

COMPUFOCALS

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Today, computers are as much a part of our work lives as the morning commute. Seventy million Americans spend an hour or more of every working day at a computer. And computers claim substantial amounts of our recreational time as well.

Many computer users have vision or eye difficulties. According to one survey, 88% of computer users suffer from eyestrain, headaches, eye irritation, or other complaints. Another survey found that computer-related problems generated 15% of patient visits to a general eye care practice. In retrospect, this is not surprising, as computer use makes prolonged, exacting demands on vision. Symptoms can result from refractive, accommodative, binocular, dry eye, presbyopic, or work environmental disorders.

Many of the problems can be resolved through the prescribing of appropriate glasses—we call them *Compufocals*. Obviously, there is no one glasses solution for all of the problems associated with computer use.

However, there are many patients for whom a specially designed pair of glasses will help their vision while working at the computer. “*Compufocals*” refers to glasses that are of a design or prescription that is different from the glasses worn to meet the user’s other daily visual needs. They also describe when the glasses are prescribed for correction of a marginal vision disorder that would not need correction if the patient worked at a less visually demanding job. These definitions may be sufficient for employer reimbursement issues.

Most patients who have problems working at a computer are presbyopes. Presbyopia describes the normal decrease in the ability of the eye to focus from distance viewing to near viewing as one matures past age forty. As members of the baby-boom generation become presbyopic, they are discovering that general-wear bifocals, trifocals, and progressive lenses are often inadequate for comfortably viewing their computer screens. Presbyopes who spend more than an hour per day working at a computer screen will often function better with a separate pair of glasses designed specifically for their computer work.

As an ophthalmologist, I see increasing numbers of presbyopic patients who are not aware that there are specific occupational eyewear recommendations for visual comfort at the computer. It is important to be aware that there are a variety of ways that glasses can optimize comfort and alleviate the eyestrain and other complaints that may initially seem inherent in computer use.

Basically, there are only two types of lenses that allow for more than one viewing distance – lined flattops and progressive bifocals.

Optics of Bifocals - Progressives

A progressive addition lens is more than a bifocal (or trifocal) ophthalmic lens without visible segments. Rather, its distinctive feature is a “corridor” (M) of steadily increasing add power leading from the distance correction in the top portion of the lens (D) to the near reading correction in the bottom portion of the lens (N) (Figure 1). The increasing power allows the wearer to focus easily on any point from infinity to a near reading distance. There is a zone of unfocussed lens (U) where the corridor merges with the rest of the lens. It takes a few weeks to learn to adjust to the unfocussed zones and the corridor transition.

Because our eyes look down and converge when we regard close objects (as when reading), progressive lenses are designed so that the natural movement

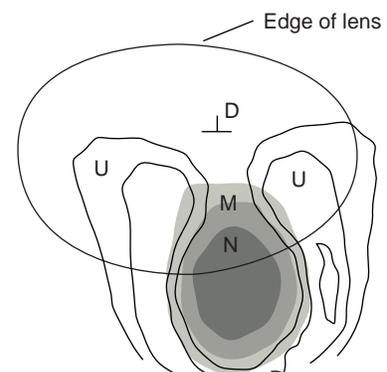


Fig. 1 Progressive Addition Lens

of the eye stays within the corridor of increasing power as the gaze is directed toward closer objects.

This lens design produces a very natural vision. Instead of discrete distance and near corrections, objects at any distance can be seen in focus. Because there are no segment boundaries (lined multifocals), there is no image jump as the eye moves from the distance to the near correction via the corridor.

Progressive lenses are available with a wide array of enhancements. They can be fabricated from almost any standard or premium lens material. They can be tinted and coated like other lenses. Almost any option available for single-vision lenses is available for progressive lenses. Strong prescriptions need not be a bar to wearing progressive lenses. Good opticianry—which includes careful frame selection and lens positioning—and high-index materials allow us to bring progressives to people with fairly high prescriptions.

