FUNCTIONAL VISION ASSESSMENT FOR CHILDREN WHO ARE YOUNG AND/OR MULTI-DISABLED

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BACKGROUND INFORMATION

Vision has been characterized as the most valuable sense for interpreting one's world (Allen & Fraser, 1986). The visual sense is unique in its ability to organize other sensory information and to provide simultaneous information from near and distant locations (Teplin, 1995). For many students who have visual impairment, vision will remain an important learning and literacy modality.

The practice of completing a functional vision assessment (FVA) is one of the hallmark features of the certified teacher of students who are visually impaired in the education of children who are visually impaired. The information that is gathered from a FVA is often quite different from what is typically gathered from a clinical vision evaluation at a doctor's office, as it is not diagnostic or treatment oriented. The goal of a FVA is to determine what and how the child sees, and what can be done to best facilitate learning through the visual sense.

For children who experience multiple disabilities, it is vital that an accurate FVA be completed. For many children, this information will make an important difference as to how their communication systems and educational programming are tailored.

This paper will review the following components of FVA for children who are very young and/or who experience multiple disabilities: (a) the philosophy of FVA, (b) the preparation process, (c) the unique assessment needs of children with multiple disabilities, and (d) assessment content and strategies.

PHILOSOPHY OF ASSESSMENT

The individual or team philosophy of the person(s) involved in completing a FVA will guide the direction and the outcome of the assessment. The following guidelines are offered as "best practice considerations" for both parents and professionals:

1. Parent information and participation are vital to the credibility of the assessment results. The first practice involves gathering functional vision observations from the family. Parents or primary caregivers are, almost without exception, the most knowledgeable persons about their child's functional abilities. They have the opportunity to observe the child in a variety of settings and daily routines. Simply put, most parents know their child better than anyone else.

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It might be helpful to provide a format to "package" parent observations within the FVA process. For example, the seemingly simple question of "What is the smallest item that your child sees?" may actually be too broad or even nebulous of a question without further explanation. The question could be restated as, "At mealtime, do you notice your child picking up small pieces of finger food?" If the answer is yes, more information can be gathered about the overall dimensions, color, and contrast of the food and its background.

The second practice involves parent participation in the assessment process. Parent facilitated activities may yield more positive results than the same activity done by an unfamiliar person. Parents can provide invaluable information as to the communicative responses and intent of the child. Sometimes these communication signals are seemingly invisible to a person who is not familiar with the child; changes in breathing or muscle tone may indeed indicate a response to a visual stimulus.

Parent involvement also ensures a partnership relationship that denotes the importance of working together as a team on behalf of the child.

2. <u>It takes time to learn about a child's functional vision.</u> The optimal FVA occurs over several sessions and possibly involves more than one environment. Multiple environment and time settings are of utmost important for children who experience multiple disabilities to truly build a perspective of the child's visual and other sensory functioning.

   It may actually be easier, in some instances, for a child not to use her vision (Jose, Smith, & Shane, 1980). It will take time to learn how to best facilitate a visual response for a child. This is particularly relevant for the child who has cortical visual impairment and/or has additional disabilities.

   If it is not possible to observe and interact with child over more than one session, it is important to check with the people most familiar with the child to determine whether a true perspective was gained during the one time evaluation. In this scenario, the evaluator should caution that the assessment findings may be limited in nature.

3. <u>A team approach provides an optimal means to gather information about the child's functional vision.</u> Team members should include the family, and appropriate medical and educational professionals. Each person represented on the team can offer a unique perspective of the child's development.

   It is of paramount importance that all team members work together in both assessment and program implementation. For example, a physical therapist might provide positioning support during the evaluation, while the certified teacher of students with visual impairments (TVI) works to determine the best focal range for object presentation.

   The ultimate goal is to build a program that will meet the needs of the whole child. As with the parable noted in Toni Linder's (1990) book on transdisciplinary play-based assessment, each team member brings different color and texture to what ultimately becomes the tapestry (overall program) of the child. As each of the developmental domains is interwoven, so should the work of a team model.

