Investigating and managing heterophoria

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Outline:
Heterophoria is the most common ocular motor status finding and is usually normal, asymptomatic and requires no treatment. However, when a heterophoria is clinically significant, patients will often report to their community optometrist as symptoms are likely to be present. This article provides an evidence-based review of assessment techniques, and intervention strategies, including when to refer.

Introduction
This article will cover the investigation and management of heterophoria for the community optometrist. Heterophoria is the most common ocular motor status finding and is usually normal, asymptomatic and requires no treatment. However, when a heterophoria is clinically significant, patients will often report to their community optometrist as symptoms are likely to be present. Community optometrists are in a prime position to detect these conditions using inexpensive equipment found within most optometric practices and with appropriate management can help to significantly improve patients’ visual function and visual comfort.

What is heterophoria and how is it classified?
Heterophoria is a latent strabismus in which the visual axes are normally directed to the same fixation point but deviate when the eyes are dissociated. The control of the normal visual direction is maintained with the use of motor fusion (intracocular muscle coordination of the two eyes). The visual system is known to be at ‘rest’ when stimuli to vision are removed and this can occur in two different ways. Firstly, when a person is placed in complete darkness, neither eye receives a visual stimulus and both eyes relax into their tonic positions of rest. In this situation, the eye alignment is to a vergence of 1m, therefore slightly diverged for near distance and slightly converged for far distance. Similarly, when one eye fixates a target and the other eye is occluded, the eye under occlusion relaxes into its resting position. Therefore a divergent deviation or exophoria is typically seen on near fixation and a convergent deviation or esophoria is typically seen on distance fixation. Variations to this occur due to anatomical differences in extraocular muscles, the presence of under/uncorrected refractive error, with increasing age and/or due to weak fusional reserves. Small deviations of less than four prism dioptres are difficult to detect with the naked eye, however it is infrequent that a true orthophoria actually exists where the eyes do not deviate at all in their resting position.

Small deviations are common in healthy, normal visual systems and are easily overcome without difficulty using motor fusion. This is known as a compensated heterophoria, i.e. one that is controlled, and the individual will perceive normal binocular single vision. However, if motor fusion becomes inadequate, a heterophoria can decompensate causing associated symptoms and a manifest deviation can present. We refer to this as either ‘decompensating’ where the individual has poor motor control of the deviation and the deviation is symptomatic, or ‘decompensated’ when the motor control of the deviation is lost.
and the heterophoria becomes an intermittent manifest heterotropia. If decompensation occurs in childhood, the child will develop a manifest strabismus, suppression will occur to overcome diplopia and binocular single vision will be lost. In adult life, binocular single vision can be maintained by exerting motor control but at the expense of symptoms such as headaches and asthenopia. In the instance where motor control is lost, the individual may complain of symptoms of diplopia or less specifically blurred vision and/or jumbling of words/letters. There is no clear fixed dividing line between an intermittent strabismus where a deviation is rarely manifest and a heterophoria which is nearly always controlled, these are one and the same.

This article will concentrate on concomitant heterotropias, i.e. those present in the primary position of gaze and which remain virtually unchanged in size in each of the nine cardinal positions of gaze and with either eye fixating. Heterotropias are generally classified according to whether they occur during distance or near fixation. Significant differences in the size of the deviation can be found depending on the fixation distance due to the synergistic fixation. Significant differences in the size of the deviation can be classified according to whether they occur during distance or near fixation.

