Bradley Rogers reviews the increasing list of indications for fitting a contact lens to correct presbyopia and offers advice on successful fitting. Module C20092, one CL specialist point for CLOs, one general CET point for optometrists and dispensing opticians.

This has been a pivotal year for presbyopic contact lens correction. There are now a plethora of multifocal products in re-usable modalities, which in 2012 have been supplemented by the introduction to the UK market of two new single-use multifocals. This acceleration in product release comes 12 years after the launch of the first (and until recently, only) single-use prescription multifocal.

Given the wide choice of contact lens modalities and designs for correcting the presbyope, why should the practitioner choose a single-use multifocal? This article seeks to examine the opportunities and challenges which influence the efficacy of presbyopic correction in a single-use, one-day disposable modality. It will concentrate specifically on those aspects which relate to vision, rather than universal attributes of single-use disposables per se, such as material properties.

Why choose to fit single-use multifocal lenses?

This is a fundamental question, since the reason for supplying a multifocal may seem obvious, as would the reason for fitting a single-vision one-day disposable; but since the product choice has only just recently expanded, why should we be considering multifocal correction in a single-use product when there is so much more choice in other modalities?

Reason 1: The potential is huge

Following the baby boom of the latter part of the 20th century, it has been estimated that globally there are now one billion presbyopes, projected to increase a further 35 per cent by 2020, reaching 1.8 billion by 2050 (Figure 1). For the practitioner, this exponential increase will bring proportionally more new patients who have never had an eye examination before, as well as existing patients who now require a new near vision correction. The ocular and lifestyle needs of these patients are interrelated and may be explained in terms of their generational experience: the so called baby boomers and generation X.

Generation X is the term for those people born from the mid-1960s to late-1970s and includes all our new and emerging presbyopes. These patients have grown up during a technological revolution, and will have a greater motor-visual demand as a result of their use of mobile technology such as phones, tablets, laptops as well as PCs. This visual demand will also vary with environment, the technology being used, its duration and working distance. Generation X patients will tend to lead a more active lifestyle and are strongly motivated to maintaining both visual function as well as a youthful appearance. These are potent drivers to multifocal contact lens prescribing which are facilitated by a greater accommodative and adaptive ability.

The baby boomer generation were born between the mid-1940s and early-1960s, and so are likely to have started lens wear at a later stage in life. They matured with comparatively less frequent and diverse use of modern technology, and are characterised by a need for comfortable near vision for relatively longer periods of time. As many baby boomers will have reached retirement, their lifestyle will be different to their younger counterparts and are strongly driven to preserving visual function rather than cosmesis.

Not only are there increasing numbers of people requiring near-correction, but there is also the question of how we deal with our existing contact lens patients. A recent study found that over 60 per cent of contact lens wearers aged 35 to 49 years and 80 per cent of patients over 50 years, said they were interested in multifocal contact lenses. With this in mind there is a huge potential for providing patients with a viable alternative to spectacle wear, and one which will offer the wearer the flexibility to wear on an occasional or part-time basis.

There is also great potential in dealing with the reasons for patients who have ceased lens wear: this is most acute after the age of 40, when the principal explanations cited for drop-out are related to comfort, vision and convenience. Paradoxically this comes at a point when there is a significant increase in the number of people requiring sight correction. Issues of comfort are usually attributable to the symptoms of dryness, which become greater in the ageing eye as does the visual problem related to presbyopia. It follows that a multifocal contact lens which can be worn comfortably will result in more patients remaining in contact lens wear, and will be further enhanced through the convenience of its use in a single-use modality.

Reason 2: Single-use modality is the ‘lifestyle modality’

Since their introduction in the mid-1990s, the prevalence of single-use, one-day disposables has grown steadily and now represents 45 per cent of new soft replacements and 39 per cent of re-fit soft replacements. Factors influencing this popularity are associated with increased convenience, optimum comfort and from a practitioner perspective, increased compliance and hygiene.

The popularity of single-use disposables does appear to be somewhat attributable to their use for occasional or part-time wear. A study published in 2009 found a bimodal pattern of
use for wearers of one-day disposable contact lenses, with 40 per cent wearing full-time (4-7 days per week), whereas 60 per cent wore part-time (1-3 days per week). The study suggested that one-day disposables were particularly popular for part-time use because of their increased convenience and hygiene; whereas the lower proportion of full-time wearers could be attributable to other factors – including perceived value for money – in comparison to part-time use.

