

Prisms Restore Lost Peripheral Vision

People with a form of partial vision loss known as homonymous hemianopia now have a potentially better way to cope with their disability: special eyeglasses equipped with prisms that allow the wearer to avoid obstacles. The glasses are also less expensive than some other options for people with hemianopia. Soon, eyeglasses with prisms may also help people with tunnel vision due to glaucoma and retinitis pigmentosa.

Out in the field

Homonymous hemianopia is the loss of half of the visual field of both eyes, creating a "blind spot" on the left or right side. Normally your field of vision consists of central vision (what you see straight ahead) as well as your peripheral vision (objects that you perceive "in the corner of your eye"). Causes of hemianopia include stroke and traumatic brain injury.

How it works

The system consists of a pair of plastic prisms mounted on the top and bottom edges of one lens in a pair of eyeglasses. The prisms pick up images from the impaired portion of the person's vision and direct them into the still-functioning part of the visual field. The prism glasses enable people with hemianopia to expand their effective visual field by up to 20 degrees. They were developed by Eli Peli, OD, an engineer and optometrist who is a senior scientist at the Schepens Eye Research Institute in Boston and an associate professor of ophthalmology at Harvard Medical School.

Each prism is about a third of an inch thick. Because the prisms lie near the top and bottom edges of the lens, the images they project are

partial "ghosts." (See diagram, facing page.) The ghost images act as a cue. "When an object of interest is detected through the prisms it catches his attention and he can turn his head and eyes toward it," Dr. Peli explains.

Potential benefits

People with hemianopia often collide with doorframes, furniture, and other people. The prism glasses offer a way for people with homonymous hemianopia to navigate the world a little more safely. A key feature of the system is that the prisms are positioned to pick up images from the person's blind spot no matter what direction he happens to be looking.

How well does it work?

Dr. Peli has fitted many of his patients with the system. He recently described his results with the first 12 of those patients in a study in the September 2000 issue of *Optometry and Vision Science*. All patients but one significantly expanded their visual field. Other optometrists have begun to offer the device. "I think this is potentially very valuable for patients," says Roanne Flom, OD,

chief of the low-vision service at the Ohio State University College of Optometry. "The key reason is that the person doesn't have to make an eye movement into the prism to get any benefit. It's always right there; you are always getting that information." Dr. Flom recently prescribed her first pair of prism glasses to one of her patients, a wheelchair-bound stroke survivor with hemianopia

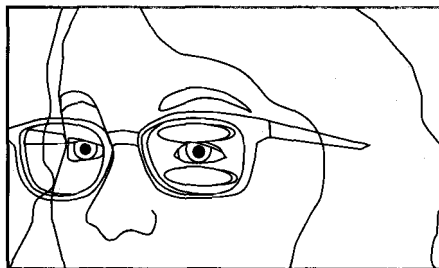
How you are fitted

The first step in taking advantage of this new technology is being fitted with temporary stick-on prisms to establish whether or not it will work for you. Once you are sure the system is doing what it should, two higher-quality prisms can be cut and installed permanently in a pair of eyeglasses. The two permanent prisms cost about \$300 each. Patients can also continue with the inexpensive stick-on prisms, Peli says, although they are hard to keep clean and fall off periodically.

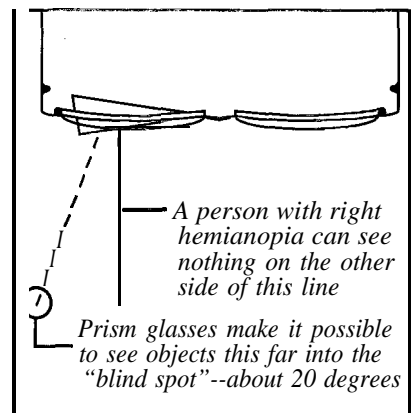
Other options

Eye doctors who treat low vision sometimes install flat "sector prisms" on both lenses of a pair of eyeglasses. Binocular sector prisms

Eli Peli's Prism Glasses



Glasses with prisms installed in the upper and lower portions of one lens enable someone who has lost half of their visual field (hemianopia) to see partly into their "blind spot."