**Table 1.** Classification, features and aetiology of heterotropias. *(modified from Rowe).*

<table>
<thead>
<tr>
<th>Type</th>
<th>Classification</th>
<th>Cover Test</th>
<th>Features</th>
<th>Aetiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exophoria</td>
<td>Convergence weakness</td>
<td>Eye moves nasally under cover when cover removed</td>
<td>Near &gt; Distance</td>
<td>Anatomical: wide IPD, extraocular muscle anomalies</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Refractive: hyperopia, anisometropia</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>High AC/A ratio</td>
</tr>
<tr>
<td></td>
<td>Excess</td>
<td>Eye moves temporally when cover removed</td>
<td>Distance &gt; Near</td>
<td>Weak negative fusional reserves</td>
</tr>
<tr>
<td></td>
<td>Non-specific</td>
<td>Convergence on dissociation</td>
<td>Distance = Near</td>
<td>Increasing age</td>
</tr>
<tr>
<td>Esophoria</td>
<td>Convergence weakness</td>
<td>Eye moves nasally under cover when cover removed</td>
<td>Near &gt; Distance</td>
<td>Anatomical: narrow IPD, extraocular muscle anomalies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Refractive: hypopresbia, anisometropia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High AC/A ratio</td>
</tr>
<tr>
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<td>Non-specific</td>
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<td>Increasing age</td>
</tr>
<tr>
<td>Hyperphoria</td>
<td></td>
<td></td>
<td></td>
<td>Accompany large exo or esophorias</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Refractive: unilateral high myopia (heavy eye syndrome)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tilted spectacles and anisometropia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Weak vertical fusional reserves</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anatomical: abnormal extraocular muscles</td>
</tr>
<tr>
<td>Alternating</td>
<td></td>
<td></td>
<td></td>
<td>Eye moves up under the cover/ down when cover removed</td>
</tr>
<tr>
<td>hyperphoria</td>
<td></td>
<td></td>
<td></td>
<td>Dissociated vertical deviation (DVD)</td>
</tr>
<tr>
<td>Cyclophoria</td>
<td>Incyclophoria</td>
<td>Eye rotates inwards under cover when cover removed</td>
<td>Upper end of the vertical axis is nasal</td>
<td>Secondary to other incomitant deviations</td>
</tr>
<tr>
<td></td>
<td>Encyclophoria</td>
<td>Eye rotates outwards under cover when cover removed</td>
<td>Upper end of the vertical axis is temporal</td>
<td>Secondary to other incomitant deviations</td>
</tr>
</tbody>
</table>

What causes decompensation of heterotropia?

The causes of decompensating heterotropia fall under three categories of which at least one will be present to cause decompensation. These categories are 1) an inadequate vergence system/weak fusional reserves, 2) interference with sensory fusion/reduced vision to one eye and 3) an unusually large heterophoria. These can be caused by changes in optical and medical factors and visual demands.

**Optical factors**

Often optical causes of decompensation are related to the link between accommodation and convergence. A young hyperope without spectacle correction has to accommodate to overcome their refractive error; stimulating over convergence and a resultant esophoria, which is greater at near than at distance. Conversely, an uncorrected myope lacks the need to accommodate and thus under-converges and an esophoria develops that is also greater at near. Correcting the refractive error will often restore the accommodative-convergence relationship and will compensate these heterotropias. Wrongly corrected refractive errors, particularly where one eye is more blurred than the other or an inaccurate accommodative balance during refraction can result in decompensation due to difficulties with sensory fusion (inability to combine two images that are dissimilar). Care must be taken to ensure good fitting spectacle lenses when correcting anisometropes as incorrectly aligned centres can induce prismatic effect putting strain on the motor fusion system. Large differences in image size (aniseikonia) can also act as a barrier to sensory fusion in anisometric patients. This can also occur among patients who recently changed occupation that requires long periods of near work such as VDU use or students who are completing excessive amounts of near work studying for exams may have difficulties maintaining compensation of a near exophoria. This is exacerbated when near work is held at a very close working distance. Conversely someone who has increased his or her time spent looking in the distance, for example a long distance lorry driver, may be finding it difficult to maintain compensation of a distance esophoria. Carrying out long periods of night driving where the patient is continually looking into a dark field, provides little stimulus to fusion and can result in decompensation, worsening when the patient is fatigued. Occupations that require monocular viewing such as those using microscopes or jewellers eyepieces, can cause a barrier to sensory fusion and result in decompensation.