When we consider that the needs of our presbyopes may vary considerably depending on their prescription/add, expectations and the type of visual task they are undertaking, it is logical to conclude that a single-use modality offers the wearer the greatest degree of flexibility of use; and this need is reinforced by recent research which found that the majority of contact lens wearing presbyopes (78 per cent), preferred to habitually correct their vision with a combination of multifocal contact lenses and progressive spectacles. This study found that spectacles were preferred for solitary or stationary activities such as reading a book, watching TV or using a computer, while multifocal contact lenses were preferred for active and social activities such as going out to a social event, work or gym. In addition, there was some overlap in preference for some uses such as driving or reading a menu.

We also know that gender plays a part too, as almost twice as many women wear contact lenses than their male counterparts and are increasingly wearing their lenses in their late 30s and early presbyopia, reflecting a desire for maintaining both cosmesis and a good standard of vision.

Given the lifestyle characteristics of generation X presbyopes, today’s increased choice in single-use multifocal correction is timely.

Reason 3: Multifocals are more popular than monovision

According to a recent survey of UK contact lens prescribing, the fitting of multifocal contact lenses now exceeds that of monovision and accounts for a third of all contact lenses prescribed to patients over 45 years of age.

It could be speculated that practitioners’ preference for multifocals may possibly be due to an increasing need for effective correction, increasing practitioner confidence fitting multifocals, an improvement in multifocal lens designs, and/or an increased level of patient satisfaction with multifocals over monovision.

Monovision, although in decline, offers correction with minimal chairtime while maintaining a broad choice of parameter availability, is less dependent on pupil size than multifocals and has quoted success rates of between 59 per cent and 67 per cent.11 In this sense it lends itself well to single-use disposables, since there is a great deal of choice in materials and prescription availability. However, while it can work well in early presbyopia, several aspects of visual function can become impaired as the add increases, which are not necessarily seen to the same degree in multifocal wear.

It has long been established that unilateral blur reduces stereopsis and has also been shown to be the case in wearers of monovision. One study found a reduction of stereoacuity for monovision wear in the range of 58 to 90 seconds, which was proportional to the add. Chapman et al (2010), concluded that changes to the gait of adapted monovision wearers were likely to be associated with reduced stereoacuity – with a range of reduction of between 17 to 87 seconds of arc. On the other hand, multifocal contact lens correction has been found to give better stereoacuity than monovision. Another study by Woods et al (2010), challenged this view by demonstrating that there was no significant difference in the number of lenses required to fit a patient with a newly developed multifocal compared to monovision.21

Another factor which may play a part in the success of multifocals is the importance of assessing visual satisfaction in ‘real-world’ situations. Another study by Woods et al (2009), compared objective and subjective results for a monovision modality to those obtained for a low-add, centre-near aspheric multifocal. Subjective results, showed that multifocal correction was preferred over monovision for real-world tasks such as driving during daytime, night-time, watching television and when changing focus from distance to near.22 Given the ease of adaptation with low-add presbyopes, the speed at which multifocals can now be fitted and the advantages of better binocularity, there is now more reason than ever for the practitioner to use multifocal contact lenses as the first-choice for presbyopic correction.

Figure 2: Distribution of time spent by practitioners advising presbyopes on their vision correction options23

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<thead>
<tr>
<th>Option</th>
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<th>UK</th>
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<th>Global</th>
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<td>12.7</td>
<td>11.1</td>
<td>10.8</td>
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How can we best correct a presbyope with a single-use disposable?

From a practitioner perspective, the vision correction of a presbyope should be a straightforward process, obtaining the desired result with minimal chair-time. A recent CooperVision-sponsored study found that UK practitioners spend an average of nearly 11 minutes advising presbyopic patients on their vision correction options (Figure 2).

Given the time pressure on the practitioner, it could be argued that for a one-day disposable multifocal to work effectively, this form of correction must achieve a good standard of vision as quickly as possible. This means using an easy-to-use lens selection (or fitting) guide, a manageable stockholding and a multifocal design philosophy consistently delivering acceptable vision. Naturally, this is a challenging balancing act, which will ultimately involve an element of ‘trade-off’, but we can consider how these aims may be achieved.

Distance vision is key

The most important rated visual factor for success in a simultaneous-vision contact lens is distance vision. This was established by Back et al (1992), who analysed the vision ratings in groups of successful and failed bifocal contact lens wearers. Discriminant analysis of the results demonstrated that for wear to be deemed successful, the minimum subjective ratings had to be in excess of 77 per cent for distance vision, 53 per cent for near vision and 46 per cent for near vision. The conclusion that near vision had a lower rating, might be due to the fact that the patient can exercise some control on those factors which affect the quality of their near vision, such as changing working distance or increasing illumination. Factors affecting distance vision rating on the other hand cannot be controlled by the wearer, and are attributable to the effects of lens design and fluctuating pupil size.

