BIOS | BRITISH AND IRISH ORTHOPTIC SOCIETY

Guidelines for the Diagrammatic Representation of Ocular Movement

Written by Elizabeth O'Flynn on behalf of the British and Irish Orthoptic Society Professional Development Committee, 2004. Revised 2010 and 2015.

Diagrammatic Documentation of Strabismus

This document outlines the approach to the diagrammatic documentation of orthoptic findings which the British and Irish Orthoptic Society (BIOS) recommends.

BIOS recognises that some orthoptists may prefer to use the conventional method of recording their findings (Henderson, 1998)[1] and this paper does not intend to suggest that a diagrammatic approach is recommended over the traditional approach. Both methods are equally valid and have their advantages, and it is for individual orthoptists and departments to decide which approach they prefer. The aim here is to provide guidance for orthoptists who are already using, or who wish to use, a diagrammatic approach.

Diagrammatic methods of documenting strabismus have been around for many years, and a variety of approaches are used. The choice of method is at the discretion of the individual practitioner, working within departmental guidelines. However, standardisation is one of the main advantages of a diagrammatic approach, with clear benefits for those learning orthoptics, in particular orthoptic students and junior medical staff, and for communication both within the profession and across professions. So at the request of members and in order to promote standardisation, this document outlines the approach to diagrammatic documentation recommended by BIOS. In 2003 a consultation exercise was carried out in which orthoptists using a diagrammatic approach were asked for details of their method. The majority of orthoptists who replied reported using the approach described by Vivian and Morris in 1993[2], and O'Flynn in 1994[3], which is based on

the method first described by Jampolsky in 1971[4]. This is therefore the approach, which BIOS recommends. Orthoptists are referred to the original papers for a full description of the method.

Ocular movements

Versions and ductions from the primary position into each of the diagnostic positions of gaze are assessed in the usual way. Movements are graded on a nine point scale:

- Zero represents a normal movement
- Under-actions/limitations:

> - 4	eye not reaching the midline
- 4	no movement beyond the midline
- 3	25% normal movement
- 2	50% normal movement
- 1	75% normal movement

- Over-actions of the oblique muscles:

+1	vertical deviation present only in the field of action of the oblique
+2	small vertical deviation on side gaze, which increases in the field of action of the oblique
+3	large vertical deviation on side gaze, which increases in the field of action of the oblique, but remains purely vertical
+4	large vertical deviation on side gaze, which increases in the field of action of the oblique with divergence of the eye

- Shading on the diagram is used to indicate limitations found on assessing ductions (see example 2). Where there is no shading, this indicates that ductions are full (see example1). Where there is a significant difference between the duction and version in a given position, this should be recorded on the diagram (see example 2).

Cover tests

These are performed in the usual way, with fixation at 1/3m and at 6m.

The results are abbreviated as follows:

E	esophoria	**LET**	left esotropia
X	exophoria	**AXT**	alternating exotropia
RH	right hyperphoria	**RHT**	right hypertropia
LHypo	left hypophoria	**LHypoT**	left hypotropia

Intermittent manifest deviations are classified by using brackets and underlining as follows:

LE(T)	intermittent left esotropia
AX(T)	intermittent alternating exotropia, mostly manifest
RH(T)	intermittent right hypertropia, mostly controlled

Prism cover tests

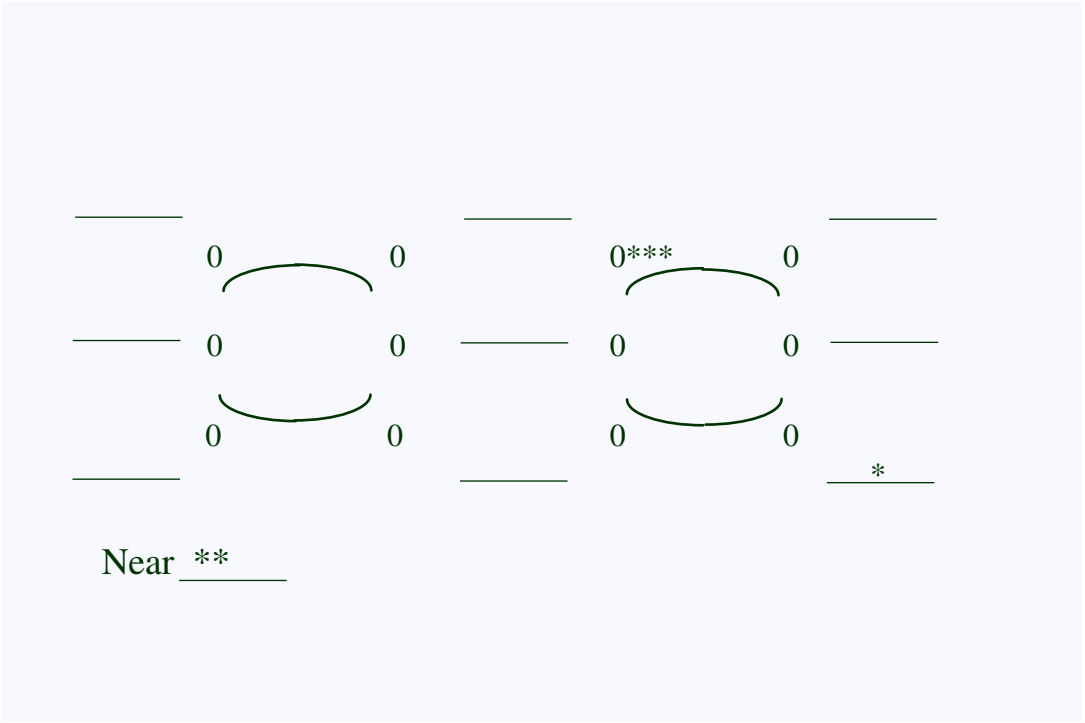
- The deviation is measured in the primary position with fixation at 1/3 metre and 6 metres.
- The deviation is measured in the secondary and tertiary gaze positions with fixation at **six metres**, to minimise the effect of accommodation. It is not necessary to measure all nine positions in every patient. Measurements are taken only in the positions required to diagnose and manage the patient, at

