A Child's Vision

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KEYWORDS

• Red reflex • Nystagmus • Cortical vision impairment • Delayed visual maturation
• Vision screening • Instrument-based screeners

KEY POINTS

- Implementing standard vision screening techniques in the primary care practice is the most effective means to detect children with potential vision problems at an age when the vision loss may be treatable.
- A critical period of vision development occurs in the first few weeks of life; thus, it is imperative that serious problems are detected at this time.
- Although it is not possible to quantitate an infant's vision, evaluating ocular health appropriately can mean the difference between sight and blindness and, in the case of retinoblastoma, life or death.

INTRODUCTION

In the United States, an estimated 1 in 20 children is at risk for permanent vision loss.[1,2] Amblyopia is the most common cause of vision loss. Other causes of vision loss include cortical vision impairment, delayed visual maturation, nystagmus, Retinopathy of prematurity, cataracts, glaucoma, optic nerve hypoplasia, and retinal abnormalities. All of these conditions can be discovered with appropriate knowledge regarding assessing visual behavior in children. The most important aspect of discovering vision abnormalities is understanding and assessing a child's visual behavior by the primary care provider at every well-child visit. In theory, this approach is the most effective screening for the largest number of children because most children see their primary care provider several times during infancy and early childhood.

Because a critical period of vision development occurs in the first few weeks of life, it is imperative that serious problems are detected at this time. Although it is not possible to quantitate an infant's vision, evaluating ocular health appropriately can mean the difference between sight and blindness and, in the case of retinoblastoma, life or death.

WHAT IS NORMAL VISUAL BEHAVIOR?

The first few weeks of life are a critical time for vision development. During this critical period, visual acuity develops rapidly and depends on a visual stimulus that is equal

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and focused in each eye.[3–5] A full-term infant should be adverse to bright light when introduced to each eye separately. The infant should consistently blink to light with each eye individually. Evaluating the normal infantile reflex of opening the eyes when the lights are turned off and closing when turned on is very important to note. Convergence spasms, or intermittent esotropia, are common in infants. This intermittent esotropia usually resolve completely by 3 to 4 months of age but occasionally lasts until 6 months.

Infants are typically able to fix on objects by 4 to 6 weeks of age. By 2 to 3 months of age, an infant should be able to follow objects.[6,7] By 3 years of age, most children can identify character shapes using Allen figures or Lea symbols, with each eye checked separately.[8] A child should be able to see 20/40 by 4 years of age and 20/30 by 5 years of age with each eye. By 5 years of age, most children can identify Snellen letters. Although, the classic end point for vision development is about 9 years of age, new multicenter controlled clinical research study has extended this period to as late as 13 to 17 years of age.[9] Normative visual acuity data for children aged 3 to 10 years have recently been published (**Table 1**).[10,11]

HOW TO ASSESS AN INFANT'S VISION

When evaluating an infant, look at eyelid structure and contour, conjunctiva, irises, pupils, and red reflex. Specifically look for any eyelid colobomas or defects, dermoids or dermolipomas, iris colobomas, or pupil irregularities. Although the pupil in an infant is miotic until about a month of age, a red reflex must be elicited during the first few weeks of life. If unable to detect a red reflex, immediate referral to a pediatric ophthalmologist is essential (**Fig. 1**).

Between 4 months and 3 years of age, the best way to assess a child's vision is by observing fixation and following. Cover each eye separately and present an interesting silent object. Observe to see that the child follows the object equally and steadily with each eye. Determine if the child consistently objects to covering either eye. Always assess and compare the red reflex of each eye simultaneously. Evaluate the corneal light reflex to detect strabismus (**Fig. 2**).

An important observation is whether the child has an abnormal head posture. Pay particular attention to a child who has a consistent head turn or tilt, which may indicate strabismus or nystagmus. Evaluate the eye alignment in all gazes. The misalignment or nystagmus often becomes apparent when the child's head is placed in a different position. Refer any child with an abnormal head posture for evaluation of strabismus or nystagmus (**Fig. 3**).

By 3 to 4 years of age, it is important to test vision using a standard eye chart with pictures or letters. The child should be able to identify at least the 20/40 line with each

Table 1
Expected visual milestones through early childhood

Age	Visual Milestone
Birth to 2 mo	Blinks to light
2–3 mo	Fix and follows
3 mo to 3 y	Central steady maintained
4–5 y	20/40 Pictures
5–6 y	20/30 Letters
6–7 y+	20/20 Snellen