Like it or not, spectacles become a part of life for most of us sometime between the age of 35 and 50. The most common reason for this is a condition called presbyopia. In presbyopia, the crystalline lens inside our eye becomes less flexible and will not change focus for objects in our near vision. This makes it difficult for us to see to read.

The current trend within the ophthalmic industry is to fit general purpose progressive spectacle lenses to people who have presbyopia. Many readers may already own a pair themselves. These spectacle lenses are slowly superseding half-eyes (or look over spectacles), bifocals and trifocals. They promise more versatility (in the car, you can see in the distance, see the dashboard and read the street directory all with the one pair of spectacles), offer better aesthetics (they look like regular spectacles, not like bifocals) and obviate the catchcry “Has anyone seen my reading glasses?”

Despite the many advantages these lenses have over other spectacle lenses, they are not necessarily the panacea for presbyopia many marketers would have us believe. Who hasn’t seen the 50-something-year-old office worker with their head tipped back and chin thrust forward struggling to see their computer screen, wearing their “one-pair-for-everything” progressive spectacles?

While general purpose progressive lenses offer the convenience of one pair of spectacles, there are work situations where their use may impact on the health, comfort and efficiency of the wearer. This article will outline some of the alternative task-specific multiple focus spectacle lenses currently available and discuss how you can help your clients with presbyopia obtain the best spectacle lens for their job.

**FEATURES OF MULTIPLE FOCUS SPECTACLES**

Multiple focus spectacles, as the name implies, contain more than one refractive (or prescription) power, enabling the presbyopic wearer to focus at more than one distance. For example, a bifocal has two refractive powers allowing the wearer to see in the distance as well as see up close. The term “multifocal spectacles” refers to bifocals, trifocals and progressive lenses.

Multiple focus spectacle lenses are prescribed and ordered by specifying three parameters:

1. The refractive power in the lens.
2. The position of the refractive power in the lens relative to the wearer’s eye.
3. The width (or field of view) of the viewing area, which is dependent on lens design.

**HOW DO GENERAL PURPOSE PROGRESSIVE LENSES WORK?**

General purpose progressive lenses have refractive power which “progresses” or gradually changes over the surface of the lens. There is a distance and a near refractive power. Linking these two areas is a channel which allows the wearer to also focus at a range of intermediate distances (see Figure 1).

There are many lens designs offering variety in the length of the intermediate channel and in the width of the distance, intermediate and reading areas. However, they are all similar in that:

- The lenses need to be precisely fitted otherwise the wearer may experience distorted areas in their peripheral field of vision.
- The reading prescription is always in the lower portion of the lens.

These lenses may be suitable for a range of “general-purpose” tasks such as reading books and newspapers, shopping and driving. However, if the near task is positioned high in the wearer’s field of view (e.g. if looking at a computer monitor) or if the wearer needs to see a near task displayed over a relatively large surface area (e.g. working at a large desk), alternative spectacle lens designs may be required.

Figure 1. General purpose progressive lenses
ALTERNATIVE TASK-SPECIFIC LENSES

Extended focus progressive lenses

Extended focus progressive lenses were launched in the ophthalmic lens market approximately 13 years ago as a lens suitable for computer users. The principal feature of these lenses is that the intermediate portion is wider and higher than that of a general purpose progressive (see figure 2). This means that the wearer is able to adopt a more neutral posture at their desk and does not need to tip their head back to see the computer monitor. They have received favourable reviews in the scientific literature\(^1\),\(^2\) and are generally well accepted by wearers.

The main disadvantage of these lenses (as for most task-specific lenses) is that they usually don’t give clear distance vision, so aren’t suitable for driving. Therefore, the wearer may need to own more than one pair of spectacles, for example, general purpose progressives for everyday use and extended focus progressives for office work.

Bifocal lenses

In some work settings bifocals can offer more versatility than a progressive lens. They have two refractive powers (see figure 3). The area indicated as “focus 2” is referred to as “the segment”.

The most common arrangement in a bifocal is for the top portion of the lens (focus 1) to be used for distance viewing and the bottom portion (focus 2) for near viewing. However, it is possible to specify almost any focal arrangement depending on the working distance of the task. For example,

- Focus 1 = 70cm viewing distance; Focus 2 = 40cm viewing distance
- Focus 1 = distance viewing; Focus 2 = 1 metre viewing distance.