4. <u>As with all early learning skills, functional vision behaviors are embedded within daily routines of play, communication, self help, and travel.</u> Assessment practices should reflect and reinforce the transfer of functional vision skills into real life settings. The FVA report should have multiple

observations of how the child is using visual information within home, school, and community settings.

One of the most important areas to factor the child's functional vision skills into will be his or her communication system. Eye preference, near vision discrimination, oculomotor coordination, figure-ground capabilities, and responsiveness to color and contrast are all necessary factors when building a communication system for a child who is multi-disabled.

5. Each child has a unique learning style. Care must be taken to learn as much as possible about individual preferences for types and sequences of sensory information, motivating materials and interactions, pacing and cueing needs, general temperament, and level of mastery motivation.

6. Both quality and quantity of visual skill development should be considered when formulating a picture of the child's skill level. Actual developmental skills and factors of consistency, visual endurance, and the ability to generalize the skill should be evaluated.

7. A FVA begins the moment the evaluator has the opportunity to observe the child. A considerable amount of information may be acquired by pure observation of the child in her daily environments and routines.

8. Expectations of the child and belief in the professional methodologies being implemented have direct ties to the outcome of the assessment. A positive regard for "the possible" should be exercised, as well as a belief that each child has promise for learning. The demonstration of this promise is either encouraged or restricted by the attitude, as well as the talents, of the adults in the child's world.

FACT FINDING BEFORE THE ASSESSMENT

Depending on the time schedule before the assessment, medical, and general developmental information should be gathered with parent consent. This information will yield important insight for preparing for the assessment process, as well as developing a detailed picture of the child's global sensory and learning needs.

***Medical Information*:** Ophthalmological or optometric information of importance includes the diagnosis of the visual impairment (if one has been made), the age of onset, suggested medical treatment (as indicated), and the overall prognosis of visual stability and visual potential. The type of visual disorder will provide insight what the possible functional vision implications might be. For example, the diagnosis of albinism suggests sensitivity to light and reduced distance vision.

Additional medical information will be necessary to gather to gain deeper perspective of the child. Other health or medical concerns such as concomitant diagnoses (cerebral palsy and/or a seizure disorder, confirmation of a presence or absence of a hearing loss, and feeding complications) will be valuable information to the assessment process.

If medications are taken, it is important to obtain information of the types of drugs used as many have side effects. Anti-convulsant medications in particular may influence the child's level of alertness, and both ocular and auditory functioning.

Developmental Information: Knowing the developmental level of the child's cognitive skills will provide a wealth of information what types of materials to bring and activities to plan (Levack, Stone, & Bishop, 1991). The person who completes a FVA will have richer assessment results, if she knows how to invite and sustain the child's interaction. A motivated child is one who is engaged at an appropriate developmental level and one who will ultimately perform at her optimal level.

The child's age will often provide usable information as to the possible developmental range. With a young child, the range of cognitive skills is obviously easier to estimate than with an older child. If the child has been enrolled in an educational program, it would be helpful to ask for information regarding her developmental status.

ASSESSMENT TOOLS AND MATERIALS

The selection of a FVA protocol is typically tied to the personal preference of the person using the tool. It is common to find a TVI who pulls from a variety of assessment tools to compile the favored components of different protocols.

The assessment tool, whether it is a commercial protocol or a homemade one, should be user and child friendly. User friendly infers that the evaluator has a strong working knowledge of the content of the assessment and is not dependent on constantly referring back to the protocol for the next step.

Child friendly infers that the assessment content not be restricted to the baseline example often given on a protocol as "how the skill is demonstrated," but rather can be expanded to the repertoire of the many ways the skill can be functionally demonstrated.

The testing materials will vary depending on the developmental and chronological age of the child. With some ingenuity, it is possible to use materials that are considered "age appropriate" while still maintaining the specific skill being probed. For example, eye-hand coordination can be assessed with a variety of types of containers. For the very young child, a shape container might be used whereas a crayon case or a change purse might be used for an older child or youth.