**Medical factors**

Fusional reserves can be temporarily reduced due to poor health, fatigue or stress and can result in a temporary loss of motor fusion and decompensation. Once the general health problem has resolved, the decompensated heterotropia often resolves as well. A traumatic head injury can also cause a temporary loss of fusion. Medications that are known to reduce accommodative ability (e.g. anti-histamines, anti-depressants) disrupt the accommodative-convergence relationship and can result in an esophoria with convergence weakness. The consumption of alcohol also has a similar effect.

**Visual demand**

A change in visual activity or an increase in visual demands can put strain on fusional reserves. For example, someone who has recently changed occupation that requires long periods of near work such as VDU use or students who are completing excessive amounts of near work studying for exams may have difficulties maintaining compensation of a near exophoria. This is exacerbated when near work is held at a very close working distance. Conversely someone who has increased his or her time spent looking in the distance, for example a long distance lorry driver, may be finding it difficult to maintain compensation of a distance esophoria. Carrying out long periods of night driving where the patient is continually looking into a dark field, provides little stimulus to fusion and can result in decompensation, worsening when the patient is fatigued. Occupations that require monocular viewing such as those using microscopes or jewellers eyepieces, can cause a barrier to sensory fusion and result in decompensation.
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How can I investigate a heterophoria?

Often the symptoms described by patients can be non-specific, i.e. they could be related to conditions other than just decompensating heterophoria, and therefore further clinical investigation is necessary.

Gross ocular inspection

Gross ocular inspection can be performed when obtaining history and symptoms or when carrying out subsequent investigations. Look for any obvious signs of decompensation such as a manifest strabismus on presentation, or more subtle signs such as the patient blinking repetitively when reading or holding reading material at a longer working distance than appears comfortable.

Refraction

In common with all eye examinations, it is important to determine whether a refractive error is present that may influence the compensation of a heterophoria as described earlier in optical factors of decompensation. A cycloplegic refraction should be carried out in children (or indeed adults) where it is suspected that an accommodative element may be involved and where an esophoria is present. The gold standard is 1.0% cyclopentolate HCl with refraction carried out 30 minutes after instillation.3

Cover test

It is essential to perform a cover/uncover test and an alternate cover test where decompensation is suspected. A cover test provides a wealth of information about a heterophoria, revealing the type and estimated size of the deviation, and importantly indicating compensation by assessing the patient’s recovery movement. The cover test should be performed with and without spectacle correction and at the patient’s reading distance (or VDU distance if appropriate) and at 6m. Table 1 describes the expected cover test results from a range of heterophorias and Table 2 outlines the possible recovery movements that can be observed on cover test.

If a heterophoria is detected, these are the features that need to be assessed and recorded during cover test for all distances:

- **Direction of deviation:** as described in Table 1, horizontal (exo/eso) vertical (hyper), torsional (incycl/encyclo) or a combination thereof
- **Size of deviation:** estimate the size by eye, grading as small (less than 10Δ), moderate (25-35Δ) or large (greater than 40Δ). Size can also be measured using a prism bar or using the prism system of the phoropter head whereby prisms are gradually introduced until the eye movement is neutralised. The Maddox rod or wing tests can also measure deviation size but as they are fully dissociative tests they may inflate the size of the deviation. Measuring an accurate deviation size is useful to monitor improvements following treatment.
- **Frequency of deviation:** is the deviation constant or intermittent, does it become worse with a particular fixation distance or with fatigue
- **Recovery:** observe and record as detailed in Table 2

It is useful to consider the time of day you are carrying out the cover test. For example if the patient presents to you in the morning on their day off work, the true extent of the problem may not be obvious.

If you suspect a decompensating heterophoria from the patient’s symptoms but it isn’t present on initial examination it can be useful to reassess at a second visit when you expect the deviation may be more apparent.