Bifocal lenses have two principle advantages over progressive lenses.

1. The segment height can be varied to suit the task.
   - Figure 4a shows the conventional position of the segment, which is aligned with the wearer’s lower eyelid. This would be suitable for general reading tasks.
   - Figure 4b shows the near segment set in a low position e.g. for a golfer who needs maximum distance viewing but who occasionally needs to complete a scorecard.
   - Figure 4c shows the near segment set in a high position e.g. for an orchestral musician who predominantly needs to see their music, but also has to see the conductor.

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2. The size of the viewing area can be varied to suit the task.
- Figure 5a shows a standard D-segment which would be suitable for general reading tasks.
- Figure 5b shows an executive bifocal which some people prefer when viewing tasks covering a large surface area (e.g. reading architectural plans).

![Figure 5 (a) D-seg bifocal (b) Executive bifocal](image)

**Trifocal lenses**
This literally means “three focus” (see figure 6). The conventional arrangement of a trifocal is that the top portion is used for distance viewing; focus 2 for viewing at an intermediate distance (e.g. 1 metre away); and focus 3 for near viewing. As for a bifocal, the main advantage of trifocal lenses is that it is possible to specify the refractive power, the position of the segment and the size of the segment according to the task demand.

![Figure 6. Trifocal lenses](image)

Trifocals have their limitations. The size of the segment area is quite large and some wearers feel that this intrudes on their field of view. Despite this, the intermediate zone is fairly shallow (7mm high) and does not allow a great deal of room for reading. One manufacturer has addressed the issue of intermediate zone size by marketing an occupational trifocal for computer users (Datalite™CRT trifocal). This lens has an intermediate zone depth of 14mm high to allow comfortable viewing of a computer monitor. However, the size of the segment does limit distance viewing and so these lenses are not suitable for tasks like driving.

![Figure 7. “Upside-down” bifocal](image)

**BUT WHAT IF THE NEAR TASK IS ABOVE THE HEAD?**
There are many situations when a near task is performed above the head. For example: a mechanic working under a car; an electrician working on overhead wires; a librarian selecting or shelving books on an overhead shelf.

One alternative is for a bifocal to be fitted up-side down (where focus 1 is set for, say, distance viewing and focus 2 for the working distance of the near task — see Figure 7). For people who need to view a near task “up” as well as “down”, an occupational trifocal might be prescribed — see figure 8, where focus 1 is set for distance viewing and focus 2 and 3 for the working distances of the near tasks.

![Figure 8. Occupational trifocal](image)

**GETTING THE RIGHT LENS FOR THE JOB**
The information ergonomists obtain in workplaces may not always be accurately conveyed to eye care practitioners, especially when communication is via the patient/client. This can result in the prescription of inappropriate spectacles for certain tasks. The best way for ergonomists to ensure that their clients are prescribed appropriate eyewear is to:
- Develop a working relationship with an eye care practitioner. A collaborative approach to problem solving is more likely to be fruitful if each party appreciates the problem from the other’s point of view. Understanding the reasoning by which eye care practitioners prescribe particular lenses will assist this process.
- Help the eye care practitioner understand the work situation. This might be achieved by:
- Drawing a diagram of the work task, identifying the working distances and relative position of the tasks
- Indicating the size of detail in tasks
- Describing the length of time spent on specific tasks
- Explain to workers that there are situations where it is advantageous to have task specific spectacles and that it may be necessary to have a pair of spectacles specifically for work.

CONCLUSION
General purpose progressive lenses are useful in many work situations as they allow the wearer to see at a range of distances with the one pair of spectacles. However, they are not the ideal lens option for all work tasks and it is possible that some workers may require task-specific spectacles in addition to their regular eyewear.

One of the greatest challenges facing eye care practitioners and ergonomists is persuading their clients to wear task specific spectacles. Ergonomists are familiar with their clients specific work tasks, and so are in an ideal position for working with eye care practitioners in determining the best type of spectacles for the job.

REFERENCES