

Vanishing legibility: daily departures from best practice

This paper is concerned with potential difficulties faced by older readers. Our aim is not to present new scientific findings, nor to review previous work in this area. Rather we wish to provide a demonstration of everyday reading problems for ageing individuals. One of the classics on the use of print¹ addressed the matter of font size and shape before the responses of the human visual system had been explored in the detail now available². The vast technical advances in colour printing and other forms of reproduction, together with the purveying of important information by electronic means, including television, have greatly increased the scope for varieties of presentation. They involve font type, size, and colour of text against a multitude of backgrounds both in printed and electronic products. Earlier data on the legibility of text have become partly overtaken by time or altogether forgotten.

Eye-test charts exemplify best practice (*Figure 1*). Note the letters of different sizes. They are rendered with equal amounts of pigment (printer's black). But their visibility is unequal, since this depends both on the amount of pigment, even if it is black, and font size. Thus, though the physical contrasts of a small and a large type may be equal, the perceived contrasts will differ, being smaller for the smaller font (*Figure 1*). When held at the distance of 40 cm from the eyes, normal non-elderly eyesight should comfortably read the line marked 1.0. This corresponds to the British notation of 6/6 and to the American Imperial measure of 20/20. It is probable that there will be a significant percentage of the older population, who are unlikely to come up to this standard even when the font is jet black on white³.

The right-hand side of *Figure 1* represents a continuation of the left-hand part, but presented with reduced contrast. This serves to mimic how an individual with a cataract might perceive the chart. It demonstrates that legibility decreases with font size, although all the samples have had their contrast reduced more or less equally.

Figure 2 reproduces the same chart on a blue background. This diminishes the contrast between print and background in two ways. Firstly, the blue background reduces the contrast with the black print in comparison with the white (or other lighter) background. Secondly, when this reduced contrast is allied to the simulated impaired vision, only the very large type remains legible.

It is important to remember that the designer's palette may differ radically from that of the reader. This applies especially to electronic reproduction, which may result from both technical and idiosyncratic variability, not to mention the effect of colour vision defects. Thus, although some font-background combinations may be thought to attract attention, or have cosmetic merit, the medium may defeat the message.

ILLUSTRATIONS FROM EVERYDAY LIFE

We have reproduced, in their actual life size, four examples from everyday sources (*Figures 3-6*). They show how perceived contrast varies with difference between print and background. A lower contrast due, for example, to white on pale blue or mauve, or black on some intensely saturated colour background, or a font chosen on cosmetic rather than legibility grounds and compounded by indifferent lighting conditions may offer a critical barrier to legibility⁴⁻⁶.

0.10

Lenses from Carl Zeiss 01707 871 260

0.20

Spectacle lenses from Carl Zeiss are high quality products designed to provide you with excellent vision. This is guaranteed by Carl Zeiss with the  hallmark of quality on every lens. 801 643 254

0.32

Thanks to modern lens materials, it is no longer a problem to provide you with thin, flat and light spectacle lenses. 675 829 419

0.40

Regardless of whether you choose single vision, multifocal or progressive lenses, high quality lenses from Carl Zeiss are always your guarantee of excellence. 781 091 234

0.50

Progressive lenses like **Gradal® Top** will provide you with smooth vision from near to far. You will always be wearing the right pair of glasses, whether you are driving the car, watching television or reading. 325 789 423

0.63

Modern computer and office workstations are very demanding on your eyes. The special progressive lens **Gradal® RD** is the optimum solution to this problem.

With its very wide range of vision, **Gradal® RL** provides you with a good overview of documents and your computer screen, without any dead or code-conformant! 863 014 275

0.80

Every spectacle lens reflects light. A high-quality anti-reflection coating eliminates these reflections almost completely. You see better, your lenses are less conspicuous, and your eyes are no longer hidden behind unsightly reflections.

And, usually, an anti-reflection coating on your lenses makes it safer to drive at night. 409 067 237

1.00

On sunny days you need a good pair of sunglasses. Carl Zeiss offers the right lens for every situation. You can choose between various tinted colours – all, of course, with the right UV protection. 735 192 846



Figure 2. Eye-test chart: the impact of a change in background colour



Figure 5. Cookery instructions (real size): small print with unhelpful contrast

They will be found in print and on screens, on words of direction, on price tags, and warnings, in addition to advertising, and other commercial notices and placards. Since older people are becoming more numerous, the information industry ought to adapt its methods to take them into account. A piece of eye-catching information cannot be said to be effective if it cannot be read.

Acknowledgments

The authors are most grateful to the Pocklington Trust (www.pocklington-trust.org.uk) for funding to meet the cost of colour reproduction. We thank

Ms Ariane Smith, Carl Zeiss Ltd., Herts. AL7 1LU for donating a test chart, the Department of Medical Illustration, and Moorfields Eye Hospital London, for technical assistance. Permission to reproduce the examples shown in figures 3-6 has been requested.

References

1. Tinker MA. Legibility of Print. Ames; Iowa State University Press; 1963
2. Weale RA. The senescence of human vision. Oxford: Oxford University Press; 1992
3. Schieber F, Vision and ageing. In: Birren JE, Schaie KW, editors. Handbook of the Psychology of Aging. 6th edition. Burlington: Elsevier; 2006; pp 129-162
4. Boyce PR. Lighting for the elderly. Technology and Disability 2003;15:165-180
5. O'Neill L. Lighting the homes of people with sight loss. Occasional Paper. London: Thomas Pocklington Trust; 2003;4:1-39
6. Sloan LL, Habel A, Feiock K. High illumination as an auxiliary reading aid in diseases of the macula. American Journal of Ophthalmology 1973;76:745-757



Figure 6. Pork escalopes: only the price is clear (figure reduced to 63%)

Robert Weale, Claudine McCreadie
 Institute of Gerontology, King's College
 London, Waterloo Bridge Wing, Waterloo
 Road, London SE1 9NH, United Kingdom
 E: Claudine.mccreadie@kcl.ac.uk