the discretion of the orthoptist.

- The six metre fixation target remains static, and the patient's head is moved to achieve fixation in the required positions. The head should be moved as far as possible into each direction whilst keeping the target visible with both eyes. However care must be taken in patients with neck problems.
- Depending on the refractive error, the refractive correction is usually worn for the prism cover tests, to ensure that accommodation is controlled.
- Single prisms are usually used for the measurements, and should be held perpendicular to the visual axis. Alternatively, prism bars or the synoptophore can be used.

Recording results

The results from the ocular movement assessment, cover tests, and prism cover tests are recorded on a template:



- The diagram represents the patient's eyes as they face the examiner.
- The distance cover test and prism cover test results are recorded in the positions indicated by horizontal lines, for example * indicates the position of the result of the distance cover test and prism cover test on down/left gaze.
- The near cover test and prism cover test result is recorded below the diagram - position indicated by**
- The ocular movement gradings are recorded in the positions indicated by '0', for example *** indicates the position of the grading of the movement of the left eye into up/right gaze.

Additional features of ocular movements

- Recorded on the template using the following symbols

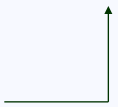
Limitation on ductions

A pattern

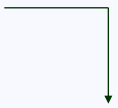
V pattern

Updrift

Downdrift



Upshoot

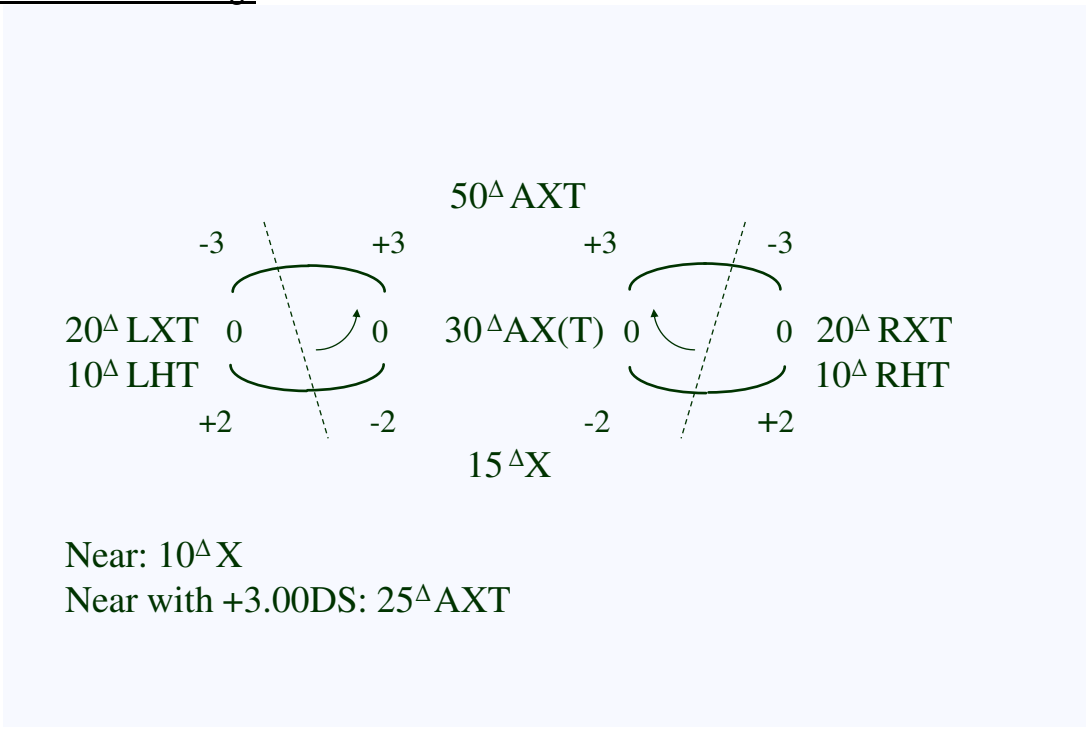


Downshoot

Example 1 - Simulated distance exotropia