Testing materials should be reflective of the normal objects within the child's world and be culturally and therapeutically appropriate. Both real life items and toy items should be included. Research with young children who are deafblind indicates that materials that are novel and have visual complexity are often the most motivating. Assessment materials that might be needed in addition to actual testing items include adaptive seating devices for the child who has a physical disability. Assistive technology materials may also be appropriate.

ASSESSMENT ENVIRONMENT

Familiar versus Unfamiliar Settings: Many children demonstrate different personality characteristics and even abilities between environments that are familiar or unfamiliar. A familiar environment often yields optimal performance behaviors as the child is relaxed and cognizant of what is expected within that setting. If an unfamiliar setting is utilized, time should be provided for the young child to explore (as desired) and to feel comfortable.

As possible, the child should be observed within her natural environment(s). This allows for a realistic portrayal of functional vision skills. For example, sensitivity to light could be observed on the playground for one child whereas it might be best observed in a vocational setting for a student in high school.

Environmental Control Factors: The final consideration of the evaluation environment is whether it can be designed or controlled to enhance functional vision performance. The ability to control the amount, type, and position of lighting should be considered. In addition, possible background auditory and visual distracters should be eliminated to allow for optimal success of the child's performance. Children who are prone to a startle response and/or who have cortical visual impairment are especially susceptible to over-stimulation; thus, benefiting from a subdued, more controlled learning environment.

FVA CONSIDERATIONS FOR THE CHILD WHO IS MULTI-DISABLED

A child who has a diagnosis of a visual impairment and additional disabilities presents an important challenge to the evaluator to find the best means of accessing visual and developmental potential. As with all children, this population of special children deserves careful attention so that optimal assessment results may occur.

Common concomitant disabilities include hearing loss, physical disability, and developmental challenges. In addition, the child may have health complications such as a seizure disorder, respiratory problems, and/or overall medical fragility.

Levack and colleagues (1991) list several guidelines for assessing children whom are very young or who have significant developmental delays. Key recommendations from her work are as follows:

Establish Rapport: Before physically interacting with the child, time should be allowed to establish a baseline relationship. The play-based style of assessment is designed so that the evaluator follows the child's lead. The initial part of the session is a period of free play. A familiar person such as the parent(s), a sibling, or a teacher can be alongside the child, if this increases the comfort level of the child. As the child demonstrates an interest in an object, the evaluator can ease into the interaction using the object of interest as a means of introduction.

Type of Visual Stimulation Utilized: The choices for visual targets or stimulation presentation styles are different for children who have different causes of visual impairment. Bright colors, visual complexity, and novelty are typically recommended as key characteristics of visual stimuli for children who have an ocular impairment. Within the range of ocular disorders, there are variables that may be better for some children and worse for others. For example, children with albinism may not respond well to brightly illuminated targets because of light sensitivity.

Bright colors, familiar objects, and reduction of visual clutter have been recommended as key characteristics of visual stimuli for children who have cortical visual impairment. A good rule of thumb with this population of children is "less is more" when it comes to visual presentations.

Each child, of course, must be viewed for her individual needs. It is best to begin with one type of visual information and gradually add more input as it appears that the child has either a tolerance or need for more sensory information.

Importance of Positioning: Careful attention to the child's physical positioning will increase visual performance. Anytime the child is in a position where she is falling into gravity; her energy will be deflected from the visual concentration task at hand. Simply put, the first priority will always be postural security. It may be too great a request for a child with a physical disability to provide both self achieved motor stability and a visual response.

An analogy for adults to consider is the scenario of attempting to read a book while maintaining balance on both tiptoes. While reading may continue for a period of time, it is probable that actual comprehension will be sacrificed at some level depending on the physical ease of maintaining one's balance.

