Paediatrics: general approach

- small, inexperienced adults
- put child at ease; have fun; praise
- may need to be quick
- do what you can, where you can, when you can
- dim lights slowly
- explain, in appropriate language
- train them and give prizes

Paediatrics: when to refer

- active & some old pathology
  - For children aged 6-18y, BV & accomm anomalies are 10x more likely to be present than ocular pathology
  - Scheiman et al. (1996)
  - The authors make an interesting point that, in this age, visual conversion reactions can mask pathology
  - non-accidental injury

Non-accidental injury (NAI)

- Ocular signs
  - Peripheral retinal haemorrhages
  - Periocular bruising
  - Subconjunctival haemorrhages
  - Hyphaema
  - Dislocated lens
  - Retinal detachment

- Systemic signs
  - Surface bruises
  - Multiple fractures & injuries
  - Scalds & burns
Child protection

- Avoid unnecessary physical contact
- To protect yourself against unfounded allegations you may:
  - Ensure presence of parent/carer at all times
  - Door ajar so parent/carer can hear
  - Open access policy: staff knock & enter any time
- But take reasonable precautions to preserve confidentiality

See C. Optom guidelines

Development of binocular vision

- Horwood (2003): Occasional (<15% of the time) neonatal misalignments are common and OK in the first month of life and only require referral if:
  - they worsen after 2 months or
  - there is an intermittent deviation at 4 months
- For most infants, motor fusion and sensory fusion develop at about 3-4 months
- By 6 months children should converge to a 20Δ base out prism and, if cooperative, should be able to fixate coarse stereoscopic targets

Ocular health

- With pre-school, optometrist unlikely to get more than a glimpse
- Pupil reactions possibly, indirect can be useful
- If in doubt, dilate. Photos if possible
- If still in doubt, refer
- Colour vision
  - Ishihara
  - TCU (1 & 2)

Symptoms, history, family history

- Symptoms:
  - Do you ever see an eye turning?
  - Distance vision (birds, planes)
  - Near vision (detail in pictures)
- History:
  - Birth on time
  - Birth weight
  - Birth complications
- Family history
  - Esotropia, amblyopia, Rx

HVID NORMS

- neonate: 9.0-10.5 mm
- 6 months: 11.5 mm ± 0.50 mm
INTRODUCTION
OCULAR HEALTH
VISUAL ACUITY
REFRACTION
ORTHOPTIC FUNCTION
CONCLUSIONS

PLAN

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Handout from www.bruce-evans.co.uk for regular tweets on optometric research

Visual acuity: overview

- Macular is poorly developed at birth
  - Large variation in rate of development
- Results vary with different test methods
- VEPs are an option
- We need to detect strabismic amblyopia
  - So, do crowded tests as soon as you can

Visual acuity: Cardiff cards

- Vanishing optotypes suitable from 6 months
- Binocular readings possible for 96% aged 12-36 months
  - Adish and Woodhouse (1994)
- A “game” that children enjoy
- Encourage them (noises etc.)
- Poor at detecting strabismic amblyopia

Visual acuity: shapes and pictures

- Manageable by many 2 year olds
- Avoid isolated uncrowded optotypes
  - Poor at detecting strabismic amblyopia
- Lea & Kay have LogMAR design
- Test Chart 2000 is ideal
- Most children who can do these can match crowded letters

Visual acuity: grating preferential looking

- Teller or Keeler or Lea
- Suitable from birth
- Two out of three
- Easier to do than you think!
- No peeping!
- Not good at detecting strabismic amblyopia
  - Vernier is the future
  (Driver et al., 2010)

Visual acuity: letter matching

- Worst:
  - Sheridan Gardiner
- Better
  - Sonksen Silver
  - Cambridge cards
  - Glasgow Acuity Test
- Best: Test Chart 2000
  - Possible from c. 2.5 years
**Visual acuity: near charts**

- Lea, Patti pics, Kay near VA cards
- Avoid stories
- Institute of Optometry near test card
- Many others

