

# Chapter Six

## Educationally Significant Visual Tests

### Signs of a Visual Problem in the Classroom

**T**eachers and reading specialists are in the most favorable position to observe visual difficulties which may cause decreased performance in classroom learning activities. The purpose of this chapter is to help the teacher, through classroom observations, key questions, and simplified tests, determine the visual performance of a child while he does his schoolwork. The results *of all* the tests and observations will establish a pattern of visual performance which will give the teacher greater insight into how a child achieves scholastically. The test results and observations can serve as a basis for referral to the appropriate practitioner. Satisfactory performance on the tests outlined should not be interpreted as definite proof that there is no problem, because final diagnosis may need more discrete testing. The tests and observations may also help parents take a more evaluative look at their children.

### What to Look For

There are certain signs of visual difficulty which a teacher can observe as the child does seatwork or reads silently. These signs outlined by the American Optometric Association are:

#### While reading

- losing place;
- holding reading or writing material closer than normal;
- moving head excessively;
- sitting in poor posture, position, and/or facial distortions;
- using finger to keep place.

#### While doing close work

- tilting head to one side;
- fidgiting;
- squinting or frowning.

#### Generally

- avoiding close work;
- developing body rigidity while looking at distant objects;
- tending to rub the eyes;
- thrusting the head forward;
- developing headaches;
- reading only when required—not voluntarily at home.

#### Performance

- reversals in reading or writing;
- inaccuracy in copying from the chalkboard;
- missing or miscalling prefixes or word endings;
- small, cramped, and heavy writing.

## What to ask

Key questions asked during a conference with a child may give additional information regarding visual involvement in a reading problem. The following questions are intended as a guide and may be restated to meet the needs of the situation. Positive answers to these questions would warrant further professional investigation of a child's visual performance.

1. Do you see two things when there is only one? (e.g., when you look at a book; when you look at the chalkboard.)
2. Do the words blur while you read?
3. Do things look blurry and then clear up after you have been reading and suddenly look up?
4. Do you lose your place while reading?
5. Do you tire while you read?
6. Do your eyes itch or burn while you read?
7. Do you get a headache while you read or after you have read?
8. Do you have trouble remembering what you read?

## Eye Movements

The way a child follows a moving object and his ability to fixate (look at an object) indicate how he has learned to use his eyes as a tracking mechanism. In addition, eye tracking gives some insights about his general body organization, reciprocal body movement, laterality (internal control of direction of movement), how he will react in copying from the chalkboard, his ability to sustain on a task, and management of form.

### Eye Movements—Pursuits

To check a child's ability to follow a moving object at near-point, hold a pencil vertically with the eraser at eye level, about eight inches from the child and in line with his nose. Tell the child to watch the eraser with his eyes as you move the pencil; you are to observe the child's eye movements. Keep the pencil in the same plane as you move it in the following directions:

1. Right and left on the horizontal midline (across);
2. Up and down on the vertical midline;
3. Diagonally across the mid-point, from upper left to lower right, and then from upper right to lower left;
4. Circular, scribing a circle about ten inches in radius from the mid-point.

### What to look for

- Degree of smoothness of the eye movements.
- Jerky eye movements and oscillation of the eyes when direction of the movement is changed, or when the pencil passes the horizontal or vertical midpoint.
- Head movements.
- Loss of teaming of the eyes.
- Loss of fixation on the target.

### What it means

The child should be able to smoothly follow the movements of the pencil eraser, with eyes only, and be able to change direction of movement without moving his head or losing smoothness.

A child showing difficulty in following the pencil with his eyes may have a poor body-image concept which will be reflected by inadequacy in the areas of gross motor coordination, fine motor coordination, development of laterality, orientation to direction, or all of these. Inadequate near-point eye movements correlate with problems in the performance of classroom tasks, such as, losing place while reading, not maintaining a border on written work, sloppy work, making reversals in reading and/or writing, showing poor form discrimination and short attention span.

## **Eye Movements—Eyes and Hand**

Repeat the above tests having the child point to the pencil with his finger.

### **What to look for**

- Change in eye movements-do they get better or worse with use of hands?
- The hand used to point at the pencil.
- A change of hands as the pencil passes through the midline.

### **What it means**

Improved performance in a child's eye movements when he uses his finger to point at the target indicates the need for tactual reinforcement while engaged in a near-point visual task.

Having this child use his fingers as a pointer while reading may be helpful to him.

