

# Chapter 5

## Testing Visual Fields in Children

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### **ABSTRACT**

*Visual fields in the pediatric population are an essential part of the eye exam that remain challenging to even the most experienced clinicians. Becoming educated in the multiple ways a child's visual field can be tested regardless of age and cognitive and physical abilities will allow the clinician to gain better insight into the child's function and in some cases, allow the clinician to identify pathological or neurological anomalies in the visual pathway. Gross visual field or functional visual field extent can be estimated by tests such as confrontation visual field testing, finger counting field testing, and white sphere kinetic perimetry. For threshold measurements of a child's visual fields, the Goldmann perimeter, or the more advanced computerized tests such as the Humphrey perimeter, Octopus perimeter, or frequency doubling technology perimeter can be used. Modifications can be made to certain tests to better suit the child's cognitive and physical abilities. The chapter covers different methods of visual field testing specific for the pediatric population.*

### **INTRODUCTION**

Visual field testing should be a part of a comprehensive pediatric eye examination to detect for any functional deficits in the patient's field of view. Visual field defects can be caused by, but is not limited to, multiple genetic disorders, trauma, and/or complicated birth. Knowledge of the visual field of children with suspected visual pathway disorders is, therefore, crucial for a number of reasons. Visual field tests in children can indicate whether the clinician should refer the child for diagnostic imaging (Chou & Digre, 1999; Molia et al., 1996; Suharwardy & Elson, 1997) and can also contribute to decisions regarding treatment (Kim et al., 2008; Wild et al., 2007). Characterization of the visual field is also crucial in establishing appropriate educational approaches and remediation services that take visual field loss into account. However, visual field assessment in children remains challenging in part because it requires a certain level of attention and cognition on the child's behalf.

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On occasion, especially with low functioning, multiply impaired children, the goal of a visual field test is generally not to find out what their threshold of sensitivity is, but where in their field of view do they have attention and where in their field of view will they respond to the visual stimuli. This is important because in instances where, for example, a wheelchair bound nonverbal and multiply impaired child is in a classroom, instruction and recommendations can be given to the teacher (or other care takers) to present learning material to the child within the spatial confines of the child's estimated binocular field extent. This will undoubtedly enhance the child's learning and engagement within the classroom environment. Knowledge of the visual field will also be helpful if the patient is working with an orientation mobility specialist because different strategies can be employed in training in order to overcome the visual field deficit(s) found.

This chapter covers different methods of visual field testing specific for the pediatric population.

## **BACKGROUND**

Children with physical or developmental disabilities are at a significantly increased risk of visual acuity deficits, visual field defects, or a combination of both (Van den Broek et al., 2006; Warburg, 1994). Examples of these include pre- or post-natal injury as a result of perinatal hypoxic-ischemic brain injury or because of complications of hydrocephalus, systemic infections, traumatic brain injury, retinopathy of prematurity, optic nerve damage, progressive retinal degeneration, or tumors of the optic chiasm. (Gilbert et al., 2003; Rahi & Gilbert, 2005).

When it comes to visual field testing in children we can divide it up into two different types: the traditional methods and the modified methods.

### **Traditional Visual Field Methods**

The traditional methods are effective for children that are able to respond to instructions and give accurate feedback. These are straightforward in testing and interpretation of the results are relatively easy. Tests that fall under this category include confrontation visual field test, finger counting visual field test, Goldmann perimetry, frequency doubling technology perimetry, and automated perimetry such as the Humphrey Field Analyzer and Octopus 900.

### **Modified Visual Field Methods**

The modified methods are usually reserved for children that are unable to respond either verbally, or physically (pointing, gesturing, or pressing buttons). These children also do not follow instructions well. Modified methods of perimetry takes the traditional methods and re-adapts the tests to be used for the child being tested. It takes some experience to administer the test and interpretation may not be straight forward. Modifications cannot be made to all tests but can be made to the following: confrontation visual field test, finger counting visual fields, Goldmann perimetry and Octopus perimetry.

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