The significance of profile design

In order to appropriately balance the visual compromise, there is no escaping the importance of the power profile in multifocal lens design. There are many factors which affect the optical performance of simultaneous-vision contact lenses, including lens centration, pupil size, optic zone diameter and the combined spherical aberration of the eye and contact lens. Since ocular aberrations and pupil size cannot be independently controlled, the single most influential feature must be the design of the lens itself (Figure 3).

It is no coincidence that all current one-day disposable multifocal designs include an element of centre-near asphericity; since a gradual change of curvature from centre to periphery allows a wide focusing range to be accommodated. An aspheric surface also lends itself well to the high quality mass production required for single-use disposable supply. Centre-near designs perform well for near tasks – aided by the reduction in pupil size during accommodation.

However aspheric, simultaneous-vision multifocal designs are subject to the effects of longitudinal spherical aberration, which increases proportionately with the power of the add. The principal reason for this is that the central portion of the lens focuses paraxial light at a different point to the marginal area of the lens. In this sense, centre-near aspherics produce negative spherical aberration, which has the potential to become troublesome depending on how the profile is configured.

A high-addition, centre-near aspheric lens produces a necessarily more dramatic transition between the distance and near, producing a large area of diffuse focus and a high level of spherical aberration, which gives rise to ghosting and image doubling and the perception of blur by the patient. However, the close vision is generally better as the centre of focus is conjugate with near vergence (Figure 4).

Conversely, a low/mid-addition aspheric surface produces a smoother transition between distance and near with a shorter area of diffuse focus and...
so a lower level of spherical aberration. This generally gives a higher quality image with lower levels of ghosting and doubling, though in itself will not truly bring near objects to a clear focus (Figure 5).

In reusable modalities, an optimum standard of vision is achieved by the use of up to four power profiles, each being engineered for a specific add range. For one-day multifocal fitting, however, the need for providing an acceptable standard of vision has to be balanced by the desire for a convenient, straightforward fitting approach. Each manufacturer seeks to achieve this balance in a different way.

Products
There are three single-use disposable multifocal products currently available in the UK:
- CIBA Vision Focus Dailies Progressives All Day Comfort
- CooperVision Proclear 1 day multifocal
- Sauflon Clariti 1 day multifocal

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<thead>
<tr>
<th>Manufacturer</th>
<th>Lens name</th>
<th>Profile</th>
<th>Effective near correction</th>
<th>BOZR (mm)</th>
<th>TD (mm)</th>
<th>Power range</th>
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<tbody>
<tr>
<td>CIBA Vision</td>
<td>Focus Dailies Progressives All Day</td>
<td>CN Aspheric</td>
<td>Up to +3.00D</td>
<td>8.60</td>
<td>13.80</td>
<td>+5.00 to 6.00</td>
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<tr>
<td>CooperVision</td>
<td>Proclear 1 day multifocal</td>
<td>Single power profile</td>
<td>Up to +2.50D</td>
<td>8.70</td>
<td>14.20</td>
<td>+6.00 to -10.00</td>
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<tr>
<td>Sauflon</td>
<td>Clariti 1 day multifocal</td>
<td>CN/B.S Aspheric</td>
<td>LOW: up to +2.25D HIGH: +2.25D to +3.00D</td>
<td>8.60</td>
<td>14.10</td>
<td>+5.00 to -6.00</td>
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CooperVision Proclear 1 day multifocal
The principal parameters for these lenses are summarised above from manufacturer and industry literature (Table 1).

CIBA Vision Focus Dailies Progressives All Day Comfort
The world’s first single-use one-day multifocal, Focus Dailies Progressives All Day Comfort was originally launched in 2000. The optical design incorporates a front central optic zone diameter of 7.80mm into which a high-add, centre-near aspheric profile carries a reading addition, effective up to +3.00D. This lens design was examined by Hough (2002), who found the dimensions of the power peak to be approximately 2mm in diameter and +3.00D high. The fitting philosophy is as a paired system in which the initial trial lens is selected using best vision sphere (corrected for vertex distance) plus half the add. The power is initially adjusted binocularly to optimise vision and further improvement may be achieved through adjustments to the power of either or both lenses.

Sauflon Clariti 1 day multifocal
This lens entered the market in April 2012 and employs a choice of two centre-near profiles (Low and High), which as outlined above, permits an element of control to be exercised in maintaining an optimal standard of vision.

Having assessed ocular dominance, the chosen distance power is based on highest-plus best vision sphere (adjusted for vertex distance), supplemented by additional plus power dependent upon the add and refractive state as detailed in the fitting guide. The Low profile is used for adds up to +2.25D, with the High profile in the non-dominant eye for adds over +2.25D, and further

![Figure 6 The CooperVision Proclear 1 day multifocal](image)

Illustration is an artist rendition and is not an actual representation of the lens design.

