

# Clinical management of aniseikonia

## An overview

**C**linical management of aniseikonia has long been neglected by a large part of the optometric community. One of the main reasons is the lack of simple and accurate instrumentation for diagnosing and measuring aniseikonia. With the knowledge that the number of aniseikonia patients is significant, and that aniseikonia rules of thumb often do not predict the actual situation well, new products have recently emerged on the market to manage aniseikonia clinically.

Aniseikonia is a binocular condition in which left and right images differ in size or shape. There are two types of aniseikonia – static and dynamic aniseikonia<sup>1</sup>. The first type is the classical aniseikonia, denoting a perceived image size difference with a fixed gaze direction. The second type of aniseikonia is also called induced anisophoria<sup>2</sup> and denotes a perceived image size difference due to unequal prism effects when looking through different parts of the two (anisometropic) spectacle lenses. For clinical purposes, the two types of aniseikonia are often related. The static aniseikonia is typically (but not always) two thirds of the dynamic aniseikonia<sup>1</sup>.

### Symptoms

Table 1 classifies the symptoms of aniseikonia. Because most of these are rather general, it is sometimes difficult for the optometrist to recognise the condition. However, recognising and treating the symptomatic aniseikonia will usually result in very grateful patients and may also be financially rewarding for the optometrist.

Symptom	Percentage of patients
Headaches	67%
Astenopia (fatigue, burning, tearing, ache, pain, pulling, etc)	67%
Photophobia	27%
Reading difficulty	23%
Nausea	15%
Motility (diplopia)	11%
Nervousness	11%
Vertigo and dizziness	7%
General fatigue	7%
Distorted space perception	6%

» Table 1

Characteristic symptoms reported by 500 patients referred for aniseikonia examination<sup>3</sup>

For someone to experience the discomfort of aniseikonia, he/she could put an afocal size lens in front of one eye. This type of lens induces a magnification, but does not have an optical power.

Alternatively, the aniseikonia can also be simulated by presenting images of different size to the two eyes. This is shown in Figure 1, where binocular separation should be achieved by using red-green anaglyph glasses (see later).

### Incidence

The incidence of aniseikonia is often underestimated. The most well known patient group at risk is the anisometropes. The prevalence of anisometropia (>1D difference) above the age of 20 is 5-10%<sup>4</sup>. A second large group of patients at risk for aniseikonia is the people who have had cataract or refractive surgery. For example, Kramer et al<sup>5</sup> found that 40% of all pseudophakes had ophthalmic complaints referable to aniseikonia. In England alone, there are approximately 250,000 cataract operations annually<sup>6</sup>. Because these numbers are significant and because aniseikonia rules of thumb have been proven unreliable<sup>7,8</sup> testing for, and managing, aniseikonia is important.

### Management

The three basic steps of aniseikonia management are:

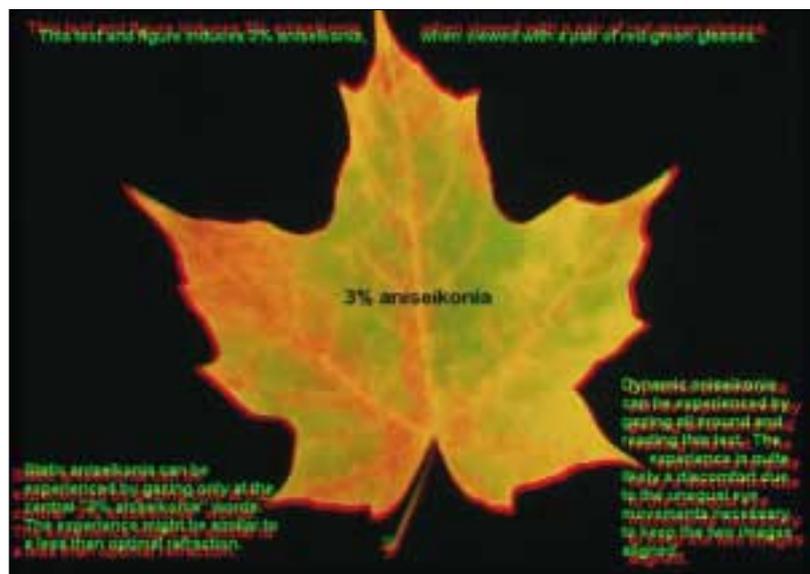
- Objectively measuring the aniseikonia
- Subjectively verifying that the patient would be helped by prescribing iseikonic lenses
- Determining a new spectacle prescription to correct for the aniseikonia

### Measurement (objective eikonometry)

There are two methods of measuring aniseikonia: space perception eikonometry and direct comparison eikonometry. The objective in a space perception eikonometric measurement is to neutralise space distortions induced by the aniseikonia. Although this method can be quite accurate in a laboratory setting, it is less suited for clinical use. To our knowledge, there are also no commercially available instruments based on this method.

Regarding direct comparison eikonometric tests, there are at least two tests commercially available. One is the NAT (New Aniseikonia Test, Handaya, Tokyo, Japan). The other is the aniseikonia test of the aniseikonia management software called the Aniseikonia Inspector (Optical Diagnostics, Culemborg, the Netherlands).

