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**OPTOMETRIA 2018**

## Workshop: diagnosis of binocular vision anomalies

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## DISCLOSURE

- Paid lectures & KOL/product feedback programmes:
  - Alcon, American Academy of Optometry (UK), Association of Optometrists, Birmingham Focus on Blindness, Black & Lizards, Central (LOC) Fund, Cerium Visual Technologies, College of Optometrists, Coopervision, ESRC, General Optical Council, Hoya, Institute of Optometry, International Institute for Colorimetry, Iris Fund for Prevention of Blindness, Johnson & Johnson, Leightons, London Vision Clinic, MRC, Norville, Optos, Paul Hamlyn Trust, Perceptive, Scrivens, Specsavers, Thomas Pocklington Trust.
  - Lecture content always my own
- Author of Pickwell's Binocular Vision Anomalies, editions 3-5
- i.O. Sales Ltd markets IFS orthoptic exercises, which the speaker designed, and for which he receives a small royalty
- Community optometric practice in Brentwood, Essex

## PLAN

For regular tweets on optometric research: Follow @BruceJWEvans

**COVER TEST**

INCOMITANCY

FUSIONAL RESERVES

**OPTOMETRIA 2018**

Full handout of slides from [www.bruce-evans.co.uk](http://www.bruce-evans.co.uk)

## Cover testing – main varieties

- Cover-uncover test
  - Diagnose phoria/tropia
  - **Grade recovery movement in phoria**
  - Measure deviation
    - **Estimation**
    - Prism cover test
- Alternating cover test
  - Measure deviation
    - Estimation
    - Prism cover test
- **Combined cover-uncover & alternating**
  - All the above, and
  - c.f., habitual angle with total angle

## Grade 1

Grade	Description
1	rapid and smooth
2	slightly slow/jerky
3	definitely slow/jerky but not breaking down
4	slow/jerky and breaks down with repeat covering, or only recovers after a blink
5	breaks down readily after 1-3 covers

Panesar & Evans, in preparation

## Grade 3

Grade	Description
1	rapid and smooth
2	slightly slow/jerky
3	definitely slow/jerky but not breaking down
4	slow/jerky and breaks down with repeat covering, or only recovers after a blink
5	breaks down readily after 1-3 covers

Panesar & Evans, in preparation

## Grade 5



Panesar & Evans, in preparation

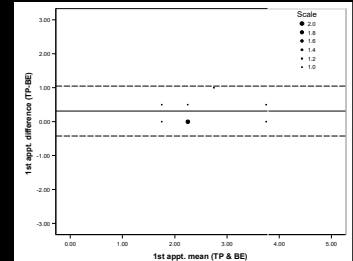
Grade	Description
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## Signs of decompensated phoria

### Poor cover test recovery

- Grading system has reasonable repeatability
- Cover test dynamics are complex (Barnard & Thomson, 1995)

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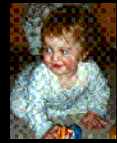
Panesar & Evans, in preparation

## Cover testing – main varieties

- Cover-uncover test
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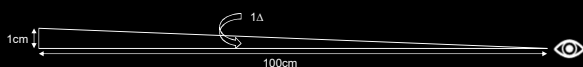
## Estimating the movement seen in cover testing

- Why estimate instead of measure with prism bar?
  - Needs minimal patient co-operation
  - Measures situation under natural viewing conditions
    - "the first cover is the purest cover"
- It is easy for the practitioner to do accurately
  - Practitioner can "calibrate" their measurements by comparing the movement seen in the cover test with a version movement of a known amplitude
  - i.e., compare a cover test movement of unknown size with a version movement of known size



## More detailed explanation

- $1\Delta$  is the angle subtended by 1cm at 1m
  - At 1/3m: 1cm subtends  $3\Delta$ , 2cm subtends  $6\Delta$ , etc.
- Work in pairs: optom & patient
- Optom holds ruler 33cm away from patient
- Optom watches patient's eyes
- Patient looks at 0, then at 2: the eyes have moved through  $6\Delta$
- Patient looks at 0, then 4: the eyes have moved through  $12\Delta$
- Practical session: practice estimating version movements, then apply to cover testing



## PLAN

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### COVER TEST

### INCOMITANCY

### FUSIONAL RESERVES



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## Incomitant Deviations

a quiz based on CD-ROM accompanying Pickwell's *Binocular Vision Anomalies*, 5th edition