V pattern, bilateral inferior oblique over-actions and superior oblique under-actions

Diagrammatic recording:



- The latent divergence at near, and the intermittent alternating manifest divergence in the distance are shown.
- The dotted lines indicate the V pattern.
- The arrows indicate the updrift of the right eye on left gaze, and the updrift of the left eye on right gaze. These are consistent with the right hypertropia shown on left gaze, and the left hypertropia shown on right gaze.
- The numerical gradings indicate the bilateral inferior oblique over-actions and superior oblique under-actions.
- The distance measurements in the primary position can be readily compared with those on side gazes, and on up and down gaze, showing the extent of the V pattern, and the lateral incomitance.
- The absence of any shading on the diagram indicates that ductions are full in all directions, and that the minus numbers therefore indicate a relative under-action seen on versional eye movements only.

The same information is presented in conventional orthoptic form on the next page.

Example 1 continued - Simulated distance exotropia

Conventional orthoptic recording:

Cover test:
Near: small latent divergence with good recovery
Distance: initially straight, becoming moderate ADS

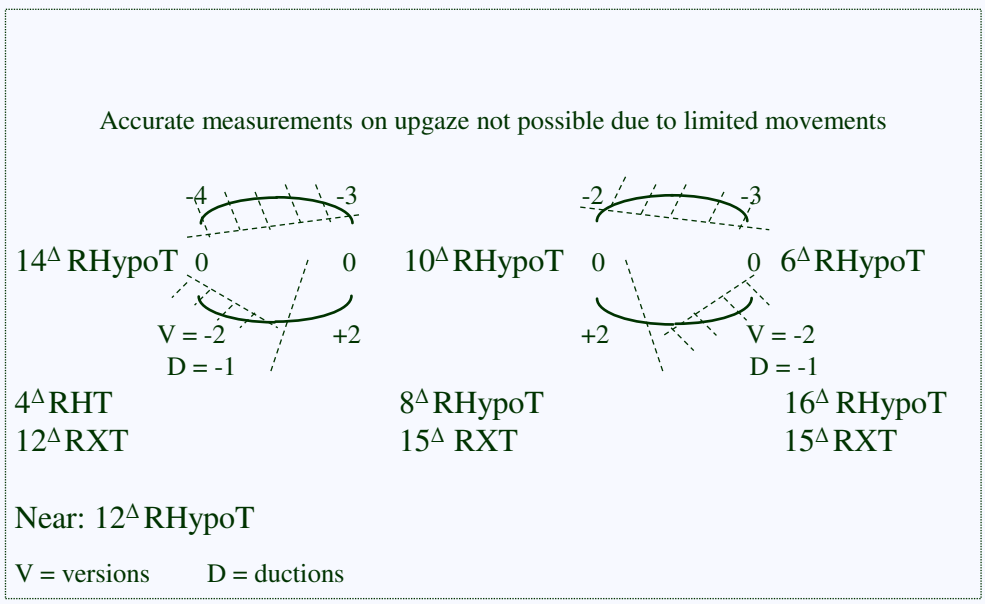
Ocular movements:
Small updrift of either eye on contralateral versions
Moderate over-action of either eye in contralateral elevation
Small under-action of either eye on contralateral depression
V pattern

Prism cover tests:

Near:	10^{Δ} base in, with +3.00DS: 25^{Δ} base in
Distance:	30^{Δ} base in
Right gaze:	20^{Δ} base in, 10^{Δ} base down left eye
Left gaze:	20^{Δ} base in,10^{Δ} base down right eye
Upgaze:	50^{Δ} base in
Downgaze:	15^{Δ} base in