If the child demonstrates head stability, it is because he has good trunk stability. Low postural tone will influence trunk stability and thus, head control. If the child has poor head control, he will require some form of artificial support to keep his head in a neutral position. For the young child, this might be a supine position on the floor, a lap of a favorite person, or a seating device that offers good trunk stability.

General guidelines for positioning according to Yates (1989) are as follows: (a) the child should be visually symmetrical and should not fall into gravity; (b) have positioning support for the bony parts of her body for physical comfort; (c) have support where it is necessary, but not at the expense of voluntary freedom of movement; and (d) be positioned in a way that does not reinforce an abnormal muscle pattern.

Children with physical disability may present great positioning challenges. Physical and occupational therapy consultation is important for optimal results.

Wait Time: "Wait time" is an assessment guideline that often gets good press, but lacks strong implementation. For the child who has a physical challenge and/or cortical visual impairment, "wait time" might mean a good long wait such as several minutes between trials. The amount of wait time between trials must be balanced with the child's need for a prompt. A trained eye will assist with this judgment call, as will the collective expertise of the people who know the child best.

Once a child has had an opportunity to practice his response, wait time is typically decreased. It's the early learning time that requires patience.

Subtlety of Child Responses: Observation skills must be finely tuned when assessing a young child, especially if the child has multiple disabilities. A response to presented stimulation may be seemingly invisible; a change in respiration, muscle tone, vocalization, quieting and/or slight body movement or stilling (Jose et al, 1980). For example, the child who has hypertonicity may respond to visual stimulation by a further increase in muscle tone.

Response Patterns: Important information can be gathered by observing what senses are used first when a child interacts with a new object. Vision may or may not be the first sense to be engaged. Many children who are cortically visually impaired and/or who are deafblind may have a distinct pattern of sensory exploration. The child's head might be used to touch an object before the hands or the child may bring the object to his ear and listen for a sound before embarking upon a visual examination. This is all a part of the unique learning style of each child.

COMPONENTS OF THE FUNCTIONAL VISION ASSESSMENT (FVA)

During the evaluator's time with the child, both in pure observation and more deliberate assessment activities, an overall picture of the child's functional vision performance can be gathered. The following components should be considered within the framework of a functional vision assessment.

Medical Intervention Information: **A** FVA begins with observing the child's overall physical appearance. Specific information on prescriptive lenses (either glasses or contact lenses), safety glasses, eye patching, conformers, or prostheses should be noted. Detailed information such as the exact prescription, circumstances of when the prescriptive lenses are worn, the specifics of a patching schedule, and so on can be gathered from the family or the actual eye care specialist.

Appearance of Eyes: **The** general appearance of the child's eyes and area around his eyes should be noted. The size of the eyes, unusual smallness or larger, more bulging eyes are all areas to observe.

Any observed asymmetry is important to document, such as a difference in the size or position of either eye. Other areas to observe include the clarity of the cornea, sclera, and pupil; evidence of excessively teary or mattered eyes; the presence of styes, ptosis, or nystagmus; and deviation of eye gaze or position.

Dr. James Jan and colleagues (1986) recommend that the child's eye movements be observed for important information about the onset, severity, and type of visual loss. A distinction may be made, for example, between children with ocular and cortical visual impairment. Slow roving eye movements accompanied with short visual attention may be indicative of cortical visual impairment.

Visual Based Reflexes**:** Visual based reflexes are involuntary motor responses to specific types of sensory input. Certain reflexes are present at birth while others complete their development in the first six months of life.

Pupillary Response: Under normal circumstance, the pupil responds to changes in immediate illumination by constricting with more light and dilating with less light. The presence of a normal pupillary response does not rule out a problem with the visual system as a child with cortical visual impairment may demonstrate a normal pupillary response (Allen & Fraser, 1986). Nor is a pupillary response to light completely synonymous with actual visual awareness, but it does suggest functional afferent and efferent pupillary pathways (Nelson, Wagner, & Breton, 1984).