**Figure 1: Key facts to elicit during history and symptoms questioning**
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Fixation disparity

Fixation disparity is the minute misalignment of the visual axes under normal viewing conditions that is not great enough to fall outside of Panum’s fusional area, thus enabling binocular single vision to be maintained without diplopia. Fixation disparity can be assessed using the Mallett unit, which is a common piece of equipment found in community optometric practices in the UK (Figure 2 & 3). A similar test can be found on the Nidek Phoropter System (Figure 4) and on Thomson Chart Software (Figure 5). The test can be carried out for distance (Figure 2) and near (Figure 3). The patient views a target common to both eyes which acts as a central fixation lock, as well as either two vertical lines above and below the central fixation or two horizontal lines to the right and left of central fixation. The near test also has surrounding text that is common to both eyes and acts a peripheral vision lock. The patient wears polarising filters during the test to partially dissociate the two eyes and exposes any misalignments of the vertical or horizontal lines. The patient is asked to comment on the alignment of the horizontal and vertical lines with prisms being introduced to measure the power required to gain realignment where a deviation from the central point has occurred. An adjustment of the spherical power can also be made instead of introducing prism lenses, which will be discussed later in the article. The size of prism required is known as the “aligning prism” or “retinal slip”. Studies have found that measuring fixation disparity is a better indicator of a decompensated heterophoria and associated symptoms than the degree of heterophoria present. The greater the size of the prism required to realign the fixation disparity the more likely the patient will suffer from symptoms particularly for near fixation disparity.

Fusional reserves

The fusional reserves are a measure of how much vergence a person has ‘in reserve’ which can be used to overcome a heterophoria. Fusional reserves are measured using variable prism devices or with a prism bar. The cover test should be used initially to determine the direction of the heterophoria and the fusional range which opposes this should be measured first, as fusional reserves can differ depending on the order they are assessed. For example, if exophoria is present a measurement of positive fusional reserve (base out prisms) is carried out first. Habitual spectacle correction is worn and the patient fixates a target either at their near working distance or at 6m. Prisms are gradually introduced giving the patient a few seconds between each increment until the print/picture begins to blur (known as blur point) and when it begins to go double (break point). The prism is then decreased gradually until the target becomes single again (recovery point). This can be carried out for positive fusional reserves (base out prism), negative fusional reserves (base-in prism) or vertical fusional reserves (base up or down prism). The examiner should watch the eye movements for the break point particularly in young patients or those with poor communication. Normal fusional reserves using a prism bar are detailed in Table 3. Fusional reserves falling below these values could indicate difficulties controlling a heterophoria. Clinicians should be aware that the fusional range is inflated when measured using a phoropter head with rotatory prisms compared to a prism bar particularly for positive reserves. Review measures should therefore be made with the same device as the initial measurement.

Table 2. Possible recovery movements seen on cover test in heterophoria, modified from Evans.

<table>
<thead>
<tr>
<th>Observation</th>
<th>Recording of recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast and smooth movement</td>
<td>Good recovery</td>
</tr>
<tr>
<td>Slightly slow/jerky movement</td>
<td>Moderate recovery</td>
</tr>
<tr>
<td>Slow/jerky movement but doesn’t decompensate to</td>
<td>Moderate to poor recovery</td>
</tr>
<tr>
<td>heterotropia</td>
<td></td>
</tr>
<tr>
<td>Slow/jerky movement that decompensates to</td>
<td>Poor recovery, recovers with blink</td>
</tr>
<tr>
<td>heterotropia with repeat covering, may only</td>
<td></td>
</tr>
<tr>
<td>recover with blink</td>
<td></td>
</tr>
<tr>
<td>Easily decompensates to heterotropia with few</td>
<td>No recovery, slow recovery with blink</td>
</tr>
<tr>
<td>covers, may recover with blink</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Normal fusional reserves (Morgan).

<table>
<thead>
<tr>
<th>Fusional Reserves</th>
<th>Near (40cm)</th>
<th>Distance (6m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative (Base In)</td>
<td>21 (SD 4)</td>
<td>7 (SD 3)</td>
</tr>
<tr>
<td>Positive (Base Out)</td>
<td>21 (SD 6)</td>
<td>19 (SD 8)</td>
</tr>
<tr>
<td>Vertical (Base Up/Down)</td>
<td>2-4</td>
<td>2-4</td>
</tr>
</tbody>
</table>
Amplitude of accommodation, near point of convergence and AC:A ratio

It is important to assess amplitude of accommodation, near point of convergence and AC:A ratio due to their intrinsic link to heterophoria compensation. Convergence can be measured subjectively using the RAF rule or simply by bringing an interesting target towards the nose for younger children. The examiner should observe the eye movements and note the distance when one eye diverges. In some occasions where the heterophoria has frequently decompensated in early life, the patient may have developed foveal suppression and will not report diplopia. The objective assessment of near point of convergence is also essential for children where diplopia may not be noticed/understood.

