Chapter 2
Testing Color Vision in Children

Kristen L. Kerber
New England College of Optometry, USA

ABSTRACT

It is important to screen for acquired or hereditary color vision defects as early as possible. Color vision is a critical part of the early learning experience, and children who have color deficiencies may have difficulties compared to their peers if there is color-based schoolwork. It becomes important for career interests/goals for older children as some jobs may require normal color vision. Hereditary red-green deficiencies are X-linked and therefore affect approximately 8% of males and less than 1% of females. Acquired color vision defects and blue-yellow defects are rare in the pediatric population; therefore, these conditions will be discussed minimally in this chapter. Infants are able to discern color by 2-3 months of age, but accurate color naming may not develop until 4-6 years of age. Screening tests are sensitive, fast, and easy to administer. If a deficiency is suspected through screening, further testing must be evaluated in order to determine the type and severity of the color vision defect. Color vision is typically tested starting at age 3 years and up.

INTRODUCTION

Color vision rapidly develops in the first few months postnatally (Brown, 1990); however, color naming and discrimination relies on cognitive development occurring in the first few years of life. For this reason, color vision testing is typically started with children aged 3 years and older and is not indicated in infants or toddlers. Many color vision tests and screeners are difficult for this young age, therefore adaptions using recognizable shapes are used. Since acquired color vision defects and blue-yellow defects are rare in children, this chapter will concentrate on congenital red-green defects. The objective of this chapter is to guide the pediatric clinician in the types of color vision tests available and their procedures.

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BACKGROUND

It is important to identify children with color vision defects at a young age. Color vision defects are not uncommon. Hereditary red-green deficiencies are X-linked, and therefore are present in approximately 8% of males and less than 1% of females. Early learning experiences (such as toys, décor, schooling, etc.) assume normal color vision, but children with color vision defects may have early academic difficulties if there is color-dependent schoolwork or activities. It becomes more important to identify color vision deficiency with increasing age as it may affect career choices later in life.

There are multiple color vision test options available to pediatric eye care practitioners. Typically, a screening test is chosen to differentiate those with normal color vision from those with color vision deficiency. Those with deficiencies may be further evaluated to identify the type and severity. Often, complete evaluation cannot be performed until the child is old enough to complete more intricate tests such as hue discrimination, disc comparison, or the anomaloscope. Screening younger children is often accomplished with Color Vision Test Made Easy (CVTME) and the Hardy-Rand-Rittler (HRR) pseudoisochromatic plates. Older children can be tested with Ishihara test plates. Digital color vision tests are also becoming more readily available. A full discussion of each is provided in this chapter.

GENERAL GUIDELINES FOR PEDIATRIC COLOR VISON TESTING

1. Typical test distance is 75cm (Carlson, 2004; National Research Council (US) Committee on Vision, 1981), but the examiner can permit young children to move closer to better engage visual attention or facilitate a motor/tracing response.
2. Color vision screening is more accurate when conducted in natural daylight or with a CIE Standard Illuminant C lamp (Birch, 2001). These lamps mimic average daylight's spectral distribution. Incandescent stand lamps are strongly discouraged during color vision screening as deutans will often perform better and may even pass screening testing when completed in this lighting.
3. Present the color vision test plates perpendicular to the line of sight.
4. Be prepared to shift to a developmentally easier test method. For example, if a school age child unexpectedly cannot correctly name numbers, shift to a tracing method. Note that the font used for some color vision numbers can be confusing to children.
5. Binocular color vision testing is standard. Consider monocular color vision testing if ocular disease is suspected.
6. It is important that children do not touch the pages in the color vision test books and the pages are not exposed to direct sunlight as it ruins the printed color. If the tracing method is employed, have children trace with a small paint brush or cotton tip applicator.
7. If the clinician suspects the child is failing the test because of poor cooperation, consider asking the parent to administer the test.
8. It is helpful to have printed information available for children who test positive for color vision deficiency.
9. It is common for parents to need reassurance that their child is not color-blind.