Allen and Fraser (1986) also state that the absence of a pupillary response should also be interpreted with caution as certain medications and/or the presence of neurological dysfunction may inhibit this reflex.

Defensive Blink: A defensive blink can be elicited to a large visual target that is rapidly presented in the infant's central visual field. It is a learned reflex. By five months, the infant has a defensive blink to oncoming objects of various sizes in both the central and peripheral fields (Nelson et al, 1984).

Doll's Eye Response: Also called the vestibulo-ocular reflex, this involuntary association of head and eye movement is typically fully integrated by three months of age. While it is present, the eyes appear to move in the opposite direction of the head when the head is turned (Erhardt, 1980). In actuality, there is a delayed response to the head turning. As the infant matures, eye movements become fully independent of head movement.

Reception and Perception of Visual Stimuli: **Reception** of visual stimuli refers to the physiological potential of visual system to take in the sensory information. Perception of visual stimuli refers to the ability to react to the sensory information in a meaningful way.

This information will provide an assessment foundation on which to build. If light projection is noted, for example, as the primary level of visual responsiveness, the oculomotor portion of the assessment will be completed using a variety of different types of light sources as the testing items.

Light Perception: The first level of visual responsiveness to a light source is the ability to react to the presence of a direct light source. It may be important to expose the child to a period of total darkness before a light source is introduced. Most children respond best to a colored light source. Colored penlight caps, cellophane paper, or transparent rubber pencil toys may be used to as a means to probe a reaction to colored light.

Light Projection: The ability to orient in the direction of a light source is called light projection. It is typically demonstrated by turning toward the source of the light. "Finger flicking" or light gazing behavior may indicate light perception (Jose et al, 1980).

Shadow and Form Perception: The ability to discern shadows and the general outline of a form may be demonstrated by the child's finger flicking, light gazing, or moving an object back and forth in front of a light source.

Detection of Motion: The ability to note visual movement involves the use of peripheral receptors in the retina. Suggested testing materials include balloons, slinkies, and objects with either internal or external movement. The child may turn her head and/or her eyes in the direction of the movement.

Color vision: Approximately one out of every twelve boys and one out of every 200 girls have some type of color vision deficiency (Patterson, 1980). Heredity plays a significant role in the color vision problems.

The ability to assess color vision is difficult with the developmentally young child. The first true means to evaluate the child's ability to discriminate color is at a developmental age of twenty-nine to thirty-three months when matching of primary colors can be accomplished as indicated by Furuno and associates (1984). They further indicate that the behavior of sorting colors is a developmental skill of 33 to 36 months. It is possible to use the Holmgren Color Wool test with a three year old child is highly motivated to match the numerous color strands.

Participation in the Ishihara Color Plates with the embedded colored trails may be performed by an older preschool age child who can understand how to trace the color trail. An advanced preschooler or kindergarten-aged child will be able to identify the color plates with the embedded numbers.

Prior to these noted developmental levels, it is helpful to note whether the child demonstrates any preferences or aversion to specific colors. Preferences might be demonstrated by an increase in visual interest, level of sustained visual interest, and/or distinct selection of an object of a certain color over the same object of a different color. Children who are cortically visually impaired will often respond favorably to certain colors such as red, yellow, and orange. There are also children with this diagnosis who appear to demonstrate an aversion to certain colors.

Contrast Sensitivity: While Snellen type acuity charts rely on the visual system to discriminate the critical detail of high-contrast optotypes. This mode of testing is "often not representative of many real-world conditions" according to Dr. Mark Mannis (1987). In the wide variety of illumination and contrast circumstances of the real world, a person's ability to achieve quality visual resolution may differ considerably from one situation to another. This ability is called "contrast sensitivity".

The functional implications of poor contrast sensitivity include difficulty with determining the relative difference between the lightness and darkness of the visual display (Morgan, 1992). This difficulty may influence facial recognition, picture or symbol decoding, or the ability to visually locate an item from a grouping.