Accommodation should also be assessed both monocularly and binocularly with either the RAF rule or dynamic retinoscopy. A positive pupil response will indicate an accommodative response has occurred; monitor pupil size during measurements as this will indicate if accommodation can be sustained. Reduced monocular and binocular accommodation is more likely to indicate accommodative insufficiency whereas reduced binocular accommodation in the presence of normal monocular accommodation suggests some form of binocularity difficulties such as decompensating heterophoria.

The AC:A ratio is a measure of the amount of accommodative convergence exerted in response to one unit of accommodation. A normal AC:A ratio is 4:1 (range 3:1 to 5:1) with ratios higher or lower than the normal range likely to cause decompensation of a heterophoria with associated symptoms. The AC:A ratio can be determined by carrying out a prism cover test (PCT) at distance (6m) and near (e.g. 33cm) with the patient wearing their spectacle correction. A detailed target such as a letter on the test chart or budgie stick should be used. Figure 6 shows the formula to calculate the AC:A ratio using the heterophoria method.

Visual acuity

A patient with normal binocular single vision should notice a slight improvement in visual acuity from monocular to binocular viewing. Where a binocular vision problem is present, patients can sometimes report that binocular acuity is worse than monocular acuity. Following refraction when the patient is first allowed to see binocularly, the examiner may notice the patient blinking several times before comfortable binocular viewing is restored or in some cases diplopia may be noted by the patient. These responses by the patient are the subjective component to those observed objectively when assessing the recovery movement when performing cover test.13

Stereoacuity

Reduced stereoacuity can indicate difficulties maintaining binocularity in adulthood. It is a useful test to measure at baseline to assess improvement at follow-up if treatment is instigated. In childhood, reduced stereoacuity or absent stereopsis indicates binocularity problems and some level of foveal suppression, suggestive that the heterophoria is frequently decompensating.

Suppression

Testing for suppression can give an indication of the frequency and constancy of decompensation. In childhood, if a heterophoria is frequently decompensated, foveal suppression will result to relieve diplopia. Worth’s Four Lights test is often available on most computerised test charts now found in community practice and the possible results are detailed in Figure 7. Alternatively suppression can be checked using the Mallett Unit where two of the four lines will disappear if deep suppression is present or flicker intermittently in the case of mild suppression.

How do I manage a decompensating heterophoria?

Treatment should be instigated where the heterophoria is causing symptoms or in childhood to ensure development of binocular single vision. A thorough investigation should elicit the underlying cause of decompensation and correcting or removing the cause is the first stage of treatment. There are two basic principles for further treatment of heterophoria, 1) increase the fusional amplitude or 2) decrease the size of the deviation. These can be achieved either by conservative methods or by surgical treatment. Surgery is always the last option after all other conservative treatments have been implemented but have not been successful.

Conservative treatments

1. Change visual environment

Advice should be given to the patient on how to adjust their environment to enable more comfortable binocular viewing.
Symptomatic patients should take regular breaks from VDU use, reading or monocular viewing (e.g. microscope user) and during this time change their fixation to something in the distance (e.g. look out a window or go for a short walk). Increasing the working distance, improving lighting and increasing the size of material they are viewing can also help relieve symptoms.

2. Improve general health

The patient may need to be referred to the GP where necessary. Take into consideration the nature of the general health problem and how long it may take to resolve. If it is a short-term problem, it may be more beneficial to assess binocularity when the patient is well again. If the problem is long-term or medication related, further optometric management will be required to allow the patient to maintain comfortable vision.

