Course Description:
This course discusses vision development in early childhood and gives a general guideline for prescribing spectacle prescriptions to children.

Vision Development

1. Vision Development
   a. Within the first 6 months of life, rapid changes occur in the visual system
      i. Visual Acuity
      ii. Oculomotor
      iii. Accommodation
      iv. Binocularity
   b. Interference with development during the very critical phase may lead to serious lifelong effects on vision.
   c. Successful treatment can be obtained more quickly with early intervention.

2. Importance of VA assessment
   a. Normal acuity in infants and young children can help the clinician to rule out a number of disorders
      i. Significant refractive errors
      ii. Amblyopia
      iii. Ocular disease

3. Methods of VA measurement in infants and children
   a. Visual Evoked Potentials (VEP)
      i. VEP is an electrical brain response triggered by a visual stimulus.
      ii. The VEP assesses the integrity of the visual system from retina to visual cortex by eliciting involuntary visual responses.
      iii. VA can be measured using different stimulus sizes.
   b. Forced Choice Preferential Looking (FPL)
      i. Examples
         1. Teller Acuity Cards
            a. Infants prefer to look at objects with higher contrast, greater number of contours, and greater complexity over more simple patterns or homogenous backgrounds.
         2. Cardiff Acuity Tests
            a. A selection of preferential looking pictures designed to measure VA in toddlers.
   c. Optokinetic Nystagmus (OKN)
i. OKN is an involuntary nystagmoid response that is triggered by a moving visual stimulus.

ii. For an observer to elicit the OKN response, a child must attend to the drum and accommodate to its surface.

iii. The absence of a response might be nothing more than inattention.

iv. Visual Acuity values in infancy and early childhood correspond to the chosen acuity technique

4. Visual Developmental Milestones
   a. Orientation detection
      ii. 6 weeks: sensitivity to oblique orientation.
   b. Motion Detection
      i. <2 mo: poor sensitivity to motion of all velocities.
      ii. ~2.5mo: VEP response to low-velocity stimuli.
      iii. ~3 mo: responses to speed 4 times as fast.
   c. Saccades
      i. 5 mo: adult-like saccades begin to show.
   d. Pursuit
      i. 6 mo: adult-like pursuit begins to show.
   e. OKN
      i. <5 mo: Asymmetric OKN seen
   f. (OKN elicited only in a temporal to nasal direction in <2mo)
      i. 5 mo: Symmetric OKN seen
   g. Accommodation
      i. 2-3 mo: accurate focus over distances of <75cm
   h. Stereopsis
      i. 3-4 mo: VEP response to RDS
      ii. 6 mo: well developed
   i. Color
      i. 2 mo: develop dichromacy
      ii. 3 mo: develop trichromacy

5. Recommended First Eye Exam
   i. At 6 months the average child has reached a number of critical developmental milestones.
   ii. It is recommended that all children receive regular, professional eye care beginning at 6 months of age after an initial eye screening at birth.

Prescribing for Children

6. Considerations
   a. Refractive Amblyopia
   b. Ocular Alignment
   c. Emmetropisation (Emmetropization)
d. Visual Function

7. **Expected Refractive Error in Infants**
   a. Hyperopia
      i. 2.00(±2.00)D Hyperopia on average in children from birth to 1 year of age.
   b. Astigmatism
      i. 30-50% of infants (<12 months old) have significant astigmatism (1.00D or greater).
      ii. Up to 2.00D is common in children under 3 years of age.

8. **Amblyogenic Factors**

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<th>Isometropia</th>
<th>Diopters</th>
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9. **Prescription Guideline**
   a. Correcting Anisometropia with Amblyopia
      i. Correct the full anisometropia and astigmatism but correct the hyperopia or myopia according to age.
   b. Correcting isometropia
      i. Consider partial correction if eyes are still under emmetropisation.

10. **Emmetropisation**
    a. Fast emmetropisation
      i. ~12 months
    b. Slow emmetropisation
      i. **Hyperopia:** ~2 years
         1. Under correct by 1.00~1.50DS during this period.
      ii. **Astigmatism:** ~1.5-5 years
         1. Under correct by 1.00DC ~ ½ astigmatism during this period.
      iii. **Myopia:** ~4-5 years
         1. Under correct by 0.50~1.00DS during this period.
c. The rate of emmetropisation is generally proportional to the initial error. Higher ametropia generally shows greater and faster changes.

d. Prescribing a full prescription may interfere with the normal process of emmetropisation.

11. Cycloplegic Refraction
   a. Cyclopentolate hydrochloride is the cycloplegic agent of choice.
   b. One drop should be instilled twice, 5 minutes apart, in each eye
      i. 0.5%: Birth to 1 year
      ii. 1.0%: Older than 1 year

12. Reference


2. Fantz, RL. The origin of form perception. Sci Am 1961; 204:66-72


