General Optical Council Approved CET For Optometrists
General Optical Council Approved CET For Dispensing Opticians

Lifestyle dispensing

Part 1 – The office

In the first in a series looking at how best to dispense to meet the patient's needs, **Stephen Freeman** considers ways of dispensing that best suit the demands of the modern office, and offers two case studies. Module C16476, one general CET point for optometrists and dispensing opticians

Providing the ideal spectacles for a patient involves understanding the purposes for which the spectacles will be used and the environment in which the patient will use them.

The selection of an optical appliance for one or more specific tasks based on the task analysis and the patient's prescription, particular consideration must be given to the presbyopic patient and there may be a legal requirement for the provision of eyewear.

We cannot sometimes help making certain assumptions about a particular working environment, however, probably the most successful approach is being open-minded and able to communicate with patients. Next we require ourselves to have a grasp of what our lens manufacturers make available for us to recommend, in advantages, disadvantages and of course a range from which we can choose.[1]

All visual tasks may be analysed under a number of headings.

- Adaptation effects
- Time for response
- Flicker
- Position in visual field
- Visual field
- Viewing or working distance
- Size of detail
- Contrast of detail
- Colour of detail
- Motion of task
- Stereopsis
- Hazards and eye protection
- Training.

Some of these will have a greater or lesser influence on any recommendations made.

For this first article, the office environment, we will consider flicker, position in visual field, working distance, detail and visual field. Since the use of a visual display unit or terminal is likely, it is worth being familiar with Health and Safety (Display Screen Equipment) Regulations 1992 (amended 2002),[2] and/or the College of Optometrists Guidelines[3] or AOP Handbook section relating to VDU use.[4]

TABLE 1
Range of clear vision for various working distances, assuming 0.50 of amplitude of accommodation is allowed for reserve

Age	Add	Working distance (cm)	Range of clear vision (cm)
45	+1.00	40	100 to 25
	+1.25	35	80 to 24
	+1.50	30	67 to 22
50	+1.50	40	67 to 29
	+2.00	35	50 to 25
	+2.25	30	44 to 24
55	+1.75	40	57 to 31
	+2.00	35	50 to 29
	+2.50	30	40 to 25
60	+2.00	40	50 to 33
	+2.25	35	44 to 31
	+2.75	30	36 to 27
65	+2.00	40	50 to 36
	+2.50	35	40 to 31
	+3.00	30	33 to 30
70	+2.25	40	44 to 36
	+2.50	35	40 to 33
	+3.00	30	33 to 29

Flicker

The flicker fusion threshold is proportional to the amount of modulation. The threshold also varies with brightness, ie it is higher for a brighter light source and the location on the retina where the light is imaged. Two mains sources of flicker in the office may give rise to discomfort if the flicker rate is below the flicker fusion frequency (FFF).

Firstly, there is overhead lighting in the form of fluorescent tubes, because the alternating current produces two brightness peaks per cycle. Provided the FFF is above the critical rate of around 100Hz, then this flicker is unlikely to be noticed. Fluorescent tubes with magnetic ballast may have a frequency of 100–120Hz and therefore can be associated with headaches or asthenopia, whereas electronic ballasts do not produce light flicker. Some individuals may have a lower critical flicker fusion threshold, and the threshold is lower for a fatigued observer. As the rods have a faster response time than the cones, flicker can be sensed in the peripheral vision at higher frequencies than the fovea, and this explains why, if one focuses on the end of a long fluorescent tube, flicker may be perceived at the other end of the tube as it is imaged in the peripheral vision.

The second potential source of flicker is from the monitor screen. Once again, if the raster scanning of the monitor's refresh rate is likely to be above threshold, which again, is very unlikely not to be, unless the monitor/CPU combination was perhaps a number of years old (eg CRT displays). Liquid crystal display (LCD) flat panels do not seem to flicker at all as the back light of the screen operates at a frequency of 200Hz.

If it is not possible to reduce the intensity of the light source, a tint on spectacles may help and some manufacturers have specific tints available for the office. The tint will reduce the intensity level and may eliminate the flicker, provided photopic vision is not compromised. If the ambient lighting is too low for our general visual tasks, and this causes a scotopic visual shift, then once again flicker may be more noticeable.