3. Correct refractive error

Correct any existing refractive errors as under- or uncorrected refractive errors may be the root cause of the decompensation. As described earlier, correcting hyperopia may help to compensate an esophoria and correcting myopia may help to compensate an exophoria. Even small refractive errors (particularly low astigmatic errors) that are normally deemed clinically insignificant can help to produce a clearer retinal image and remove the barrier to sensory fusion. Even in the presence of exophoria and a hyperopic refractive error, correction can often help with control by improving image clarity. In some cases, correction of hyperopia can make the exophoria worse, cover test with correction can assess whether this is the case. Significant anisometropic errors may require contact lens correction instead of spectacles to remove the aniseikonia and promote sensory fusion. If symptoms of decompensating heterophoria have occurred following the prescription of new spectacles, the patient’s refractive error, accommodative balance and lens centration should be checked to ensure the new spectacle correction is not the cause of decompensation or that prismatic effect is not being induced.

4. Refractive modification

Refractive errors can be modified to alter the accommodative-convergence link by adding more plus to a refraction where an esophoria is present or more minus where an exophoria is present. In the presence of a decompensating esophoria and hyperopia, the maximum plus should be given to compensate the esophoria. A further positive addition may be required for near in the form of bifocal or multifocal lenses where there is poor control of the deviation for near fixation. The power of these lenses should be gradually reduced as the patient learns to control the deviation with the help of eye exercises. In the case of a patient with myopia and esophoria, the myopic correction is given to ensure clear distance vision, however a slight undercorrection of -0.50D or less may be tolerated to help with deviation control. Where exophoria and myopia exists, correction of the myopic refraction will often restore the accommodative-convergence balance. In the instance where an esophoria remains decompensated with full correction, a myopic overcorrection can be considered if the patient has adequate accommodative amplitude. A negative addition of up to -3.00D can be given and gradually reduced as control improves with the help of exercises. Similarly, emmetropic patients with decompensating esophoria can be given minus lenses to stimulate accommodation and convergence where adequate accommodation is present or conversely plus lenses can be given to compensate a decompensating esophoria in an emmetrope. In the presence of exophoria and hyperopia, a partial correction may need to be considered so as not to decompensate the esophoria.

The amount of refractive modification is the minimum amount of extra lens power required to control the deviation. This can be determined using a fixation disparity test (e.g. Mallett Unit) at the problematic distance, with the introduction of lenses until the slip is eliminated. If giving positive addition in a bifocal lens to children, the segment should be set high inline with the pupil centre for easy access of the additional power.

5. Orthoptic exercises

Significant refractive corrections should be prescribed in the first instance to assess whether this compensates the heterophoria before commencing exercises. Compensation should be checked after approximately one month of spectacle wear. Orthoptic exercises will work best where symptoms are present and the patient is co-operative and motivated. General health should be stabilised before exercises are commenced. The most suitable patients for exercises are those with exophoria of convergence weakness, exophoria of divergence excess (if deviation is not greater than 10-15Δ) and esophoria of convergence excess (if deviation is not greater than 10-15Δ). The principle of orthoptic exercises is to increase fusional reserves, improve convergence and re-establish the correct balance between convergence and accommodation. This can involve improving positive relative convergence, where convergence is exerted in excess of accommodation or negative relative convergence, where convergence is relaxed in relation to the accommodation exerted. Usually treatment is administered over an intense period (4-6 weeks) and reviewed regularly (2-3 weeks) to ensure compliance with exercises and improvement is occurring. Exercises should be carried out several times a day on a daily basis. Patients should always be given instruction on how to relax the eye muscles again following exercises to avoid muscle spasm (particularly convergence spasm); closing the eyes or looking out a window for one minute should give adequate relaxation.