Progressive lenses cost more than plain segmented multifocals. And, like any multifocal ophthalmic lens, progressive lenses take a little getting used to. But for most patients, the advantages of progressive lenses outweigh the costs. What patients get for their extra money is a greatly enhanced range of vision, and the visual benefits of the progressive design increases as the patient gets older. With segmented multifocals, as the add power increases, patients lose more and more of their intermediate vision. Progressive lenses restore intermediate vision.

Optics of Bifocals – Lined Flattops

Before the introduction of progressive lenses, the only method for viewing more than one working distance was the lined flattop bifocal or trifocal. These lenses are very effective in that each segment of the flattop bifocal is totally devoted to a specific working distance (Figure 2). This means that if you wore a lined trifocal lens, the top portion (D) was clear all the way across the segment for distance objects, the middle portion (M) was similarly clear for mid-range viewing and the bottom portion (N) was clear for near viewing.

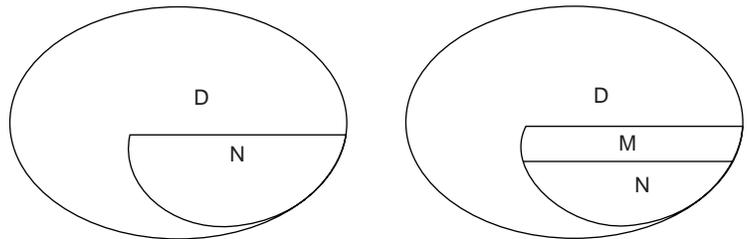


Fig. 2 Traditional bifocal and trifocal

Of course, the lined bifocal provided only distance and near vision. This allowed for an especially wide working area where you could easily scan across whole pages of text. However, there are problems with lined flattops. The first objection to this type of lens was that they did not look good with the obvious lines. However, their greatest dysfunction was that there was a jump in vision whenever your eyes moved from one segment to the next – in other words, your vision would jump from far (D) to near (N) or to mid-range (M). This was manageable over time, but it was always a problem.

Computers and Ordinary Bifocals

With very few exceptions, general-wear bifocal glasses are not ideal for presbyopic patients who spend more than an hour per day doing computer work. General-wear bifocal glasses are designed for reading and doing tasks with one's hands; and the typical fitting of these general-wear glasses produces good near vision with a downward gaze of 25-30 degrees. The screens of desktop computer monitors tend to be located, at most, 20 degrees below primary gaze, and many are at eye level (Figure 3). Also, in most general-wear bifocals, the near lens power has been prescribed for a viewing distance of 15-

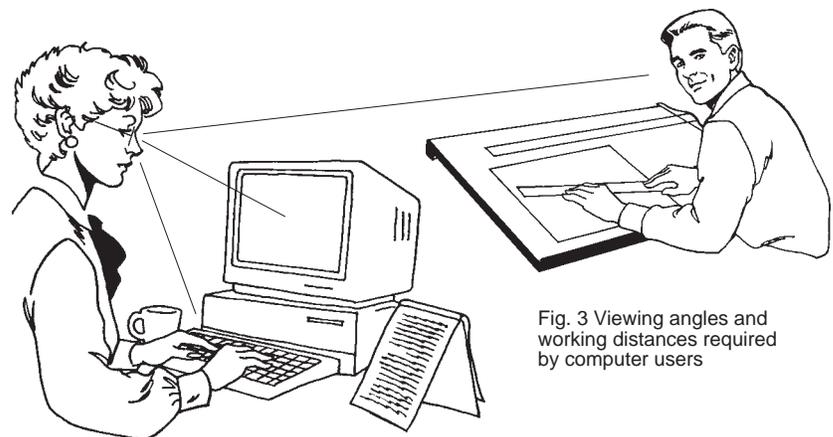


Fig. 3 Viewing angles and working distances required by computer users

16 inches. The screen of a typical desktop computer is typically 19-28 inches from the user's eye; so the standard near correction is unsatisfactory, especially over extended periods of viewing.

Because the near correction is in the bottom of the lens, a general-use bifocal wearer who uses a desktop computer often must tilt their chin upward to see the screen through the near vision portion of the glasses. If the near portion of

the glasses is set for normal near work, they also have to lean forward towards the computer screen to get close enough for clear vision. This usually results in sore neck and back muscles. If the mid-range placed computer screen is clear through the tilted-up bifocal portion of the glasses, this usually means that the bifocal is not strong enough for normal closer near vision work. The alternative for a more comfortable posture is blurred vision when the computer is viewed through the upper portion of the glasses. The patient must effectively choose between either blurred vision or postural discomfort.