Position in field

The only region in which maximum visual acuity is obtained is the very centre of the fovea. The whole fovea only subtends 2° and, at the edge of the fovea, visual acuity is halved. So if the visual acuity at the centre of the fovea is 6/6 then at the edge the acuity has dropped to 6/12. For reading at 50cm, the foveal vision covers an area about 17mm across. On the computer screen it only covers about 25mm. Moving further out, away from the centre, by the time 10° from fixation is reached, the acuity has dropped to 6/60. This is only 1m away from the fixation point, when viewing an object at 6m.

However, monitors should be set so that the working area is below eye level.[2] If the monitor is set at eye level the visual system will have feedback errors. The eye level, 'straight-ahead', viewing implies that the visual system is dealing with a distant object and for a subject with 'normal' vision this means that accommodation and convergence are relaxed. Since the monitor screen is relatively close, accommodation is needed to focus the detail and convergence is needed to ensure double vision does not occur. This can produce conflict which in some users will produce asthenopic symptoms with headaches, sore and 'tired' eyes.

Since accommodation is 20 per cent better when looking down at an angle of 20°, a lower monitor position will be of benefit to a subject in the early stages of presbyopia.

Of course, this is not always possible in the confines of space and the working environment.

Visual field

The extent of the visual field required can influence the choice of optical appliance. Barriers would be distortions caused by progressive power lenses (PPLs), lens aperture size and shape or any other physical barriers such as posts or pillars.

Working distance

Perhaps the greatest challenge when dealing with presbyopic patients is working distance. Any add provided will create an artificial far point, beyond which clear vision will not be possible. Table 1 shows the potential range of clear vision based on age, addition and working distances.

The furthest distance looking through the add is the artificial far point, assuming no accommodation, and the closest distance is assuming all of the accommodation is being used. The add itself is calculated by taking half of the available accommodation from the dioptric working distance (alternatively, if only a third of the available amplitude of accommodation is left in reserve, then all the adds will be a bit lower). Due to some degree of convergence taking place, then some measurable amount of accommodation will be in play for any working distance closer than 6m.

Detail size

The angle subtended at the eye by the detail of the task which needs to be resolved will indicate the acuity required. For example, lower case letters on a computer screen may be approximately 3mm high. If the screen is viewed at a distance of 70cm this is equivalent to a distance visual acuity of 6/18. However, it is probable that discomfort would occur with prolonged periods of work if the subject only had this minimum standard of vision. It is normal to recommend that the VA should be twice the minimum required to resolve the detail of the task. So to view 3mm letters at 70cm comfortably, for long periods, the visual acuity should not be less than 6/9.

Detail contrast

The ability to recognise detail depends on contrast. A black line on a white background would have a contrast of 1 or 100 per cent. Light scatter or glare can affect the contrast of objects and their backgrounds.

CASE STUDY 1

The case study involved a small town centre primary school (Figure 1). The office (Figure 2) has three permanent desks, two of which are used by administration personnel, the third, occasionally used by the IT technician.

Patient A, a 50-year-old woman, works full time as a school administrator. Her job involves data input to a computerised system (Figure 3) and manual register recording. She is also the first point of contact for school visitors.

She had been using spectacles for close work for approximately four years. Her last sight test was in January 2009, when she remembered being told there was minimal change and so