In the case of a decompensating esophoria, positive relative convergence, positive fusional reserves and convergence require improvement and this can be achieved using pen-to-nose exercises (smooth and jump convergence), dot cards and positive stereograms (Figure 8). Where decompensating esophoria is present, negative relative convergence, divergence and negative fusional reserves require improvement and this can be achieved using negative stereograms (Figure 9) and bar reading. Bar reading involves reading with a septum (such as pen/pencil) at a distance between the patient’s eyes and their reading material. If the patient is using both eyes appropriately and binocular single vision is maintained, they will be able to read ‘through’ the septum without difficulty. If a heterophoria decompensates or suppression occurs, the patient will be aware of the septum occluding the eye and will be unable to see the text. This should alert the patient that their deviation has decompensated and they should try to overcome this by exerting their fusional reserves. It is essential before any exercises are initiated that the patient can recognise diplopia. Orthoptic exercises are of limited use where vertical phorias are present.

![Figure 8. Exercising positive relative convergence using positive ‘three cats’ stereogram.](image)
and orthoptic exercises. However, all clinicians should work within the heterophorias by refractive correction, refractive modification, prisms and orthoptic exercises and are reduced as compensation improves. They are also useful where orthoptic exercises have failed to show improvement, are not suitable because of the patient’s age or general health status or where compliance with exercises has been poor. They are also particularly useful for vertical deviations where orthoptic exercises cannot be used. The size of the prism to prescribe can be determined by the minimum amount of prism required to eliminate slip on a fixation disparity test or finding the weakest prism that allows a quick and smooth recovery on cover test. Prism direction is chosen consistent with the direction of heterophoria present, exophoria requires base in, esophoria, base out and hyperphoria, base down in front of higher eye. The size of the prism can be divided equally between the two eyes for better lens cosmesis or unequally where there is strong ocular dominance with the less dominant eye receiving the stronger prism.

6. Prisms

In the case of decompensating heterophoria, prisms are used to decrease the size of the heterophoria present either fully correcting the size of the deviation or reducing it to a manageable size that the patient can control. Prisms can be used to compliment orthoptic exercises and are reduced as compensation improves. They are also useful where orthoptic exercises have failed to show improvement, are not suitable because of the patient’s age or general health status or where compliance with exercises has been poor. They are also particularly useful for vertical deviations where orthoptic exercises cannot be used. The size of the prism to prescribe can be determined by the minimum amount of prism required to eliminate slip on a fixation disparity test or finding the weakest prism that allows a quick and smooth recovery on cover test. Prism direction is chosen consistent with the direction of heterophoria present, exophoria requires base in, esophoria, base out and hyperphoria, base down in front of higher eye. The size of the prism can be divided equally between the two eyes for better lens cosmesis or unequally where there is strong ocular dominance with the less dominant eye receiving the stronger prism.

7. Botulinum toxin

Botulinum toxin (Bo-Tox) can reduce the size of the angle of deviation by lengthening and weakening a muscle, e.g. for esophoria, medial recti are injected, this can either result in complete correction of the deviation or a reduction to a manageable size for the patient. On occasions, this can offer a permanent treatment by allowing the patient time to develop motor and sensory fusion. However, in most cases, the effects wear off after approximately three months and repeat injections are required. Bo-tox injections are often used as a diagnostic test prior to surgery to assess the potential result with surgical correction.

Surgery

In the instance where a very large heterophoria is present or one that has not responded to conservative treatment, surgery will be the only treatment option. This will be resection (shortening of a muscle to strengthen) and recession (muscle moved towards the back of the eye to weaken) of two opposing muscles to reduce the size of the deviation. Vertical phorias and cyclophorias often require surgical treatment.

Referral

Community optometrists can manage the majority of decompensating heterophorias by refractive correction, refractive modification, prisms and orthoptic exercises. However, all clinicians should work within the scope of their own expertise and competence and where necessary refer appropriately to the GP, orthoptics or ophthalmology. Referral is necessary when the decompensation has arisen from an underlying general health problem, suspected pathology or head injury or where conservative treatments have been exhausted with no improvement.

Summary

This article has described the possible causes, investigation and management of decompensating heterophoria for the community optometrist. Optometrists should be able to differentially diagnose the types of heterophoria and determine whether deviations are compensated or decompensated. The tests described to investigate heterophorias within this article are inexpensive and commonly found within optometric practice making diagnosis of this condition well within the scope of practice. Management of these conditions can often be achieved by correction/manipulation of refractive error or by simple eye exercises but can significantly improve a patient’s visual comfort. Community optometrists should not underestimate the role they can play in the management of patients with binocular abnormalities, however in the instance where the abnormality is beyond the competence of the optometrist they must refer to the necessary clinician in the best interests of the patient.

