Infant Vision

Diagnostic Tests

Dark Adapted Threshold (DAT)

The dark adapted threshold test (DAT) evaluates night vision using dim spots of light in a dark room. It helps us determine the minimum light level that an infant or child can detect. With increasing time in the dark, the cells of the retina become more sensitive to light. Therefore, before testing begins, the child sits in the dark for 30 minutes to allow his/her eyes to become maximally sensitive.

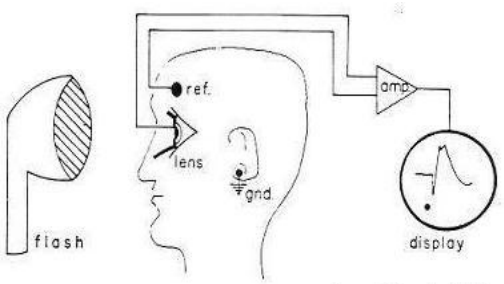
Once the eyes have adapted to the darkness, the child views a black screen onto which dim spots of light are projected. The spots are projected one at a time, either to the right or to the left side of the screen, and as the test proceeds, the spots become dimmer and dimmer. Children are asked to point to the spots until they can no longer detect them. The dimmest intensity that the child can detect is his/her dark adapted threshold.

When infants are tested, an observer with a night vision camera attempts to determine the location of the spots based on the infant's head and eye movements. The infant's threshold is defined as the dimmest intensity for which the observer can reliably identify the location of the stimulus.

The entire test, including the period of dark adaptation, typically takes less than an hour.

Electroretinogram (ERG)

The electroretinogram (ERG) is an eye test that evaluates the function of the retina, the film that lines the inside of the eye. The ERG test helps diagnose diseases of the retina.



Carr & Siegel, 1990

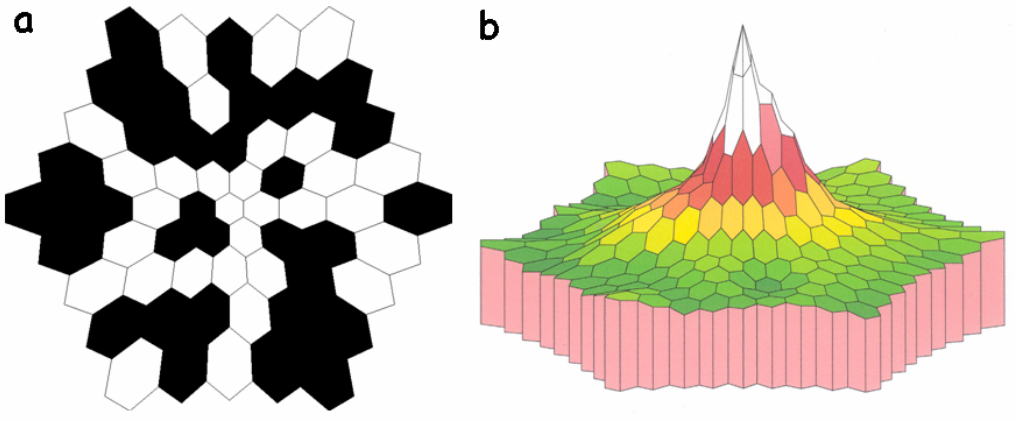
During the ERG test, the cells of the retina (rods and cones) release tiny amounts of electricity in response to flashes of light. If we know exactly how much light enters the eye and how much electricity comes out, we can figure out how the rods and cones are working. To pick up the electricity from the retina, a special contact lens is placed on the surface of the eye.

To prepare for the ERG test, drops are placed in the child's eyes to dilate the pupils. These drops are the same drops that eye doctors routinely use for eye examinations. The child then sits in a dark room for 30 minutes to allow the pupils to dilate. Also, since the retina become more sensitive to light with increasing time in the dark, the retina will give its strongest response following this period of dark adaptation.

After dark adaptation, anesthetic drops are given and a contact lens is placed on the child's eye. (Often, both eyes are tested at the same time.) Once the contact lens is in place, responses are recorded to a series of blue and red lights. This part of the test may take 30 to 45 minutes. The total time for the ERG test (including the period of dilation and dark adaptation) is approximately $1\frac{1}{2}$ hours.

