Chapter 8
Refraction in the Pediatric Eye Examination

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ABSTRACT

Accurate determination of refractive error is one of the most critical components of a pediatric eye examination. According to the National Eye Institute, refractive errors are the most common causes of correctable reduced vision in children. Children with uncorrected refractive error are more likely to have developmental delays, visual-related academic problems, and poor social skills or interactions. In addition to difficulty seeing, uncorrected refractive errors can contribute to developmental deficits of accommodation, binocular vision, and certain forms of strabismus, amblyopia, and perceptual function. The author provides the clinician an in-depth guide on how to determine the refractive error in pediatric patients. The chapter focuses on the specific techniques, advantages and disadvantages, equipment required, and step-by-step procedures for performing retinoscopy, objective refraction, and subjective refraction on children.

INTRODUCTION

Accurate determination of refractive error is one of the most critical components of a pediatric eye examination. Refractive errors of hyperopia, myopia and astigmatism are the most common types of vision problems in children (National Eye Institute, 2020). Although not as common, anisometropia is also a significant refractive error concern. In addition to difficulty seeing, uncorrected refractive errors can contribute to developmental deficits of accommodation, binocular vision, and certain forms of strabismus, amblyopia, and perceptual function. Therefore, an accurate determination of a child's refractive error is important.

Refraction is a procedure used to determine a patient's eyeglass prescription. In young children, this procedure can be somewhat tricky due to their inability to express themselves. For young and nonverbal children, clinicians tend to rely on objective findings instead of subjective findings to aid in the decision making of what to best prescribe. This chapter will focus on the specific techniques, advantages and

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disadvantages, equipment required, and step-by-step procedures for performing retinoscopy, objective refraction, and subjective refraction on children.

BACKGROUND

Retinoscopy is an objective method to measure refractive error and is a valuable skill to the pediatric eye care provider. Retinoscopy can be performed on patients of all ages, is fast when performed by a practiced clinician, does not require any verbal responses and only minimal cooperation from the child, and can be performed with minimal equipment. For the younger child who lacks the maturity, understanding or ability to provide subjective responses, retinoscopy may be the sole method for measuring refractive error. For the older child who can perform a subjective refraction, retinoscopy provides a starting point that can be fine-tuned by a subjective refraction.

Principles and Methodology of Retinoscopy

Retinoscopy is performed with a retinoscope (Figure 1) and uses correcting lenses to quantify the refractive errors of hyperopia, myopia, and astigmatism in each eye. Specifically, retinoscopy uses lenses to bring the patient's far point to the peephole of the retinoscope where the eye of the examiner is positioned. Retinoscopy can be performed behind a phoropter (Figure 2), with lens racks (Figure 3), or with loose lenses (Figure 4). The age and maturity of the child will help decide how retinoscopy is performed.

Before beginning retinoscopy, the clinician should determine their working distance. This is the distance from the retinoscope to the phoropter. The working distance is typically 50 cm or 67 cm, which corresponds to a dioptric value of 2.00 D (one divided by 0.50 m) or 1.50 D (one divided by 0.67 m), respectively.

Figure 1. Retinoscope