Computers and Ordinary Progressive Lenses

General-wear progressive lenses are definitely better and may satisfy many presbyopic computer users. However, many presbyopes who work at a computer do not function well even with general-wear progressives. Although progressive lenses do provide clear vision at the mid-range required for viewing the computer, this zone is relatively small, both vertically and horizontally (see Fig. 1 repeated here). General-wear progressives may not be sufficient for extended viewing of objects located at mid-range distances.

Patients who use general-wear progressives for work at a computer may engage in a frustrating and fatiguing search for the narrow “sweet spot” in the lens that gives them a clear view of the screen. This requires head and neck movement rather than eye movement and may result in sore muscles due to the postural rigidity and constraints, as well as difficulty in focusing and eyestrain.

Many patients do succeed at the computer with general-wear progressives, especially if the progressive portion of the lens starts high enough. When computer use is brief and infrequent, general-wear progressives can function well.

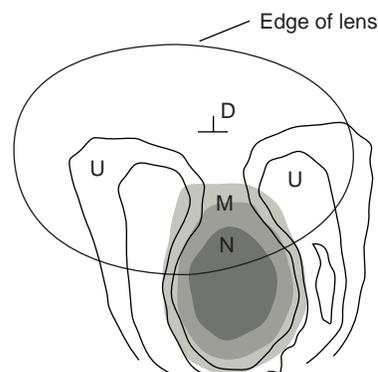


Fig. 1 Progressive Addition Lens

Special Requirements

Presbyopic computer users generally benefit from a large central area for mid-range viewing and a lower portion of the lens that can focus on near objects (for general office reading). In addition, many patients want to be able to get up and walk around the office without changing glasses. Significant blurring of distance vision can be disturbing when the patient is away from the desk.

The viewing distance and angle of the monitor and of frequently used near materials is important information necessary to determine the appropriate prescription and lens design. A typical, and usually appropriate, monitor location is at 24 inches away from and 15 to 20 degrees below eye level. Specially designed lenses will work in this situation. Where the job necessarily involves unusual viewing distances and/or angles, extra attention to prescription and lens design is required.

Occupational Lenses

In response to the increasing demand for eyewear solutions designed specifically for computer users, a lens design utilizing the progressive addition lens design has been introduced. Clinical studies show that computer users prefer these lens designs to traditional lens designs. Those wearing progressive lenses for general wear are excellent candidates for these new designs.

Our occupational progressive computer glasses (*Compufocals* - Figure 4) have the entire upper and central portion of the lens devoted to mid-range viewing (M) and the lower portion of the lens is for near viewing (N). You will notice that the corridor starts higher up in the lens than it normally does in general wear progressives (Fig. 1 above). A Varilux progressive addition lens is one of the better progressive lens designs that allow for a normal transition from mid-range viewing to near viewing. Some lenses can also incorporate a small area for distance viewing area at the top of the lens (Fig. 5).