Figure 1 Entrance to the school

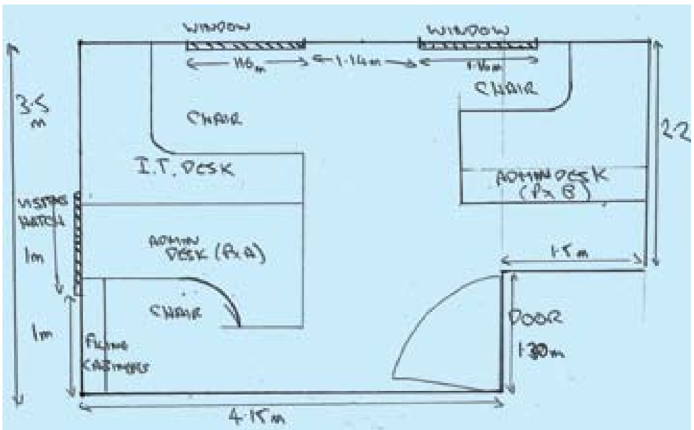

Figure 2 Office plan

Figure 3 The workstation

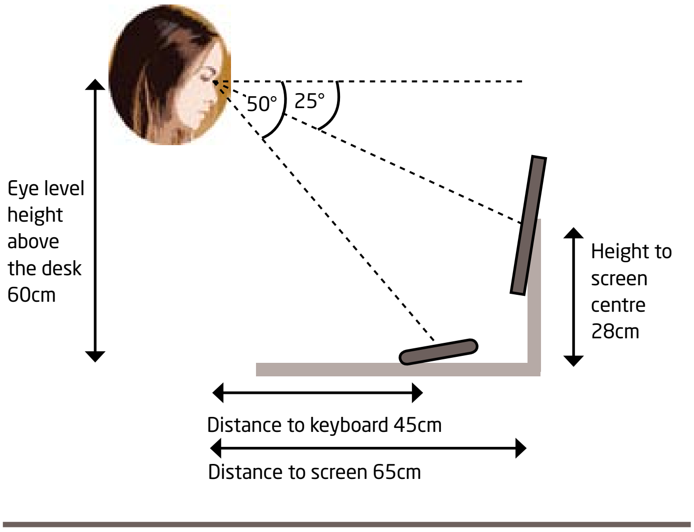

Figure 4 Schematic of workstation

did not update the glasses.

She is using single-vision lenses in shallow frames over which she can peer for distance tasks. These are still to her original prescription, supplied in 2007:

R +1.75DS L +2.75/-0.75 x 45

Not surprisingly, as more of her latent hypermetropia has become manifest, her most recent refractive findings are:

R +0.75/-0.25 x 90 (6/5)
L +1.75/-0.75 x 55 (6/6)
Add 1.75 R&L N5 at 40cm

She has been increasingly aware that some of her nearer visual tasks have become more difficult, hence the reason for her sight test. She drives to work and has no perceived difficulty with far distance tasks.

- **Flicker** – although the computers and more importantly display screens are less than five years old, the monitors are LCD flat screen. There are some restrictions on where desks are placed and where the monitors have to go. The overhead lighting is 2x2 fluorescent tube banks, with all lights on or off
- **Position in field** – the monitor lies at 65cm with the centre of screen 28cm from the desk top. The keyboard is at 45cm. Her eyes are approximately 60cm from the desk top (viewing angle when seated approximately 25° depression from straight ahead (Figures 3 and 4)
- **Visual field** – spreadsheets are used on-screen and large registers are manually updated. Registers and other paperwork are placed to the side of the keyboard at 45-50cm. The communication window is to the left of her seated position, the height to the bottom of the hatch is 120cm (Figure 5).

Working distance

Most of the time she uses a PC with the screen at 65cm and keyboard at 45cm. The work comprises inputting data from written material onto information systems and manually writing in registers. With the window for the visitors' reception, the security lock for the main door is located just beneath, 100cm from the patient's seated position. Due to the shelf on the other side of hatch (for the signing-in book), visitors themselves will be 180cm away if standing to speak to our patient in the office while she remains in her seated position.

Detail

The size of font used in manual registers (eg student names, class ID), are font size N12, printed on A4 sheets. Through some quirk of the school these are printed on yellow paper, thus reducing contrast. Handwritten 'ticks' in tick box (or 0 for absence) are N14. Occasionally fine detail is required, eg medication for students, dosage instructions, and these are in font size N10 on the medicine bottle. From the position outside window, glare can also be noticeable on a bright day. Apart from discomfort, light scatter also reduces contrast. The window has white Venetian (thin horizontal slats) blinds that can be closed, a simple solution to the problem which means keeping overhead lights on (Figure 6).