Quiz	Team A	Team B
<a href="#">Quiz 1</a>		
<a href="#">Quiz 2</a>		
<a href="#">Quiz 3</a>		
<a href="#">Quiz 4</a>		
<a href="#">Quiz 5</a>		
<a href="#">Quiz 6</a>		
<a href="#">Quiz 7</a>		
<a href="#">Quiz 8</a>		
<a href="#">Quiz 9</a>		
<a href="#">Quiz 10</a>		
<a href="#">Quiz 11</a>		
<a href="#">Quiz 12</a>		
<a href="#">Quiz 13</a>		

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## Quiz 1



[click here to see explanation & Hess chart](#)

[click here to see other incomitancies](#)

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## Quiz 5

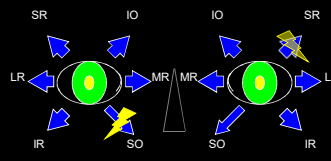


[click here to see explanation & Hess chart](#)

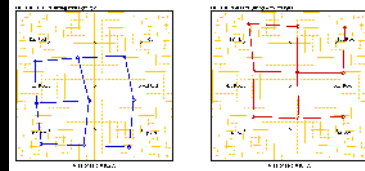
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## RSO palsy & secondary LSR palsy



[click here to see motility video again](#)

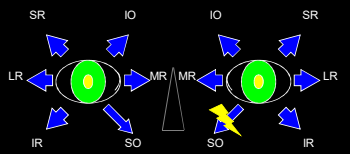


[click here to see typical symptoms and clinical test results](#)

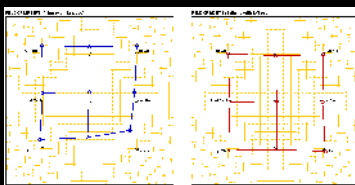
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## LSO palsy: motility & Hess test



[click here to see motility video again](#)



[click here to see typical symptoms and clinical test results](#)

[click here to see other incomitancies](#)

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## SO palsy: typical symptoms & test results

- ☀ History
  - ▢ Commonly congenital, with head tilt since infancy
- ☀ Symptoms
  - ▢ May decompensate in adult life
  - ▢ Can be newly acquired, particularly after trauma
- ☀ Cover test
  - ▢ Small hyper-deviation of affected eye, worse for near fixation
- ☀ Dissociation tests
  - ▢ A cyclo-deviation and positive Bielschowsky test help diagnose SO palsy
    - ▢ See Appendix 8
- ☀ Refractive correction
  - ▢ Avoid or be cautious in prescribing multifocals

[click here to see motility videos again](#)

[click here to see explanation & Hess screen again](#)

[click here to see other incomitancies](#)

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## Case study 1

- Superior oblique palsy (old)
- Decompensated
- Optom prescribed VF
- Patient decompensated
  - Sued optom for causing decompensation

## Case study 2

- Optometrist saw at age 5, 6, 7 y
- R +0.75DS=6/5 L +3.00/-3.50x180
- Optometrist decided not to treat
- Age 8 hospital treated
- No benefit
- Legal case against optometrist

## Amblyopia: when to treat

- Strabismic: under age of 7-8
- Anisometropic: any age

## Quiz 3

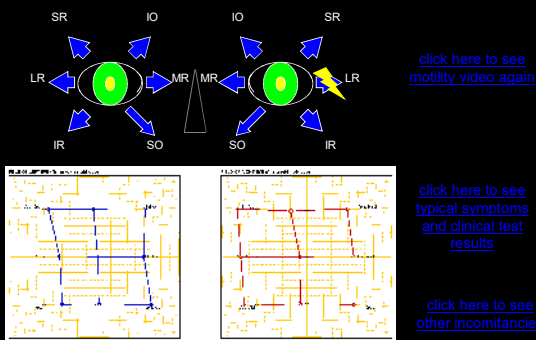


[click here to see explanation & Hess chart](#)

[click here to see other incomitancies](#)

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## LLR palsy: motility & Hess test



## LR palsy: symptoms & test results of case in video clip

- History
  - High blood pressure, at one time poorly controlled when horizontal diplopia started
- Symptoms
  - Horizontal diplopia in distance vision, not at near, worse when looking to affected side.
- Cover test
  - Distance: 15Δ left esotropia
  - Near: orthophoric
- Comments
  - A small vertical deviation may be present

[click here to see motility video again](#)

[click here to see explanation & Hess screen again](#)