ILLUSTRATIONS BY MARINA TERLESKY. SOURCE: ELI PELI

are supposed to function much like the side view mirrors on a car, making things visible that lie outside the driver's peripheral vision.

In practice, optometrists have had limited success with binocular sector prisms. The glasses, explains Dr. Peli, merely shift vision to one side—typically about 10 degrees. "I've always been pretty skeptical about what binocular sector prisms were supposed to do," Dr. Flom adds. "They only provide any benefit if the person makes an eye movement toward the blind side. And even then, the added peripheral awareness is small and vision through the prism is blurred. We really don't know how often they work."

Single sector prism: Another option is to mount a single prism on just one lens. This has a very different effect: When the wearer glances sideways into the prism, it superimposes an image from the missing portion of the visual field onto the intact vision. The result is diplopia, or "double vision." The superimposed image is supposed to provide a cue for avoiding obstacles.

Gottlieb "button" prism: Daniel D. Gottlieb, OD, of the Gottlieb Vision Group in Stone Mountain, Georgia, has developed a new type of single sector prism called the Visual Field Awareness System. It consists of a small circular "button" prism mounted off-center within one lens in a pair of eyeglasses. By scanning through the prism, Dr. Gottlieb explains, patients build up a combined, or "gestalt," view of their surroundings. The button is optically clear, permanent, and easier to keep clean than an off-the-shelf flat sector prism. Dr. Gottlieb trains optometrists and ophthalmologists in how to fit people with the system and coach them in how to use it. It was available in at least 27 U.S. states and some foreign countries. Dr. Gottlieb developed the system and holds the patent.

Button prism vs Peli system

When the person looks directly into the button prism, it introduces momentary double vision. At first, this can be confusing to the patient,

but people adapt to it quickly. "In most patients, if they try the system they are successful," Dr. Gottlieb says.

In the Peli system, the double vision occurs in the peripheral vision. This is because the person does not look directly into the prisms. Dr. Peli asserts that this is less disorienting than diplopia introduced into central vision. However, Dr. Gottlieb emphasizes, even though the effect of looking into the button prism may be disorienting "for the first few minutes," it is ultimately the double vision that makes his system work. With training, he says, most patients who have used the system to date have benefited. He has also published research suggesting that some people who use the system may recover some of their lost visual field due to intact areas of the brain taking over the function of the damaged area.

Paying for it

Another key difference in the two systems is price. Being fitted with the Gottlieb system—including installation of the prism within the lens—costs anywhere from \$1,500 to \$3,000, depending on the prescription (bifocals versus trifocals, for instance) and various extra features. Then the patient is offered training in how to use the system. Typically, a dozen training sessions are required for someone to become accustomed to the system. This is followed by additional training sessions as needed, "especially if they want to drive," Dr. Gottlieb says.

The cost of training can run an additional \$1,200 to \$1,500. Some people may have to travel out of state to reach eye doctors trained by Dr. Gottlieb, adding to the expense. Dr. Gottlieb says that most people with major medical insurance can get reimbursed for the system.

If you are interested in trying a prism system, first discuss it with



Partial ghost images provide cues that allow a person wearing Eli Peli's prism glasses to avoid obstacles. At left, a man's head and feet become visible in the glasses. Only his arm would be visible otherwise.

SOURCE: JOURNAL OF OPTOMETRY AND VISION SCIENCE

your eye doctor. Dr. Peli welcomes inquiries from optometrists and ophthalmologists (see below). If you would like to find out more about the Visual Field Awareness System, contact Dr. Gottlieb at his clinic.

The next step

Dr. Peli and his colleagues at the Schepens Eye Research Institute are gearing up for a study of how well people wearing the prism glasses can drive a car. Presently some states test for visual field size and some don't. In states that do test, people with hemianopia cannot drive—a major impediment to living independently. Also, Dr. Peli is evaluating whether other types of prism glasses can help people with retinal damage that turns their visual field into a narrow tunnel—a common symptom of retinitis pigmentosa and glaucoma.

For More Information

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