## **Eye Movements—Near to Far Fixations**

To check a child's ability to change his eyes from near (reading and writing distance) to far (chalkboard distance) and then from far to near (as a child would do when copying from the chalkboard) do the following test:

1. Hold the pencil with the eraser at eye level, eight inches from the child's face, on the midline.
2. Select a target about four inches square, twenty feet away, in line with the pencil.
3. Ask the child to look at the eraser, then look at the distant target, and then look back at the eraser.
4. Repeat three times.

### **What to look for**

1. Observe the child's eyes as he changes fixation from near to far and from far to near.
2. The child's eyes should diverge and converge smoothly and simultaneously as he changes fixation from near to far and from far to near.

### **What it means**

Should the change in fixation result in a series of movements, should one eye seem to lag behind the other, or should both of these take place, a problem in convergence and spatial location is indicated. A child with this type of problem will have difficulty copying from the chalkboard, finishing his written work on time, and in keeping his place while reading.

## **Visual Acuity**

Visual acuity tells us how clearly a child can see at a specific test distance. While visual acuity is an important aspect of seeing, it can be made more meaningful from an educational point of view by becoming aware of the child's process as he looks at something. The denotation of 20/20 tells us that a child sees clearly at twenty feet; however, his classroom activities require that he look at distances from ten inches to beyond twenty feet. The demands of the classroom require the child to work at his desk, search for books on a bookshelf, watch the teacher, and copy from the chalkboard. His visual acuity must allow him to see with enough clarity to get meaning from what he sees but he must be able to do this without tension.

The school child is tested at twenty feet and at his near working distance. A standard Snellen Chart is used to determine the child's visual acuity at 20 feet and a reduced Snellen Chart is used at near. A child with 20/30 visual acuity will be able to see with adequate clarity to meet classroom demands.

### **Procedure: Visual Acuity at Farpoint**

1. Child sits or stands twenty feet from the Snellen Chart.
2. Child is to call off the letters, one at a time, from the lowest line that he can see.
3. The test is done with one eye at a time and then both eyes.

### **Visual Acuity at Nearpoint**

1. As you hand the reduced Snellen Chart to the child, ask him to read the lowest line (using both eyes).
2. Measure the distance from the bridge of the nose to where the chart is held.
3. Have the child cover one eye and again read the lowest line. Repeat for the other eye.
4. Note any difference in position of the card, when the child uses only one eye as compared to both eyes; if the position varies from eye to eye.
5. Compare the distance at which the chart is held with the Harmon distance as discussed in "Near Working Distance."

For educational significance the following observations give us insight into how a child processes what he sees and factors that may contribute to tension.

### **What to look for**

1. When the child is asked to read the chart does he do any of the following?
  - a. Read from left to right spontaneously?
  - b. Ask, "Where should I start?"
  - c. Read from right to left?
  - d. Read the right side of the chart before the left side?
2. As the child reads the chart does he do any of the following?
  - a. Reverse letters or numbers; i.e., call 3 an E, reverse the order of letters in the line?
  - b. Lose his place as he reads the letters?
  - c. Pause between letters?
  - d. Has to be prodded to call off the letters?
  - e. Is quick and spontaneous?
3. As the child reads the chart, must you point out each letter with your finger?
4. As the child reads the chart does he change his facial expression?
  - a. Squint?
  - b. Distort his face?
  - c. Frown?
  - d. Open his eyes wider?
5. As the child reads the letters does he use his hands or finger to point to each letter?

## What it means

### 1. Direction difficulties:

- a. The child who asks, "Where should I start," reads the letters from right to left, makes reversals in the letters, or changes order, indicates confusion in inner direction. He is reflecting an internal organization that differs from the left to right demand of the culture. This may be reflected in reversals of letters and words in reading, and writing. He is showing difficulties in handling direction of movement.

### 2. Fixation difficulties :

- a. The child who needs to have each letter pointed out for him may be having difficulty in ocular fixation and as a result cannot accurately locate objects with his eyes. This difficulty in ocular fixation may reflect itself in how accurately the child copies from the chalkboard.
- b. Using hands to point to the letters may indicate that the child has a need for tactual or motor reinforcement as he is engaged in a visual task. This may also be a child who will need his finger or a marker as he reads to help him keep his place.