[click here to see other incomitancies](#)

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## Inferior oblique (IO) palsy

- An IO palsy is the rarest of all extra-ocular muscle palsies and no video clips were available
- When the diagnosis of an IO palsy is made it is very often a mis-diagnosis of a Brown's syndrome
  - Differential diagnosis is discussed in the slides on Brown's syndrome

[click here to see Brown's syndrome](#)

[click here to see other incomitancies](#)

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## Quiz 4



[click here to see explanation & Hess chart](#)

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## Quiz 8

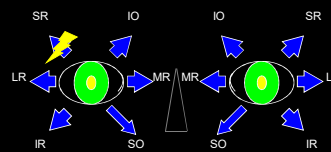


[click here to see explanation & Hess chart](#)

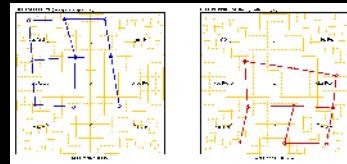
[click here to see other incomitancies](#)

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## RSR palsy: motility & Hess test



[click here to see motility video again](#)



[click here to see typical symptoms and clinical test results](#)

[click here to see other incomitancies](#)

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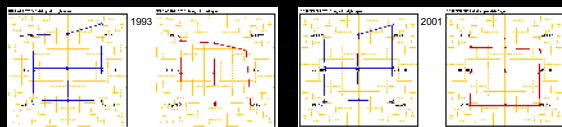
## RSR palsy: motility & Hess test

- Motility testing ([see video](#)) suggests right double elevator palsy, but the Hess chart, from some years before, suggests RSR
  - Sometimes, a superior rectus palsy can "spread" in this way



[click here to see motility video again](#)

[click here to see symptoms and clinical test results](#)



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## SR palsy: typical symptoms & test results

- History
  - Typically congenital, can be acquired
- Symptoms
  - May be diplopia in upgaze
  - Sometimes with ptosis, especially if congenital
- Cover test
  - Hypotropia of affected eye, worse for distance fixation, often with small excyclotrophia
  - A SR palsy can sometimes occur as a sequel to a SO palsy in the other eye (see Appendix 8)

[click here to see motility videos again](#)

[click here to see other incomitancies](#)

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## Duane's retraction syndrome

- Classified in two ways:
- Huber's classification
  - [Type 1](#): restricted abduction, adduction minimally affected
  - [Type 2](#): restricted adduction, abduction minimally affected
  - [Type 3](#): restricted abduction & adduction
- Old classification
  - [Type A](#): restricted abduction, slightly defective adduction
  - [Type B](#): restricted abduction, normal adduction
  - [Type C](#): restricted adduction & slightly defective abduction

Click on the blue writing above to see examples of each type

[click here to see other incomitancies](#)

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## Duane's retraction syndrome: first example

- Left eye only, grossly restricted abduction, adduction fairly normal, retraction LE on adduction
- Huber's classification
  - [Type 1](#): restricted abduction, adduction minimally affected
- Old classification
  - [Type B](#): restricted abduction, normal adduction

click on picture to see video



[click here to see bilateral Duane's Type 1](#)

[click here to see other Duane's](#)

[click here to see other incomitancies](#)

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## Quiz 2

click on picture to see video



[click here to see explanation](#)

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## Duane's retraction syndrome: second example

- bilateral, grossly restricted abduction, adduction slightly restricted, retraction of each eye on adduction
- Huber's classification
  - [Type 1](#): restricted abduction, adduction minimally affected
- Old classification
  - [Type A](#): restricted abduction, normal adduction

click on picture to see video



[click here to see other Duane's](#)

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## Quiz 7

click on picture to see video



[click here to see explanation](#)

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## Duane's retraction syndrome: third example

- Left eye only, grossly restricted adduction, abduction normal, slight retraction LE on adduction
- Huber's classification
  - [Type 2](#): restricted adduction, abduction minimally affected
- Old classification
  - [Type C](#): restricted adduction, [slightly affected] abduction

click on picture to see video (becomes clearer)



[click here to see bilateral Duane's Type 2](#)

[click here to see other Duane's](#)

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## Quiz 10

click on picture to see video (becomes clearer)



[click here to see explanation](#)

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## Duane's retraction syndrome: fourth example