While there are contrast sensitivity tests, these items require some type of reporting of what is and is not seen from a qualitative point of view. For this reason, many children who are developmentally young or who have multiple disabilities would be excluded from this type of testing process.

If the child is not at an appropriate developmental level to participate in this testing, it is possible to acquire information about the functional level of contrast sensitivity by observing changes in visual performance as the level of contrast is increased or reduced from situation to situation.

In some situations, sunglasses, filters, and/or changes in illumination will help the individual with reduced contrast sensitivity (Morgan, 1992). For children who ultimately will use a picture or communication board, contrast sensitivity is an important factor of optical consideration. It may be that a child will do better in identifying a picture or symbol, if strong contrast and a possible color filter are used.

Visual Acuity: Visual acuity refers to "the measurement of the sharpness of the sense of vision as it relates to the ability to discriminate detail" (Levack et al, 1991). The notation for normal visual acuity is 20:20.

Visual acuity numbers provide an important piece of information about a child's functional vision. These numbers, at their best, offer a global expectation framework of what the child may or may not be able to see. To put this concept to the test, ask yourself what does the notation of "20/200" tell you about what a child can or cannot see? We can decipher that 20/200 marks legal blindness and that it probably translates to poor distance vision. But it does not provide true functional information as to what a person with that visual acuity can see.

In fact, two children with the exact same visual acuities may demonstrate very different visual functioning. This may due in part to both contrast sensitivity, ability to use cognitive clues to decode compromised visual information, and personal familiarity with a visual situation.

The numbers associated with visual acuity do provide a legal framework of legal blindness. Visual acuity may determine whether a child will qualify for educational and other types of assistance services. Typically near and distance visual acuity is determined through a standardized testing process. However, informal observation methods can be used to estimate visual acuity. Both processes will be briefly reviewed.

Forced Preferential Looking Tests provide a means to measure the visual acuity of children who are unable to participate in testing which requires picture, letter, or symbol matching and/or a verbal identification responses. Forced Preferential Looking Tests are typically used with infants and children who are nonverbal and/or multi-disabled who are have a developmental level below two years of age (Levack et al, 1991).

Other tools to measure visual acuity include picture and symbol tests. These tests require some level of participation by the child. If the child is unable to consistently verbally identify his name for the picture or symbol, he must be able to point to its counterpart match which has been placed in front of him as the possible picture or symbol choices.

The Lighthouse Visual Acuity cards, for example, have three pictures: an apple, an umbrella, and a house. Children may call one or more of these pictures by a different name. Children in Unuit villages in Alaska, for example, often do not have personal experience with an umbrella. For these children, a substitute name of tree or flower was used. The important factor is identification consistency. As long as the word "tree" or "flower" is always used for the umbrella, the evaluator has confirmation that the child knew what picture was being presented.

For children who are nonverbal or have inconsistencies in their language, a matching exercise can be arranged. Copies of the picture choices can be placed in front of the child on the wheelchair tray or table. When one of the Snellen equivalent cards is presented at the previously determined testing distance, the child has the opportunity to touch the matching picture in front of him to indicate what he saw. The evaluator will need to be patient with the child who requires time to organize a voluntary body or eye pointing movement. It may also be wise to consult with a motor therapist prior to the testing to determine the best physical lay-out of the choice cards based on the motor capabilities of the child.

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A functional estimate of a child's visual acuity can be determined by observing the smallest objects such as cereal pieces or cake decoration pellets that a child visually locates. The size of the object can be factored into the focal distance of the object from the child's eyes to determine an estimated visual acuity.

<u>Oculomotor Behaviors</u>*:* Factors which may negatively impact oculomotor refinement include postural tone abnormalities which influence head stability, retention of the Doll's Eye Reflex or other motor reflexes, strabismus, and developmental immaturity.

Children with abnormal postural tone are at the greatest risk for problems with head stability. Retention of the Doll's Eye Reflex is more common with children who have cerebral palsy or some other form of neurological involvement. Strabismus is a common problem for children who have Down syndrome, Fetal Alcohol syndrome, cerebral palsy, or who were born prematurely.

