Paediatric Optometry: A Practical Guide
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Objectives
• to review the importance of eye examinations in childhood
• to describe different methods for assessing visual function
• to provide normative data relating to these tests and discuss the relevance of findings

Functions to be examined …
• vision and visual acuity – measurement and management
• binocular function – useful tests
• accommodative function – assessment

• amblyopia and strabismus are the primary adverse outcomes
• detection of uncorrected refractive error
• normal development needs to be understood
• evidenced-based practice is important

0.5% or 1.0% Cyclopentolate HCl NOT Tropicamide
Visual Acuity

- poor at birth
- rapid improvement 0-6 months
- adult levels reached 4-5 years
- inter-ocular acuity differences rare

Infants and toddlers

- preferential-looking
- 0-3 years

Preferential-looking

- isoluminant target
- measure of resolution acuity

Resolution Acuity

- the ability to detect and resolve a target
- less sensitive to amblyopic deficits, particularly in strabismus

Recognition Acuity

- the ability to detect, resolve and recognise a target
- more sensitive to amblyopic deficits, particularly when crowded presentation used

Older Children

- Letter/picture matching
- 2.5+ years
Letter/Picture Matching tests

Sonksen LogMAR test

Crowded Kay pictures

LogMAR acuity test

what constitutes a significant interocular acuity difference?

Visual Acuity Norms (Cardiff acuity test)

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>bino° VA</th>
<th>mono° VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 - 17.9</td>
<td>6/48 - 6/12</td>
<td>6/48 - 6/15</td>
</tr>
<tr>
<td>18 - 23.9</td>
<td>6/24 - 6/7.5</td>
<td>6/30 - 6/7.5</td>
</tr>
<tr>
<td>24 - 29.9</td>
<td>6/15 - 6/7.5</td>
<td>6/19 - 6/7.5</td>
</tr>
<tr>
<td>30 - 36</td>
<td>6/12 - 6/6</td>
<td>6/12 - 6/6</td>
</tr>
</tbody>
</table>

Visual Acuity Norms (crowded Kay picture test)

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>mono° VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 4</td>
<td>0.100 logMAR (6/7.5)</td>
</tr>
<tr>
<td>4 - 5</td>
<td>0.050 logMAR (6/6°)</td>
</tr>
</tbody>
</table>

Approximately 95% of 'visually normal' children will have acuity of this level or better according to data on the Kay Pictures manufacturer's website (www.kaypictures.co.uk).
### Visual Acuity Norms (Lea symbols)

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>mono VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30</td>
<td>6/18</td>
</tr>
<tr>
<td>31-36</td>
<td>6/9.5</td>
</tr>
<tr>
<td>37-48</td>
<td>6/6</td>
</tr>
<tr>
<td>49-60</td>
<td>6/7.5</td>
</tr>
<tr>
<td>60-93</td>
<td>6/6</td>
</tr>
</tbody>
</table>

90% of 'visually normal' children will have acuity of this level or better (after Becker et al. 2002).

### Visual Acuity Norms (Sonksen LogMAR test)

#### Binocular Norms

#### Monocular Norms
Visual Acuity Norms (Sonksen LogMAR test)

monocular

Visual Acuity Norms (Sonksen LogMAR test)

monocular

Visual Acuity Norms (Sonksen LogMAR test)

monocular

vision and visual acuity

• best tests …. sensitive, age appropriate tests, data to support their use

Infants and toddlers: Cardiff Acuity Test (cardiffacuity.co.uk)

Picture tests:
Lea Crowded Symbols (logovision.co.uk)
or
Kay Crowded Picture Test (kaypictures.co.uk)

Letter tests:
Keeler LogMAR test (keeler.co.uk)
or
Sonksen LogMAR test (novomed.net)

vision and visual acuity

• amblyopia and strabismus are the primary adverse outcomes

• optometrists can;
  – identify amblyopia using robust VA tests
  – correct refractive error
  – monitor impact of refractive correction on VA

Management of amblyopia
Management of amblyopia

- refractive correction is recognised as an important component of amblyopia treatment (pediatric eye disease investigator group, PEDIG, 2006)

VA improvement with spectacles should be monitored until it stabilises

If it does not improve by at least one line (0.1 logMAR) at consecutive visits this is regarded as stabilisation

Prior to patching VA improvement with refractive correction alone for up to 16-22 weeks is suggested by the Royal College of Ophthalmologists

Need to monitor VA improvement regularly (every 2 months?) to check for stabilisation

Build any local post-referral delay for orthoptic appointments into your management plan
Near vision

Shute, Candy, Westall, Woodhouse (1990)

• useful tests – ones that don’t require red/green glasses or polarising filters?

Binocular function

• useful tests
  – ones that don’t require red/green glasses or polarising filters?

Stereopsis

• Lang stereotest
Stereopsis

- Frisby stereotest

Accommodation

- Children's accommodative function is not always as good as we expect (Sterner et al. 2004)
- Corrected hyperopes do comparatively better at school than uncorrected hyperopes (>1.50D) (Rosner & Rosner 1987)
Accommodation

- children’s accommodative function is not always as good as we expect (Steiner et al. 2004)
- corrected hyperopes do comparatively better at school than uncorrected hyperopes (>1.50D) (Rosner & Rosner 1987)
- uncorrected hyperopes show evidence of task avoidance (Sydney Myopia Study, 2009)

Accommodation

- objective measure of accommodative facility is invaluable in decision-making
- push-up not appropriate
- dynamic retinoscopy is useful

Dynamic retinoscopy

- modified Nott retinoscopy
- accommodative target held at specific distance from patient
Dynamic retinoscopy

• modified Nott retinoscopy
• accommodative target held at specific distance from patient
• distance correction in place

'Dynamic retinoscopy

'with' movement observed - move retinoscope away from patient

'Dynamic retinoscopy

'with' movement observed - move retinoscope away from patient
• 'against' movement - move retinoscope towards patient
• target remains still

'Dynamic retinoscopy

dioptric distance between target and retinoscope when neutral reflex observed is the 'lag' or 'lead'
• e.g. target @ 25cm (4D demand)
• neutral @ 40 cm (2.50D response)
• 'lag' = 1.50D

UC-CUBE dynamic retinoscopy
target (peter.fogartycon@googlemail.com)
- Developmentally and visually normal subjects tend to have less than 1D lag
- Reduced responses require further investigation
- Children with special needs often have poor accommodation

Accommodation
- D28 bifocals
  - Fit high (to pupil centre or just below)

Selected References

Leat SJ 1996 'Reduced accommodation in children with cerebral palsy'. Ophthalmic and Physiological Optics 16: 375-384