- bilateral, mild case, slightly restricted adduction, abduction normal, retraction of each eye on adduction
- Huber's classification
  - **Type 2:** restricted adduction, abduction minimally affected
- Old classification
  - **Type C:** restricted adduction, [slightly affected] abduction

click on picture to see video



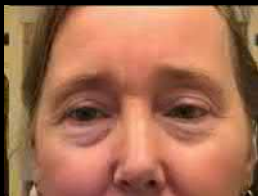
[click here to see other Duane's](#)

[click here to see other incomitancies](#)

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## Quiz 11

click on picture to see video



[click here to see explanation](#)

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## Duane's retraction syndrome: fifth example

- Left eye, grossly restricted abduction and adduction
- Huber's classification
  - **Type 3:** restricted abduction & adduction
- Old classification
  - ? Type A or Type C

click on picture to see video



[click here to see other Duane's](#)

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## Quiz 13

click on picture to see video



[click here to see explanation](#)

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## Brown's syndrome

- Previously known as superior oblique tendon sheath syndrome
- The syndrome has the appearance of an inferior oblique (IO) palsy. For differential diagnosis, consider:
  - IO palsy is exceptionally rare. Brown's syndrome is, relatively speaking, much more common
  - An incyclodeviation will be present in the primary position in IO palsy, not in Brown's syndrome
  - Parks three step is positive in IO palsy, not in Brown's syndrome
  - Secondary sequelae (overaction of: ipsilateral SO and contralateral SR) will be present in long-standing IO palsy, not Brown's

[click here to see first example of Brown's syndrome](#)

[click here to see second example of Brown's syndrome](#)

[click here to see third example of Brown's syndrome](#)

[click here to see other incomitancies](#)

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## Brown's syndrome

- Brown's syndrome left eye
- Classification: *mild* because no L hypo-deviation is apparent in the primary position or when the left eye looks straight to the right
- Note the V-syndrome
- Differential diagnosis: LIO palsy is ruled out because: no cyclo-deviation, no secondary sequelae, and a negative Parks three step test

click on picture to see video



[click here to see other examples of Brown's syndrome](#)

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## Quiz 9

click on picture to see video



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## Brown's syndrome: second example

- Left Brown's syndrome: the LE fails to fully elevate in adduction
- Classification: *mild* because no L hypo-deviation is apparent in the primary position or when the left eye looks straight to the right
- Differential diagnosis: LIO palsy is ruled out because no cyclo-deviation, no secondary sequelae, and a negative Parks three step test
- A Hess plot for the central motor field and was fairly normal, because the mechanical restriction is only apparent on extreme gaze

click on picture to see video



[click here to see other examples of Brown's syndrome](#)

[click here to see other incomitancies](#)

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## Quiz 12

click on picture to see video



[click here to see explanation](#)

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## Brown's syndrome

- Brown's syndrome right eye: RE fails to fully elevate in adduction
- Classification: *mild* because no R hypo-deviation is apparent in the primary position or when the left eye looks straight to the left
- Differential diagnosis: RIO palsy is ruled out because: no cyclo-deviation, no secondary sequelae, and a negative Parks three step test

click on picture to see video



[click here to see other examples of Brown's syndrome](#)

[click here to see other incomitancies](#)

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## Quiz 6

click on picture to see video



[click here to see explanation](#)

[click here to see why not](#)

[click here to see other incomitancies](#)

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COVER TEST

INCOMITANCY

**FUSIONAL RESERVES**



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## KEY SIGNS OF DECOMP. PHORIA

- ▣ Poor cover test recovery
- ▣ Aligning prism
- ▣ Low fusional reserve opposing phoria
  - ▣ Sheard's criterion
  - ▣ Particularly useful for exophorias
- ▣ For esophorias, size and imbalanced fusional reserves are relevant
- ▣ For hyperphorias, size matters

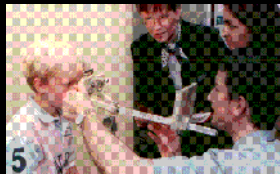
## FUSIONAL RESERVES

Can be measured with:

loose prisms



prism bar



rotary prisms

## FUSIONAL RESERVES

- Use base out prism to measure convergent reserve
- Use base in prism to measure divergent reserve
- Measure the reserve that opposes the phoria first
  - Rosenfield et al. (1995)
- Often the blur point cannot be measured (Horwood & Toor, 2014)
- Record in  $\Delta$  as:
  - blur / break / recovery
- Example:
  - Fusional reserves at 33cm with glasses
  - convergent: 20/28/26
  - divergent: -- /16/12