Dispensing options specific to working environment

Separate single-vision, intermediate (or reduced near) add for optimum working distance of 70cm. This would make the add 1.00DS or 1.25DS, using a subjective approach to which is the more comfortable.

- **Advantages** – ideal for all computer-based tasks. The patient can still look

Figure 5 The visitors' window

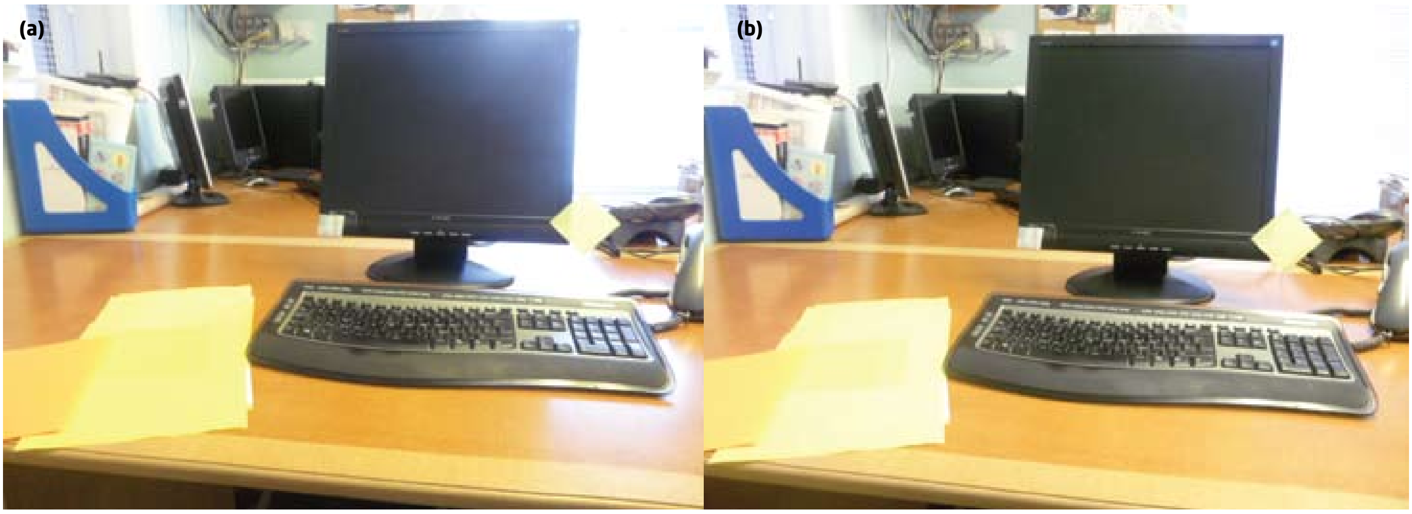

Figure 6 Glare is reduced and contrast enhanced by closing the blind (b)

over the top of her lenses for clearer distance viewing; wide field of view, restricted only by lens size; similar visual correction to present spectacles (nothing new to get used to); cost

- **Disadvantages** – patient already notices some near detail difficulties; room distance will also not be as clear; additional spectacles would be required for prolonged near tasks.

Progressive power lenses

- **Advantages** – one pair required, can be used for general purpose, home and leisure; large choice of designs and features available; room distance detail enhanced
- **Disadvantages** – basic designs inherent with surface astigmatism, corridor length and width shortfalls, lens aperture size and shape considerations; Restricted field of view for mid-range viewing; cost implications of bespoke designs; adaption time; small amount of anisometropia would be exaggerated by the amount of eye depression required to achieve reading visual point. Potentially this could be offset by deliberately choosing short corridor designs, or even supplying a short corridor in one eye and longer corridor in the other, but great care in lens designs is required if this option is to be considered. It would, however, not address the restriction width of intermediate portion.

Enhanced readers (degressive power lenses)

There are a number of this type of lens design from the manufacturers, most of which are available in two power modulations depending on the add. Two typical examples of this type of lens design – both of which have been around about 10 years – are Essilor's Interview and Zeiss Business.