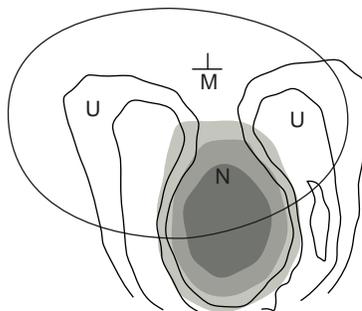


Fig. 4 Compufocal design

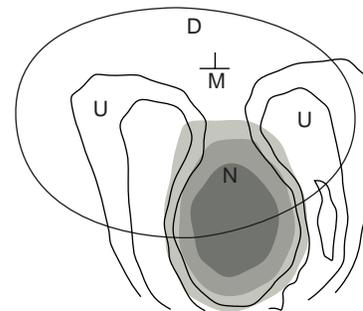


Fig. 5 Compufocal with small distance area

Lined Multifocals

Some patients cannot adjust to progressive lenses for computer viewing as the transition zone from the middle portion of the lens to the lower portion of the lens may be too narrow for comfort. Other patients are more willing to wear lined bifocals, if they know they will only be wearing these lenses while working at the computer. There are also those who just prefer occupational lined bifocals or trifocals specifically designed for computer use. Often these are patients who are happy with general-wear lined bifocals or trifocals. A traditional flattop lined bifocal can work well for advanced presbyopes and will be very helpful when they are specifically designed for computer use. In these patients, a single-vision prescription cannot meet the needs of both mid-range and near vision. The *Compufocal* lined bifocal lens (Figure 6) is prescribed so that the top portion of the lens corrects the mid-range view (M) for computer use and the bottom portion corrects the near vision (N). As noted before, there will be no graduated transition from the mid-range top portion of the lens to the near vision bottom portion of the lens.

As an alternative, traditional bifocals in which the line is set high in the lens can be prescribed for patients who need to be able to see at a distance when working at their computers. This also holds for patients who are excessively disturbed by the distance blur when the top portion of the lens is devoted solely to mid-range correction. In this lens design (Figure 7), the top portion of the lens is for distance viewing and the lower portion of the lens is for viewing the mid-range computer screen. If the mid-range lens power does not enable the person to see at near ranges, then a trifocal will be required. Special trifocal designs are available for computer users (Figure 8), often with a larger mid-range portion (10 or 14 mm in height, rather than the typical 7 to 8 mm size).

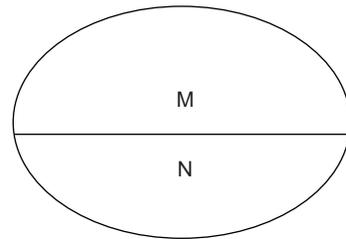


Fig. 6 Executive *Compufocal*

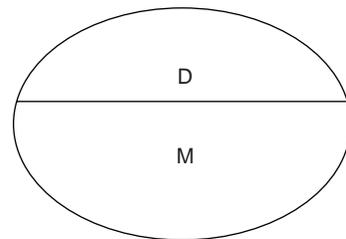


Fig. 7 Executive distance/
mid-range *Compufocal*

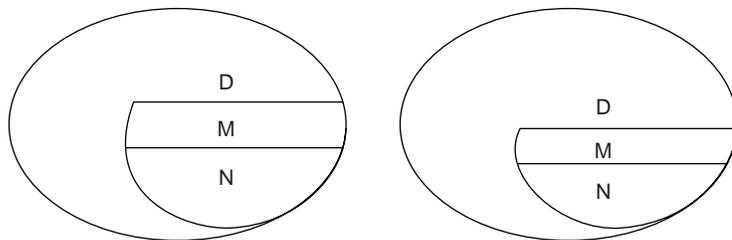


Fig. 8 Computer vs. traditional trifocal

Early Presbyopes

Some younger presbyopes can be prescribed single-vision lenses specifically for use while they work at the computer. The power is determined by placing a visual target at their usual computer mid-range viewing distance (commonly 24 inches) and refracting for that distance. These individuals still have enough accommodation to enable them to see reading distance near objects clearly through a lens designed for mid-range viewing. Distance vision will be somewhat blurred, but most patients will find this acceptable, as the amount of blur created by the relatively low mid-range power is small and the need for distance vision while using the computer is limited. Although many of these patients prefer vision with the occupational lenses described above, the single vision lenses are less expensive, and they offer a large, clear field of vision for viewing the computer screen.

Many younger presbyopes can also use their remaining accommodation to view the computer screen through the distance portion of a general-wear progressive lens. Eventually, however, these presbyopes will lose their ability to accommodate and will need another solution for working at the computer.

Function is Good

Having good and comfortable vision at work is a high priority for most of us. People want to be able to concentrate on their work, unencumbered by eyestrain or postural difficulties. Enabling patients to do their jobs comfortably is a very rewarding part of our practice.

If you have any questions about this newsletter or about the *Compufocals* described herein, please call or visit our optician, Michelle Wilson or her assistant, Carol Schroeder at (972) 867-2044.