References

Investigating and managing heterophoria - Multiple choice questions

Complete quiz on iLearn > Available training > Learning catalogue > Professional training > CET articles.

The question options below are a preview; the order in which they appear will be randomised when viewed online.

Optometrist           Dispensing optician

Q1 When a person is placed in complete darkness and their eyes have relaxed into their tonic positions, how will the eyes look for far distance?

Q2 Which of the following is not a classification of exophoria?
   • Divergence excess
   • Non-specific
   • Divergence weakness
   • Convergence weakness

Q3 What recovery movements would a patient with a decompensating heterophoria display during cover test?

Q4 The size of a deviation can be estimated and graded small, medium or large. What is the approximate size of deviation if a heterophoria is graded as “small”?

Q5 Regarding fixation disparity, which of the statements are true?
   • Fixation disparity is the minute misalignment of the visual axes under normal viewing conditions that is not great enough to fall outside of Panum’s fusional area.
   • The greater the size of the prism required to realign the fixation disparity the less likely the patient will suffer from symptoms.
   • Measuring the degree of heterophoria present is a better indicator of a decompensated heterophoria and associated symptoms than the fixation disparity.
   • Fixation disparity can not be assessed using the Mallett unit.

Q6 Regarding fusional reserves, which of the statements are true?
   • Fusional reserves can only be measured with a prism bar.
   • No spectacle correction should be worn when measuring fusional reserves.
   • Fusional reserves can only be measured positively or negatively.
   • The patient should fixate at a target either at their near working distance or at 6m.

Do not submit this quiz if you intend to complete the interactive version.
Step 1: Go to iLearn>Available training>Learning catalogue>Professional training>CET articles, opt for Module C-51837 and complete the 6 MCQs (these are a repeat of the MCQs in the non-interactive version of this module).

To gain interactive points, the following additional steps must be completed within 30 days of completing the MCQ quiz:

Step 2: Discuss the interactive questions relating to this learning with a two-year qualified colleague. Note if you are an optometrist, the colleague must also be an optometrist. If you are a dispensing optician, the colleague may be a dispensing optician, a contact lens optician or an optometrist. The discussion should be in a quiet environment where you are not interrupted for at least 30 minutes. Record the output of your discussion in the template on iLearn. You will be asked to provide details of the colleague you had the discussion with, so they can be contacted for verification purposes.

Step 3: In the event of an audit we need to be able to show the GOC that this interaction has taken place in accordance with the instructions. Your colleague will be contacted via an iLearn alert and asked to verify that the interactive discussion took place.

NB: You cannot be awarded interactive CET points unless these steps are completed within 30 days of your completing the MCQ quiz.

Interactive questions

Learning objective 1: Optometrists and dispensing opticians will have an understanding of the different causes of decompensation of a heterophoria and also the symptoms a patient with symptomatic heterophorias may present with.

Question 1
1. Discuss with your colleague what can cause a heterophoria to decompensate and the symptoms that a patient may experience.

Learning objective 2: Optometrists and dispensing opticians will have an understanding of different management pathways including the conservative and non-conservative treatments for managing symptomatic heterophorias.

Question 2
2. Discuss with your colleague how heterophoria can be managed conservatively and non-conservatively. You should discuss the options presented in your reading, including management pathways that would be appropriate in your locality and how you would convey this information to the patient.

Question 3
3. Discuss with your colleague the personal learning outcomes you have gained from this module and how you will apply this learning to practice. Consider the following questions (Upload these reflections to iLearn within 30 days of completing the quiz in order to qualify for an interactive CET point).

3.1. What are the main things you learned from the reading?
3.2. How will you apply this learning in your future practice?
3.3. Has this module identified for you any areas in which you wish to pursue further learning?