**Visual acuity: “better than nothing”**

- Reaction to occlusion
- 10° up one eye
  - Should alternate freely

<table>
<thead>
<tr>
<th>Method</th>
<th>1</th>
<th>3</th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>36</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical prism test, with 10° up one eye</td>
<td>0.30</td>
<td>0.30</td>
<td>0.24</td>
<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pating preferential looking (Zwink, 1954)</td>
<td>0.30</td>
<td>0.30</td>
<td>0.24</td>
<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
<td></td>
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</tr>
<tr>
<td>Cardiff card (Teller, Teller &amp; L geg, 1962)</td>
<td>0.30</td>
<td>0.30</td>
<td>0.24</td>
<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
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<td>0.30</td>
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<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
<td></td>
<td></td>
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<tr>
<td>Wining E</td>
<td>0.30</td>
<td>0.30</td>
<td>0.24</td>
<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snellen chart letter matching</td>
<td>0.30</td>
<td>0.30</td>
<td>0.24</td>
<td>0.12</td>
<td>0.06</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Automated refraction: Photorefraction**

- Paediatric handheld autorefractors e.g.,
  - Plusoptix
  - Retinomax
- Eccentric photorefraction e.g.,
  - 2Win

**Refraction: Basic minimum**

- Are the retinoscopy reflexes symmetrical and no large refractive errors?
- Be adaptable about working distance
- Hold trial lenses with infants
- Fixation target is anything that will attract their attention, ideally Test Chart 2000

**Refraction: Mohindra retinoscopy**

- Working distance = 55cm
- Totally darkened room
- Occlude one eye
- Fixate retinoscope light
- -1.00 to -1.25D allowance
- High correlation with cycloplegic retinoscopy for over 2 yr-olds
**Refraction: accommodative lag**
- MEM retinoscopy
  - Binocularly fixes target on retinoscope at normal reading distance
  - Practitioner monocularly rapidly interposes lenses to neutralize reflex
  - Mean +/- 1 SD quoted as plano to +0.75
- Nott retinoscopy
  - UC-CUBE

**Refraction: cycloplegic**
- Indications for cycloplegic:
  - Symptom of intermittent SOT
  - Sign of SOP or SOT
  - Unexplained poor VA
  - Unexplained symptoms
  - Variable or suspicious Rx
  - Suspected accommodative anomaly
- Refer if under 3 months
  - Under 12 months use 0.5% cyclo
  - Dark pigmentation leave for longer

**Refraction: normal development**
- At birth +2.00 DS (SD = 2.00 DS)
- Very variable in first year
- On average, hypermetropia decreases rapidly during the first year to a mean level of about +1.50 D at age one year
- High astigmatism in first year often reduces

**Refraction: when to prescribe (Leat 2011)**
- Nearly 75% of children with esotropia &/or amblyopia have a significant Rx
- Hyperopia
  - Age 1+: ≥3.50D in any meridian (give partial Rx)
  - Age 4+: ≥2.50D in any meridian (give partial Rx, reduce by 1-1.50D)
- School age: ≥1.50D
- Astigmatism
  - Age 1.5+: ≥2.00DC; give partial up to age 3-4y
  - Age 4+: ≥1.50DC
- Correct oblique astigmatism ≥1.00DC from 1y onwards
- Anisometropia: prescribe full aniso correction if amblyopia

**Myopia control**
- Dual focus soft CL slow myopia progression (Anstice & Phillips, 2010)
  - 40 children aged 11-14y, cross-over RCT, 2 x 10 month periods, CV MiSight
  - In 70%, myopia progression reduced by 30% or more
- Soft CL to reduce hyperopic defocus works
- Slow myopic progression by 30-50% (Walline et al., 2013; Lam et al., 2013)
- Bifocal soft CL can slow myopia progression by 60-70% if esophoric at near, at least for 1y
- Bifocal soft CL (CD) can slow myopia progression by 50%
  (Walline et al., 2013)
- Orthokeratology slows myopia progression by 30-50%