![Figure 7 For additions greater than +1.00D, Proclear 1 day multifocal uses different powers in each eye to improve near vision, while minimising distance vision compromise](image)
enhancements may be achieved through adjusting the power of either or both lenses. 31

CooperVision Proclear 1 day multifocal
As a result of its extensive research into the criteria for multifocal success, CooperVision has designed a lens which makes fitting the presbyopia convenient and effective through appropriate management of visual compromise. To achieve this, Proclear 1 day multifocal has been uniquely designed with a single profile aspheric centre-near design (Figure 6), in combination with a novel fitting approach. This has enabled CooperVision to reduce the need for complex fitting guides and isolate a clear recipe for success.

The low/mid-add, single profile centre-near aspheric surface used in Proclear 1 day multifocal, produces a lower range of diffuse focus and at the same time corrects up to +1.00D of near-add, so for very early presbyopes it may be fitted in the same way as a pair of single-vision lenses. Correcting higher-add presbyopes is achieved through using the best attributes of modified monovision, where a ‘dialed-in’, controlled amount of plus power (a ‘near boost’ of up to +1.00D) is added to the non-dominant eye. Through its use of a low/mid-add profile, each eye receives separate, uncompromised signals in which the dominant eye is biased to distance and intermediate, and the non-dominant eye is biased to intermediate and near (Figure 7). Adding a predetermined amount of plus power not only improves the near vision, but binocular distance vision remains unchanged (Figure 8). It is interesting to note that in clinical studies, the average stereoview found with Proclear 1 day multifocal corrected in this manner was 61 seconds of arc, which compares favourably with the mean stereoview measured with monovision by Richdale et al (2006). 18

The combination of profile design and novel fitting philosophy results in a system which delivers excellent vision at all distances – it improves near vision without disturbing distance vision, produces overall a more natural visual experience and allows ease of adaptation through different stages of presbyopia. The simplicity and flexibility of the fitting approach means that the lens can be fitted very quickly; aided by a straightforward lens selection guide (Table 2). The visual results can also be assessed and optimised within a few minutes of the lens being inserted.

Summary
There is clearly great potential for single-use disposable multifocals in today’s market. The expanding population of over-40s is marked by diverse lifestyle needs which are predisposed to one-day disposable lens use, as well as the needs of patients who have dropped out of contact lens wear due to vision-related issues. Given the shifting preference for multifocals over monovision, the increased choice of single-use multifocal products means there is now a greater opportunity than ever, for these needs to be met.

References
4 Akerman DA. 40 is the New 20/20-Presbyopia equals opportunity. Contact Lens Spectrum, 2010 (March).
8 Needle SW. Do presbyopes prefer progressive spectacles or multifocal contact lenses? BCLA Abstract, 2010.
23 CooperVision Global Survey on Multifocal.
MULTIPLE-CHOICE QUESTIONS - take part at opticianonline.net

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<tr>
<td>1</td>
<td>Which of the following represents the expected increase in global presbyopia from 2020 to 2050?</td>
<td>4</td>
<td>What is the most important rated visual factor for success in a simultaneous-vision contact lens?</td>
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<tr>
<td></td>
<td>A</td>
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<td>Distance vision</td>
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<td>B</td>
<td>0.4 billion</td>
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<td>Near vision</td>
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<td></td>
<td>D</td>
<td>1.8 billion</td>
<td>D</td>
<td>Comfort</td>
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| 2 | According to a 2009 study, what is the most likely wearing modality for daily disposable lenses? | 5 | Which aberration impacts upon the vision with aspheric simultaneous-vision multifocal contact lenses? |
|   | A | One day per week | A | Coma |
|   | B | 1-3 days per week | B | Astigmatism |
|   | C | 4-5 days per week | C | Oblique spherical aberration |
|   | D | 6-7 days per week | D | Longitudinal spherical aberration |

| 3 | Which of the following statements about monovision is false? | 6 | All current one-day multifocal contact lenses include an element of which of the following? |
|   | A | In the UK more presbyopes are fitted with multifocal contact lenses than with monovision | A | Centre-distance asphericity |
|   | B | Evidence suggests monovision impacts upon gait | B | Centre-near asphericity |
|   | C | Monovision gives better stereoacuity than multifocal contact lens wear | C | UV filter |
|   | D | Increasing the addition in monovision decreases the stereopsis | D | Controlled ‘near boost’ modified monovision |

 Bradley Rogers is a UK contact lens practitioner, ABDO contact lens practical examiner and CooperVision clinical specialist.