The principle of direct comparison eikonometry is that a different size target is presented to each eye and that those two size targets have to be made equal in size



» Figure 1

When using red-green anaglyph spectacles, this image shows the discomfort produced by 3% of aniseikonia (assuming the viewer does not have inherent aniseikonia)

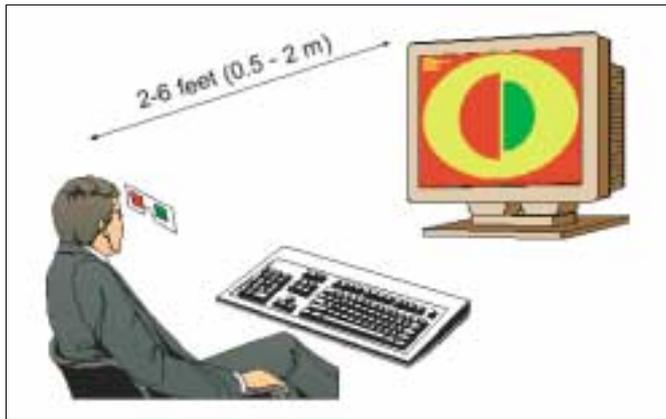


Figure 2

Layout of the aniseikonia test of the Aniseikonia Inspector. The patient uses red-green spectacles to separate the two half-circle size targets binocularly. The objective of the test is to make the two half-circles visually equal in size

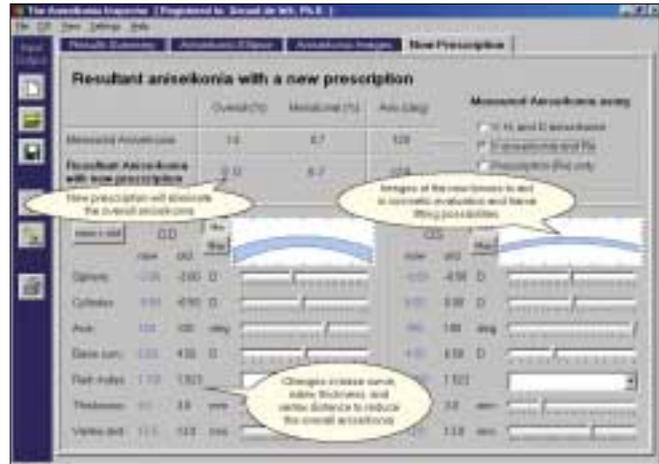


Figure 3

Determining an aniseikonia corrected prescription with the Aniseikonia Inspector software is fast and easy

by either holding size lenses in front of one eye, or by physically changing the size of one of the size targets.

Figure 2 shows the half-circle size targets of the Aniseikonia Inspector test. The layout of the test, in particular, the (in)visibility of binocularly fuseable objects around the size targets, is important in comparison with eikonometry<sup>9</sup>. Due to binocularly visible objects around the size targets, the NAT test seems to underestimate aniseikonia<sup>10</sup>, while the Aniseikonia Inspector test measures aniseikonia more correctly<sup>10,11</sup>.

### Verification (subjective eikonometry)

The second step in aniseikonia management is often to verify if the patient would be helped by iseikonic lenses. The reason is that the sensitivity to aniseikonia can vary a lot from patient to patient. Some patients are very grateful if 1% of aniseikonia is corrected, while others might not be bothered by as much as 3% of aniseikonia. Subjective eikonometry can be done by simulation, as shown in Figure 3, but a better way may be to use size lenses.

### Correction

Equivalent to a sphere and cylinder refractive error, there is an overall and a meridional aniseikonia. For clinical purposes, correcting the overall aniseikonia is usually most important and sufficient<sup>1</sup>. That is, overall aniseikonia gives rise to headache and asthenopia. Meridional aniseikonia, on the other hand, gives rise to distorted space perception.

The most effective way to reduce or eliminate aniseikonia is to provide an iseikonic prescription. One cannot change the effective power at the cornea, because this would reduce the patient's visual acuity. However, one can change the accompanying spectacle magnifications of the corrective lenses by manipulating the

base curve, centre thickness, index of refraction, and back vertex distance.

Besides the lack of instrumentation, determining an iseikonic prescription was too big a hurdle for some optometrists to actually manage aniseikonia. However, with the advent of computers, determining such a prescription has become much easier (Figure 3).

### Conclusion

Clinical management of aniseikonia used to be done only by a few specialists. The main reasons for this lack of skill and knowledge among optometrists are believed to be outdated and insufficient instruction, the lack of simple and accurate instrumentation, and the relatively complicated or time-consuming determination of iseikonic spectacles. On the other hand, the number of aniseikonia patients is substantial and growing, due to the ageing population and the increase in cataract and refractive surgery operations.

Another reason, heard sometimes, for not managing aniseikonia, is that iseikonic prescription spectacles can be cosmetically unattractive. Of course, this depends a lot on the amount of aniseikonia to be corrected and the frame size. There might also be a trade-off to undercorrect aniseikonia to keep the spectacles attractive. The trade-off between appearance and correction will depend a lot on the patient and on the severity of the symptoms. Many aniseikonia patients would prefer to trade a reduction in good appearance for more visual comfort. Also, the patient might purchase two pair of spectacles – one for optimum visual comfort for daily routine and one for optimum appearance during social events.

A product like the Aniseikonia Inspector now gives the optometrist the opportunity to manage aniseikonia. Potential rewards will be some very grateful patients, a larger patient base, and a possible increase in revenue.

### About the authors

Dr Gerard C. de Wit is involved with research at Optical Diagnostics in the Netherlands. Dr Arnulf Remole is on the faculty of the School of Optometry at the University of Waterloo in Canada.

### Special offer

For viewing Figure 1, Dr de Wit is offering to send a simple pair of red-green spectacles to the first OT readers to email him at dewit@opticaldiagnostics.com.

### References

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