### 3. Tension difficulties:

- a. Changing facial expression indicates that the child is having difficulty in the task. We usually squint, frown, or make some facial grimace when a task is beyond the level of ease of performance or spontaneity.
- b. The child may be manifesting a problem in seeing clearly. The facial grimaces may be evidence of early or beginning myopia, astigmatism, hyperopia, binocular coordinating problems, or some other visual difficulty.
- c. The grimaces indicate restriction in peripheral vision. Ask him what he saw in the room when he read the chart
- d. Moving closer to the chart also indicates stress in processing visual information.

### 4. Expressive language difficulties:

Visual difficulty may also indicate difficulties in expressive language as shown by the child who calls the letters off very slowly with long pauses between letters.

Performance on one test should be compared with performance on other tests before a final evaluation is made. The child who shows reversals or direction difficulties while reading the Snellen Chart should alert you to look for clues in other tests such as, how he organizes his copy forms, how well he functions reciprocally, how he moves his eye as he crosses the midline of his body, how consistent he is with dominance, and how he postures his body as he does close work. The child's past performance should be checked for a history of reversals of letters and words.

As you become aware of a child's performance, even a relatively basic test as the Snellen test can become a meaningful tool. Relating his process of performance on one test with that of others gives us insights into the child's difficulties and from this we can plan a program for remediation.

## Nearpoint of Convergence

The nearpoint of convergence is the point nearest to the eyes where two-eyed vision can no longer be maintained. To check a child's near point of convergence, do the following:

1. Hold a pencil in vertical position about twenty inches from his face, the eraser held level with the bridge of his nose.
2. Ask the child to tell when he sees double as the pencil moves towards him.
3. As you move the pencil towards the bridge of the child's nose, record the following:

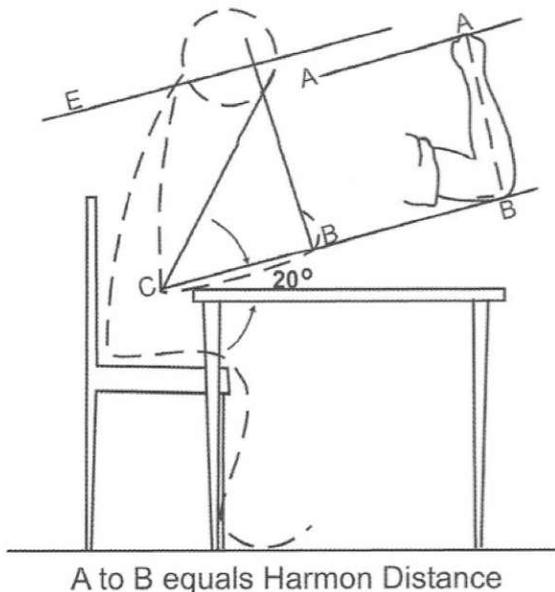
- a. The distance of the pencil from the bridge of the child's nose when one eye turns out. This is the nearpoint of convergence.
  - b. The eye that maintains fixation. This is the physiologically dominant eye.
  - c. The child's report of double vision.
4. Move the pencil away from the child's nose and record the following:
- a. The distance at which he recovers two-eyed fixation.
  - b. The distance where the child reports seeing one pencil.

Satisfactory performance on this test is indicated when a child's near point of convergence is at least two inches from the bridge of his nose. He reports seeing double at the moment you observe his eye turning out, and he recovers two-eyed fixation and reports seeing a single eraser at about four inches or closer as the pencil moves away from the bridge of his nose.

A problem in the use of a child's two eyes as a team is indicated when the near point of convergence is beyond four inches from the bridge of his nose, he does not report seeing double when an eye turns out, the recovery is beyond four to six inches, the deviating eye changes when the test is repeated, the near point of convergence and recovery become more distant when the test is repeated. It is possible that one eye does not release; that is, the child continues to look at the eraser with both eyes all the way to his nose. This lack of release indicates tense performance.

## Near Working Distance

To determine if a child is holding his reading or writing material at a tension-free distance, the ratio between his physiological working distance (Harmon Distance) and his actual working distance must be determined. The Harmon Distance is the distance from the elbow to the first knuckle; the working distance is the distance from the bridge of the nose to the book or paper. Divide the working distance by the Harmon Distance (working distance/Harmon distance).