Multifocal ERG (mfERG)

A new type of electroretinogram, called the multifocal ERG (mfERG), allows responses to be simultaneously recorded from multiple retinal areas using a stimulus array made up of black and white, flickering hexagons (a). The results can be analyzed to provide a contour map (b) of the function of the center of the retina, called the macula. This is the specialized part of the eye that is used to read letters. It is also the last part of the retina to develop.



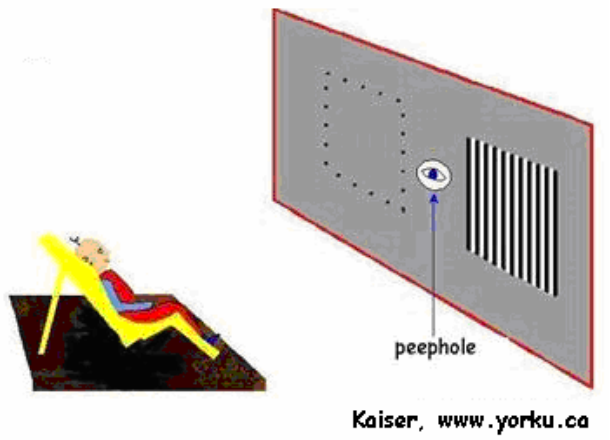
To prepare for the ERG test, drops are placed in the child's eyes to dilate the pupils. These drops are the same drops that eye doctors routinely use for eye examinations. They take about 30 minutes to take full effect. Next, anesthetic drops are given and a special contact lens is placed on the eye.

The child is positioned on the doctor's lap in front of a video monitor. The contact lens picks up electrical signals produced by the retina, following which a map of the functional integrity of the retina is plotted.

The time for actual recording is typically 20-30 minutes; the total time (including dilation) is typically less than an hour.

Preferential Looking (PL)

The Preferential Looking test is used to assess visual acuity in infants and young children who are unable to identify pictures or letters. The child is presented with two stimulus fields, one with stripes and the other with a homogeneous gray area of the same average luminance as the striped field. The location of the stripes is randomly alternated. Typically, infants and children will look at the more interesting stripes (if they can detect them) rather than at the blank field.



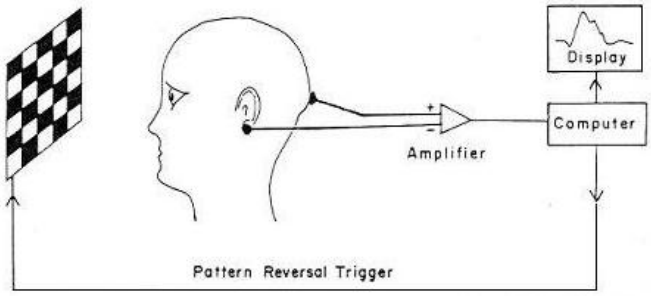
In the diagram, the baby is shown in an infant seat; alternatively, the child may sit on an adult's lap or be held over the shoulder. A small peephole is centered between the two fields. An observer views the child through the peephole and judges the location of the stripes based on the child's head and eye movements.

If the child can see the stripes, he/she will prefer to look at them. If the child cannot see them, the striped field will look the same as the blank gray field, and the child will not show a preference. The smallest stripe width for which the observer can consistently identify the location of the stripes is considered to be the child's resolution threshold (visual acuity).

Visual Evoked Potential (VEP)

In adults and cooperative older children, visual acuity (the ability to see fine detail and patterns) is measured using a letter chart. For those who are unable to read the letter chart, the visual evoked potential (VEP) can be used. It measures acuity by assessing the response of the brain to alternating black and white stripes or checks. This acuity test is most helpful for testing youngsters for whom other vision tests, like the preferential looking test, give ambiguous or incomplete information about visual acuity.

To do the test, three small metal discs are placed on the child's head. They are held in place by paste (similar to toothpaste) and a band wrapped around the head. The discs are connected by wires to a computer.



Carr & Siegel, 1990

The child is then positioned in front of a TV screen displaying alternating black and white stripes that progressively get narrower. As the child views the stripes, a signal is relayed from the eyes to the brain (the visual cortex). This signal is detected by the electrodes. The test is designed to find the finest black and white stripes that reliably produce a response.

Often the vision of each eye is tested separately; a patch is used to cover the non-tested eye. The test typically takes less than an hour, depending on the child's ability to cooperate.