Eye Muscle Balance: Both eyes should be equally aligned in appearance by three to six months of age (Nelson et al, 1984). A persistent deviation at any age should be referral criteria for an evaluation by an eye care specialist.

There are three functional vision evaluation measures that determine eye muscle balance. The first two tests address the possible presence of tropias, which are "manifest deviations of the visual axis which fusion cannot control" (Patterson, 1980). The third measure tests for phorias or "latent deviations of the eyes that fusion can control."

The Hirschberg Test or the corneal reflection test is used to determine if a tropia is present. To administer, a light is held three feet away from the child's eyes. As the child looks at the light, the evaluator observes whether the light is symmetrically reflected in the child's eyes.

A normal reflection should be located in the center of each cornea. If the reflection is nasal to the center of the cornea, the eye is exotropic. If the reflection is temporal to the center of the cornea, the eye is esotropic. Superior displacement may indicate hypotropia and inferior displacement may indicate hypertropia (Patterson, 1980).

The Cover - Uncover Test should be administered with the child's optical correction in place. Administration is done by first establishing the child's fixation on a visual target in front of him, then quickly covering one of the child's eyes and noticing (at the same time) whether there is any redress movement of the uncovered eye. If there is no redress movement when either eye is tested, the results are to be considered normal.

A tropia can be inferred if there is redress movement in any of the following patterns:

Esotropia:	"in position" toward an "out position"
Exotropia:	"out position" toward an "in position"
Hypertropia:	"up position" to the "down position"
Hypotropia:	"down position" to the "up position"

The Cross - Cover or Alternate Cover test helps to flush out a possible phoria as the tendency for an eye(s) to deviate is typically not observed under natural viewing circumstances. Again, the child should have his optical correction in place, if such lenses have been prescribed.

To administer, the evaluator first establishes the child's fixation on an object in front of him. While the child is fixating, the evaluator then covers one eye with an occluder, then quickly passes the occluder across the bridge of the child's nose while watching for any redress movement in the newly uncovered eye as it resumes fixation on the object of visual interest.

All individuals will show some level of redress movement. If the movement is over 1/2 to one millimeter of movement, however, it is significant for indicating a phoria. The direction of the redress movement and the resultant type of phoria (eso, exo, hyper, and hypo) are the same as with the Cover-Uncover test.

The risk of any eye deviation is resultant amblyopia from visual suppression of the nonpreferred eye. Children who demonstrate either a phoria or a tropia should be referred to an eye care specialist for further evaluation and possible medical treatment.

Fixation: The ability to lock one's gaze on a visual target is called fixation. By six months developmental age, both eyes should show strong teaming during fixation tasks. Both near range and distance fixation abilities should be evaluated.

Factors to assess when evaluating a child's ability to fixate include eye widening or squinting; eye, head, and/or body positioning; eccentric viewing patterns; focal range of fixation targets; size of fixation targets and associated figure/ground contrast; and demonstration of an eye preference.

Visual Pursuit / Tracking: A distinction can be made between visual pursuit and tracking skills. The former involves following a moving object; maintaining fixation on the object that happens to be moving in space. The latter involves moving the eyes across a visual plane of stationary items such as during reading.

Variables to consider include the child's head and body position; eye teaming ability; the color, size, speed, and movement pattern of the moving object (direction and range); the quality of the pursuits (fluid versus segmented, presence of accompanying head movements); and the influence of repetition on accuracy and overall visual endurance. Full range motility should also be observed, as should the ease of crossing midline.

Convergence and Divergence: The ability to maintain fixation on an oncoming object is called convergence. Divergence occurs when one continues to hold fixation upon a retreating object.

Factors of assessment consideration include the size, color, and focal distance of the object; the influence of repetition on accuracy and visual endurance; and the ability of the eyes to team.