- A – Mid-point between two eyes
- B – Point of fixation
- Line A-B – Distance from first knuckle to elbow
- Line B-C – 20° out of horizontal
- Line C-A – Points toward center of gravity of body when seated
- Line E – Plane of face – parallel to Line B-C
- A to B equals Harmon Distance (Study board top)

A child is operating under tension while reading or writing when the resulting number is less than one. Research has shown that a ratio of less than one is indicative of a near-point vision problem (difficulty processing visual information at near).

## Dominant or Lead Side

Dominance refers to the eye, the hand, and the foot which leads when an activity is started. The following activities are used to determine a child's eye, hand, and foot dominance (lead side).

## **Posture for activities**

1. Standing: feet apart and in balance.
2. Sitting: back into a chair, feet flat on the floor, body weight on thighs, hands on lap.

## **Presentation of objects**

All objects to be manipulated are presented on the midline which allows a child freedom to select the side he will use.

## **Lead eye**

Have the child sight a toy gun, look through a real or imaginary telescope (a tube from paper towels) or microscope, and look at a picture through a one-inch hole cut in a piece of cardboard. Note which eye and hand is used while performing these activities. (The sighting eye should correspond to the physiologically dominant eye determined in the near-point of convergence test.)

## **Lead hand**

Have the child write, throw a ball, comb his hair, use scissors, use a hammer, brush his teeth, open a door, bat a ball, and erase the chalkboard. Note which hand is used.

## **Lead foot**

Have the child kick a ball, hop on one foot, pretend to stomp on a bug, and skip. Note which foot is used.

A great deal has been written regarding the neurological implications of dominance; however, in reviewing the literature, the exact mechanisms relating dominance to learning have not been established. An investigation of dominance is important to the teacher because dominance affects a child's control of the direction of movement, which is a factor in reading, writing, and arithmetic. When a child has established consistent sidedness (dominance), it is assumed that he will have consistency in the direction of movement and will not get confused when the direction changes, e.g., reading in a left-to-right direction and returning in a right-to-left direction, or in long division. The dominant side, therefore, acts as a spatial reference point. Inconsistent sidedness (mixed or confused dominance) may cause the child's spatial reference point to change as he reads or writes, resulting in confusion, frustration, and reversals.

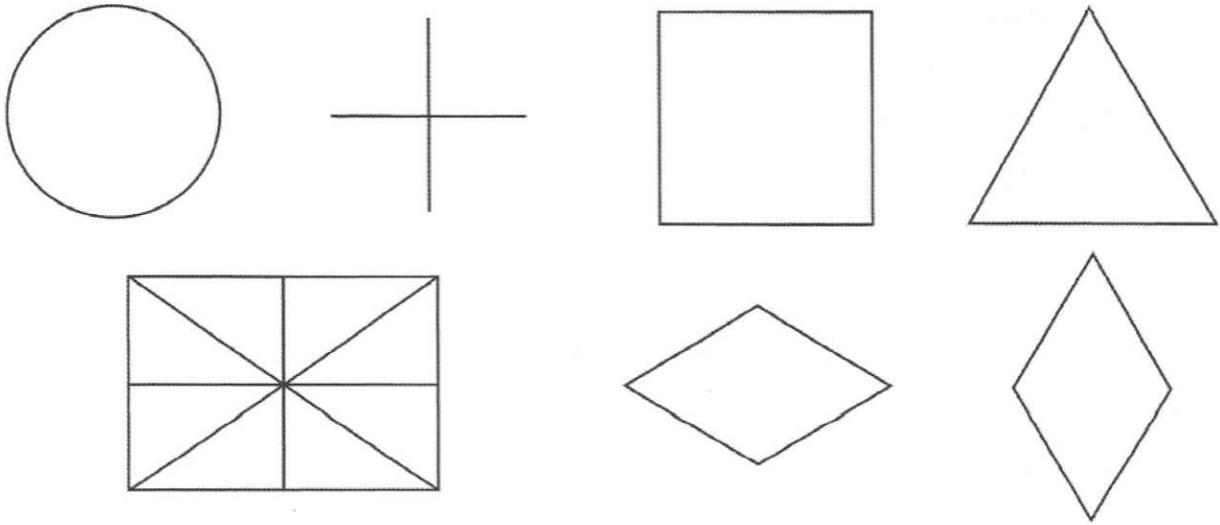
## **The Gesell Copy Form Test**

The Gesell Copy Form Test consists of a set of seven geometric forms which a child is to reproduce on paper. The forms are a circle, cross, square, triangle, divided rectangle, horizontal diamond and vertical diamond. (See illustration on following page.)