The Interview (n 1.56) is available as 080 (for adds less than 2.00) or 130 (for adds 2.00 or more), which represents the reduction in lens power at the patient's pupil centre, from the full reading prescription, available at about 9mm below this point. To calculate the artificial far point through the weakest part of the lens, simply subtract either 0.80D or 1.30D from the add. In this case, the 080 modulation would be chosen, since the add is less than 2.00D, and so the furthest point of clear vision will be just over 1 metre. Fitting reference is the lower limbus.

With the Zeiss Business (n 1.5) 10 and 15, again the numbers represent the amount of degression, and once again, the 10 would be chosen here and so the artificial far point again would be a bit further at 1.33m. This lens fitting point is the pupil centre height, lowered to take into account the pantoscopic tilt.

An easy way to measure this is, with the patient wearing the frames, ask them to lift their chin so the frame front is exactly vertical, ie pantoscopic angle is zero. Dot the positions of the pupil centres. When the chin is then lowered so the head is in its habitual position, the dots should be exactly in the correct position for this lens design.

BBGR, Hoya, Nikon, Norville, Rodenstock, Seiko and Shamir all produce their own degressive designs and again, check the fitting reference required and the modulations available.

VDU optimised design

Essilor's Computer 2V, Hoya's HoyaluxTact, Norville's Continuum and Pentax PCway are examples to use where the predominant visual task is the monitor. Fitted on HCL, the 2V and Continuum weakens by 0.75D and 1.00D respectively as one choice.

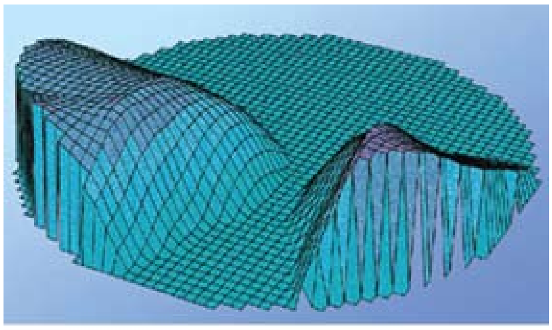

Figure 7a Standard progressive lens power

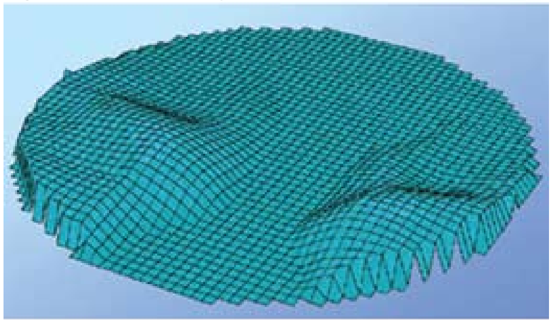

Figure 7b Power profile for Zeiss Gradal (images courtesy of Zeiss)

Since the power modulation is relatively small, all these lenses will exhibit very little surface astigmatism, therefore adaptation should be minimal.

Occupational progressives

These are true progressives. An example, which has been available for some time, is Zeiss Gradal RD (or room distance), a soft design so it inherently would have wider intermediate corridor, whereby an extra 0.50D is added to the distance Rx while keeping the add the same. This means the power profile range is reduced by 0.50, making the aberrational astigmatism less than a conventional progressive (Figure 7).

This allows a fixed artificial far point of two metres, ideal when the visual ▶

tasks, although mainly intermediate and near, include occasional further distance viewing through the top part of the lens. Other examples of this design are the AO Technica, Hoyalux iD work Eyas 200/400 and Essilor's Computer 3V. It is certainly worth comparing all the manufacturers' design details to see if one happens to suit better than another. While any of these designs are likely to be suitable for our patient's workplace scenario, it must be stressed to the patient that they are not suitable for driving.

With so many options, not all will be ideal in every situation. In this particular case, an occupational lens was eventually dispensed. This allowed for good intermediate viewing, enhanced near and demonstrated the ability to see clearly any visitors at the hatch without having to remove the spectacles or peer over the top. Training in what these spectacles will and will not do for the patient – even in terms of looking after or keeping lenses clean – to general advice on VDU use regarding breaks etc was also given.

