivity was the best indicator of driving ability for these patients.</td>
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**References**

Dealing with glare. Glare sensitivity isn't as clear-cut as contrast sensitivity, but the two often accompany each other. Patients may say they're dazzled by the headlights of an oncoming car, or they may have trouble seeing when the sunlight is shining directly into their eyes, such as at sunset.

Distinguishing obstacles on the ground. Reduced contrast sensitivity makes it difficult for older patients to distinguish subtle variations in shade. This can hinder their ability to walk safely and avoid falls. Patients may say they tripped or had a fall going from the dark gray pavement to a light gray sidewalk or walking up wooden stairs.

Recognizing faces. Our faces are shades of the same color, so poor contrast sensitivity affects our ability to see faces clearly and recognize them. For example, patients might say they have trouble identifying people across the room, but they recognize them as they come closer. One of my patients, a businessman who relied on networking, had trouble recognizing people he'd known for years as a result of AMD and low contrast sensitivity. He compensated with voice recognition.

More Than Snellen Visual Acuity

When it comes to measuring a patient's contrast sensitivity, many physicians use the Snellen visual acuity test. However, this test is only a measure of high-contrast vision. It tests the patient's ability to see black-on-white letters, but not low-contrast, gray-on-white letters. Since we don't live in a black-and-white world, the Snellen chart isn't an accurate measure of real-world vision for older patients. Testing only high-contrast vision may overestimate some patients' visual abilities.

Several easy-to-use contrast sensitivity tests are available, but many doctors don't use them because we haven't realized that Snellen visual acuity alone doesn't give a complete assessment of vision that includes contrast sensitivity. For example, when we assess someone for driving ability, we may only evaluate Snellen acuity because the driver's license forms ask only for a Snellen number.

If you're like me and you have many geriatric patients, you know that Snellen acuity may not give us the full picture. I examine many patients with reasonable Snellen visual acuities who complain bitterly about difficulty driving or reading the newspaper, and their contrast sensitivity test results usually reveal the problem. They explain the discrepancy between Snellen acuity and real-world function.

Contrast Testing That Works

Testing for contrast sensitivity isn't complicated. However, the available tests are like apples and oranges, so we can't compare their results side by side. Practitioners simply need to choose a test and use it consistently to maintain a frame of reference.

The most popular test is the Pelli-Robson chart. Rather than showing black-on-white letters that decrease in size as the Snellen acuity chart does, this chart shows letters of the same size on a white background colored in gradually lighter shades, from black to light gray. The farther down the chart patients can read, the better their contrast sensitivity.

I use the Bailey-Lovie chart. It has black-on-white, high-contrast letters on one side of the chart, with letters of decreasing size. On the other side is the same kind of letter chart, printed in low-contrast, gray-on-white letters.

In addition, doctors may use a chart that's incorporated in their autorefractor. Many of these devices also can simulate glare.

Once you have a result, you'll learn much about the patient's visual experience by comparing their high-contrast Snellen visual acuity to their low-contrast visual acuity. For people with good contrast sensitivity, the difference between low- and high-contrast visual acuity is usually relatively small. In someone with poor contrast visual acuity, you'll see much more of a difference. The latter disparity is what makes contrast sensitivity testing so important.
Clinical and Environmental Answers

To improve the quality of vision for patients with reduced contrast sensitivity, you want to maximize their usable vision by making objects appear in higher contrast. That always starts with an updated eyeglass prescription, since refractive error changes with age. For patients with cataracts, cataract surgery can improve contrast sensitivity.

Environmental changes also can help patients adapt to low contrast sensitivity and improve their safety. For patients who have trouble reading, good full-spectrum (incandescent) light, such as an indirect reading light, helps enormously. Large-print books and magnifiers can help as well, because letters with lower contrast are easier to read when they’re larger. Patients also can make changes around the house, such as putting colored tape on the edges of stairs to help prevent falls. They can label household devices, such as telephones, thermostats and stove dials, using print labels that have larger words and numbers on them. Low-vision experts can recommend many other practical ways to help patients with reduced contrast sensitivity and associated ocular disease. For example, they can increase the visibility of food and beverages by pouring milk into a dark mug, eating rice off of a dark plate or using a dark tablecloth with white china.

Each of these interventions improve visual acuity for patients with reduced contrast sensitivity. And by taking steps to address this deficiency, we enhance their total real-world vision and their quality of life. nOD

Reference


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