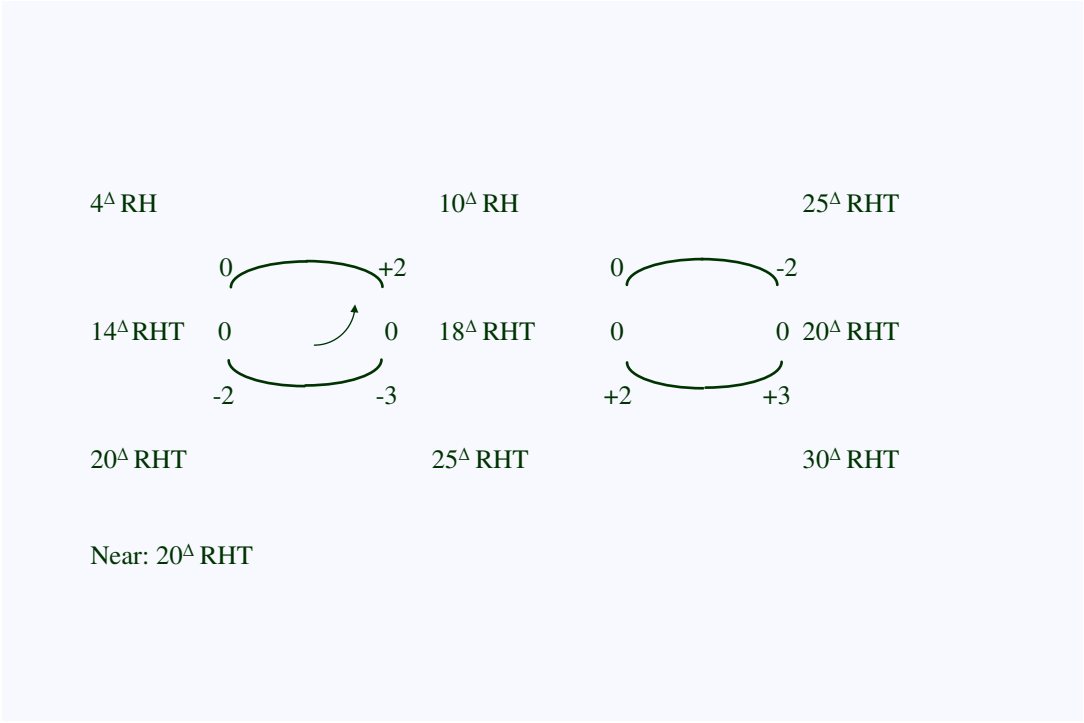
Identical information to that presented in the diagram on the previous page is shown in conventional orthoptic notation

Example 2 - Thyroid orbitopathy



- The right hypotropia is shown. This is present in all positions except on down/right gaze, where the deviation reverses to a small right hypertropia.
- On depression there is some divergence of the eyes. This is indicated by the use of lines, and is consistent with the exotropia present in the depressed positions.
- The minus numbers on upgaze indicate the reduced movements of both eyes in all elevated positions, and the shading indicates that these are due to limitations of ductions. Version and duction movements are equal in elevated positions in this patient.
- The minus numbers for the movement of the right eye on down/right gaze, and the left eye on down/left gaze, indicate the failures of movement in these positions. In these positions, the initial –2 under-action seen on testing versions, improves to a –1 movement when ductions are assessed. Ductions and versions are graded separately for these positions so that the difference is apparent.
- The use of shading emphasises the limitations of ductions present for the right eye on down/right gaze, and for the left eye on down/left gaze.
- The +2 over-action in the field each superior oblique is shown.

Example 3 - Right superior oblique under-action



- The right hypertropia measuring 18^{Δ} on distance fixation, and 20^{Δ} on near fixation is shown.
- The deviation increases to a maximum of 30^{Δ} right hypertropia on down/left gaze, and reduces to a minimum of 4^{Δ} right hyperphoria on up/right gaze.
- There is a -3 under-action of the right superior oblique, and a +2 over-action of the right inferior oblique, with the updrift of the right eye on left gaze shown by the arrow.

Measurements in nine positions of gaze can be helpful in determining the best surgical options in cases such as this. The procedure of choice in patients with a superior oblique weakness is usually a weakening of the ipsilateral inferior oblique muscle. In this case the right hypertropia is significant across the whole of the lower field of gaze, and a right inferior oblique weakening may not provide enough correction of the deviation on down/right gaze, so it may be necessary to consider a left inferior rectus recession in addition to the right inferior oblique weakening.

References

1. Henderson G. Orthoptic reports: descriptive or graphic? *British Orthoptic Journal* 1998; 55: 66-74.

2. Vivian AJ, Morris RJ. Diagrammatic representation of strabismus. *Eye* 1993; 7: 565-571.

3. O'Flynn EA. Strabismus documentation: an alternative approach. *British Orthoptic Journal*, 1994; 51: 10-14.

4. Jampolsky A. A simplified approach to strabismus diagnosis. *In*: Burian HM, Dunlap EA, Dyer JA, Fletcher MC, Jampolsky A, Knapp P, *at al. Symposium on strabismus: Transactions of the New Orleans Academy of Ophthalmology*. St Louis: Mosby 1971: 34-91.