CASE STUDY 2

Patient B is a 45-year-old woman who works part-time as the school bursar, occupying the other administrator's desk with a similar set-up regarding the position of the monitor and keyboard. She is the school's financial controller, and deals with health and safety issues that arise during school hours.

Although, like patient A, a significant proportion of her visual tasks are VDU based, she frequently needs to visit other parts of the school and is often required in the teaching staff room and head's office. If the patient covers the visitors' window in the absence of her work colleague, this is approximately 6m from her habitual work station.

The patient has been myopic since her mid-teens, but more recently noticed fine detail easier to see when looking under her spectacles, which she has noticed more with her craft-based hobbies than any difficulties with work-based visual tasks. She still achieves N5 with her current spectacles which she has worn since her last sight test in 2009. These are:

R -2.50/-0.75 x 160 (6/5-)
L -1.75/-1.25 x 180 (6/5-) N5 at 40cm.

Most recent refraction:
R -2.75/-0.75 x 155 (6/5)
L -2.00/-1.25 x 180 (6/5) and still just reads N5 at 40cm.

However, measuring the amplitude of accommodation with this latest prescription to be 3.00DS, it is likely detailed near tasks will become more difficult very soon. This was demonstrated to the patient with a +1.00 add.

Again in discussion, if the patient does appreciate the slightly better distance acuity which may be noticeable for example, when night driving, this would probably push her into a +1.00 add for prolonged comfortable near tasks with this new distance Rx. Due to the mix of visual tasks, it seems sensible to consider a varying focus lens design.

Essilor produces its Anti-Fatigue design in both Orma 1.5 and Stylis 1.67 materials. This is described as a single-vision lens with a +0.60D power change in the lower half of the lens. It is for patients between 20 and 45 years old, who do a lot of nearer based tasks, and who may be complaining of visual fatigue. Alternatively – and in this case, more preferably – a modern, double aspheric progressive, freeform design lens is available from most manufacturers.[1]

Conclusion

As indicated at the beginning of this article, a flexible approach to this kind of challenge, with a detailed visual task analysis, allows for the practitioner to fully appreciate the different requirements which, on the surface, might have been perceived as similar.

The author has no connection with any lens manufacturer and technical information presented is available from catalogues and manufacturer websites. Inevitably, not all products available may have been mentioned in this article; the intention is to give examples of what is current at the time of writing. ●

● The second in this series will cover an outdoor dispensing scenario.

References

1 Cubbage R. Ophthalmic Lenses Availability, London: ABDO:2010.

2 Work with display screen equipment. HSE Books: 2003.

3 College of Optometrists Guidelines. Section E03. March 2011. www.college-optometrists.org.uk (accessed 19 April 2011).

4 Association of Optometrists Handbook. Section C07. London 2009.

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MULTIPLE-CHOICE QUESTIONS – take part at opticianonline.net

1 Above what flicker rate might flicker first be noticed?
A 50Hz
B 100Hz
C 150Hz
D 250Hz

2 What add might be most appropriate for a 55 year old with a working distance of 30 cm and a range of 40 to 25cm?
A +2.00DS
B +2.25DS
C +2.50DS
D +2.75DS

3 What area of a computer screen at a typical viewing distance is covered by foveal vision?
A 1mm
B 17mm
C 25mm
D 35mm

4 What is the usually recommended acuity reserve to resolve the detail of a task?
A 1:1
B 2:1
C 3:1
D 4:1

5 What is the effect of a line of gaze below the horizontal?
A Convergence is more difficult
B Accommodation is reduced
C Accommodation is improved
D No impact

6 What is the expected range for a +2.50 add for a patient with 0.50D reserve accommodation?
A 50 to 25cm
B 35 to 25cm
C 45 to 35cm
D 40 to 33cm

Successful participation in this module counts as one credit towards the GOC CET scheme administered by Vantage and one towards the Association of Optometrists Ireland's scheme.
The deadline for responses is June 9 2011