**PLAN**
- INTRODUCTION
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Orthoptics: development

- VOR present at full term birth
- Saccades improve over first 2 months
- Pursuit improves over the first 3 months
- Bifoveal fixation occurs at about 2-3 months
- Sensory & motor fusion & stereopsis at 3-4 months
- Accommodation relatively inaccurate, in line with sensory abilities until about 3 months

Orthoptics: tests of alignment

- Cover test: the gold standard
- Hirschberg: Inaccurate
  - 1 mm = 15-20°
- Krimsky: ±14°
- Bruckner
  - Symmetry of red reflexes, direct ophthalmoscope at 80-100 cm, dial in correction for near vision. Darker reflex in strabismic eye
  - Detects strabismus, anisometropia, anisocoria or pathology

Orthoptics: motor fusion

- Base out prism test
  - Have child fix a detailed picture
  - Can measure in older children with prism bar
  - Measure the reserve that opposes the phoria first

Orthoptics: sensory fusion & stereo

- Lang works well with infants: look at eye movements
- Frisby makes a good game with squeaky toy
- Recommended from age 2y is Randot
  - Random dot
  - Contoured
  - Mallet polarised letters test

Orthoptics: motility

- Infants don’t like having head held
  - Move around
  - Or parent can rotate the child

STEREOTESTS

www.bernell.com
**Orthoptics: stereotest norms**

- Generally, different tests give different results
- But Titmus circles similar to Randot circles

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Test</th>
<th>Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>any</td>
<td>unlikely to make any response</td>
</tr>
<tr>
<td>6-18</td>
<td>Lang 1 observe patient’s eyes: may see fixations indicating sees pictures</td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>Lang 1 or 2 should fixate and may point at pictures</td>
<td></td>
</tr>
<tr>
<td>&gt; 24</td>
<td>Lang 1 or 2 should be able to point and name pictures</td>
<td></td>
</tr>
<tr>
<td>≥ 24</td>
<td>Randot (shapes) if sees shapes on random dot background indicates no strabismus</td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>Randot (animals) should be able to see all animals</td>
<td></td>
</tr>
<tr>
<td>&gt; 5</td>
<td>Titmus 3000” (Romano et al., 1975)</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Titmus 70”</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Titmus 40”  (Romano et al., 1975)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Titmus 80”  (Romano et al., 1975)</td>
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</tr>
<tr>
<td>7</td>
<td>Titmus 60”  (Romano et al., 1975)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Titmus 40”  (Romano et al., 1975)</td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>Frisby 250”</td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>TNO 120”</td>
<td></td>
</tr>
</tbody>
</table>

**KEY SIGNS OF DECOMP. PHORIA**

- Symptoms
- Poor cover test recovery

**Profound learning difficulties**

- e.g., Downs syndrome
- often associated with:
  - refractive error
  - strabismus
  - poor accommodation
  - reduced VA
- paediatric techniques may work; be quick
- need eyecare, often need Rx (bifocals)
Specific learning difficulties (SpLD) e.g., dyslexia

- vision does not cause dyslexia, BUT there can be co-occurring visual problems:
  - normal prevalence of refractive error
  - c.15% have binocular instability
  - c. 20% may benefit from coloured filters
- SpLD may benefit from specialist (non-NHS) eyecare

Evans & Allen (2016)

Conclusions: we need them

- c. 10% of population is under 16 yrs
- children need regular brief exams
- some orthoptic patients prefer exercises in primary care
- specialist care for SpLD

A personal perspective: Dr Optometry

- In 2008 the Institute of Optometry launched a Doctor of Optometry degree in collaboration with London South Bank University
- 5 year part time professional doctorate
  - Year 1 has 13 taught days & 2 assignments
  - Year 2 has 8 taught days & 2 assignments
  - Years 3-5 are supervised doctoral research
    - Research most likely to be clinical, in practice
- "the ultimate HQ for UK optometrists"

Conclusions: they need us

- Young children need and deserve more than once only vision screening on school entry
- Many non-pathological orthoptic anomalies can be best managed in primary optometric care
- Accept that you won’t get perfect results
  - Record the quality of the response