The test is usually given to children ranging in age from three years to twelve years old. For our purposes, we will discuss the application of the test to children from the end of kindergarten to grade seven and for children with severe learning difficulty.

## **Procedure**

1. The child is seated at a desk.
2. A piece of paper is placed on the desk in front of him.
3. The paper is placed vertically and in the child's midline.
4. The tester stands in front of the child with the forms.
5. The tester says, "I am going to show you the forms I wish you to make on your paper. I will show you each one and then when I tell you, make them on your paper. You don't memorize them, just look."



The Gesell Copy Form Test

6. After the forms have been shown, say, "Now start with this one and make it on your paper." When the child has reproduced the form on his paper, show him the next one. Repeat until he has made all of the forms.

**What to look for**

1. How does the child sit?
  - a. Symmetrically—both eyes on the task?
  - b. Head to one side?
  - c. Head close to desk and the work?
  - d. Head turned so that only one eye is on the task?
2. How does the child hold his pencil?
  - a. Clutching grasp?
  - b. Normal grasp?
  - c. Unusual grasp?
  - d. How close to the tip does the child hold the pencil?
  - e. Which hand does he use?
3. How does the child hold the paper after its original placement?
  - a. Vertical to horizontal?
  - b. Any other position?
  - c. Rotates paper while he draws the lines?
4. How does the child execute the forms?
  - a. Fingers only?
  - b. Fingers and wrist?
  - c. Whole arm movements?
  - d. Arm and body movements?
  - e. Rotates the paper for any or all lines?

- f. Looks at the form once and then reproduces it?
  - g. Looks at one line at a time and reproduces it piecemeal?
  - h. Traces over the printed form with his finger or pencil before he draws it?
  - i. Moves his eyes and head as if he is tracing over the form before he draws it?
  - j. Slowly and methodically, or spontaneously?
5. How does the child arrange the forms on the paper?
    - a. Left to right?
    - b. Right to left?
    - c. Around the center?
    - d. Overlapping?
    - e. Vertically?
    - f. Random arrangement?
  6. How does the child follow directions?
    - a. Asks for orientation by saying, "Where should I start?"
    - b. Puts the forms down spontaneously?
  7. How does the child indicate the need for emotional support?
    - a. Asks for approval of his performance by saying, "Is this all right?" or, "Is this the way you want it?"
    - b. Criticizes himself by saying, "I could do better"; "I need a ruler"; or crosses out his work?
    - c. Strives for perfection?

### **What it means**

1. How the child sits
 

When a child sits to one side and blocks the use of one eye or gets close to his paper, difficulty may exist in the following areas:

  - a. The demands of the task are greater than the child's ability to meet those demands.
  - b. He is holding his pencil too close to the point.
  - c. Lack of freedom in the control of arm and body movement indicating restriction of movement.
  - d. Lack of adequate reciprocal integration between the right and left half of his body.
  - e. Use of his eyes as a team.
2. How child holds his pencil.
  - a. Child's preferred hand-right or left handedness. (Does it agree with dominance?)
  - b. Insights into the degree of fine motor control.
  - c. Ease of movement.
3. How the child holds his paper.
  - a. His most comfortable orientation to direction, e.g., the easiest way to hold his paper to write.
  - b. His adaptation to the classroom teacher's instruction of how he is to hold his paper.
4. How the child executes his forms, and inadequate control of movement.

- a. Restriction in movement when he uses fingers only, fingers and wrist, body movements, or rotates his paper.
  - b. Tracing over the forms with his finger, pencil, or eyes and head indicates that the child needs motor or tactual reinforcement in addition to his eyes. It indicates that he has not developed to the stage where he can gain information from eyes alone.
  - c. Looking at one line at a time indicates that the child cannot visually handle the form in its totality. Visual memory may be inadequate. This may reflect in segmented reading.
  - d. Using eyes in one glance indicates that the child can gain information by seeing wholes.
  - e. Degree of adequate muscular control of movement.
  - f. Adequacy of a child's form concept.
5. How the child arranges the forms on his paper indicates the child's organization of the direction of movement within himself. Deviation from the left to right arrangement of the forms indicates disparity between the child's inner organization of movement and the left to right direction of the classroom demand (reading and writing). The greater the difference between the organization of the forms and the classroom demand, the greater will be the tension developed by the child as he attempts to meet the classroom demand, requiring adaptation to the demand by restriction or withdrawal from it.