Shift of Gaze: The ability of the eyes to release fixation on one target to look at another object is called shift of gaze. It is an important communication prerequisite for making visual choices.

Factors of assessment consideration include: the size, color, focal distance (same or different between the two targets), and horizontal spacing of the objects used; presence or absence of visual clutter and/or additional sensory cueing such as using a sounding target or causing the target to move to catch the child's eye; quality of the gaze release (with or without a blink); and presence of accompanying head movement during the gaze shift.

Scanning: Shifting gaze from one object to another in a visual search pattern is called scanning. Scanning involves a visual search in a line from one visual target to another.

Assessment factors include: the size, color, shape, and focal distance(s) of the objects; the visual field parameters of the search; the presence or absence of visual clutter; body and object positioning; visual coordination; use of accompanying head movements; and overall visual endurance.

The evaluator should be aware of field problems that may be identified through scanning activities such as an obvious “missing piece” section of the visual search parameters or the consistent use of accompanying head movements to pick up missing piece.

Field of Vision: Care should be taken to eliminate any tactile, visual movement, and auditory clues during visual field testing. If possible, monocular testing should be completed during visual field testing to ensure accurate results (Allen et al, 1986).

Factors of assessment consideration include the size, color, distance, and precise field location of object; irregular eye or head posturing; fluid versus segmented eye movements; and presence of accompanying head movements. Materials that can be used include penlight(s), a slinky, soap bubbles, multi-piece objects such as marbles or pick-up sticks, and finger food.

Depth and Figure Ground Perception: Depth perception requires binocular vision. Both eyes must team together to achieve three-dimensional visual fusion.

For children who can respond to verbal directions with a physical action or a verbal response, there are tests to determine stereoscopic vision. Three in particular are the Stereoscopic Vision Screening, the Stereo Fly Test, and the Reindeer Test. All three of these tests are performed with 3-D glasses. The child is asked to touch a certain part of the picture (the piece that is presented with a 3-D image) or indicate which item is closer to them.

For children who cannot participate in such testing, there are many functional opportunities to observe a child's ability to discern depth. Eye-hand coordination activities that require precision placement can provide an abundance of information about the child's depth perception, unless the child has physical disability that negatively influences fine motor accuracy. A major sign to look for is an accurate reach for the object; any indication of a consistent over reach, under reach, or hand placement to the side of the object may be significant for poor depth perception (Jose & Smith, 1979).

Another informal testing means is observations of the child's ability to visually decode changes in ground surfaces. For example, does the child consistently miss a step up or a step down; does she anticipate oncoming surface changes; and can she differentiate between actual surface changes versus only color changes between two ground surfaces such as tile and carpet.

Assessment factors include possible motor involvement that would affect prehension accuracy or navigation of surface changes; and color and contrast of object, background, and surface changes.

Figure Ground Perception: The ability to discern an object from its background is called figure ground perception. Examples of functional means of assessment include noting whether a child can find an object located on a busy background (e.g. multicolored floral quilt), or find a certain toy located in a pile of other toys, and/or locate a select detail in a picture.

Assessment factors include: color, familiarity, novelty of visual target; presence or absence of visual clutter; level of background contrast from the object; and the focal distance between the child and the item of interest.

Visual Motor Coordination: Visual motor coordination encompasses both the skills of fine and gross motor coordination. The skills of visual directed reaching, stacking, opening, closing, inserting and removing objects are included in the visual - fine motor category. Visual navigation during movement activities, kicking a ball, and stepping up a step are all examples of visual - gross motor coordination activities.

Factors of consideration include: size of objects, focal distance, background contrast, presence or absence of visual clutter, body position/support, position of objects; accuracy of reach or kick; tendency to look at or away from the object that is about to be contacted; and the influence of a physical disability.

Children who have both a sensory and a physical disability may demonstrate poor fine and gross motor accuracy. The challenge for the team is to sort out what the influence of the motor disability has upon these skills as compared to the influence of the visual disability.

Attention to reducing the physical complexity of the task and the possible use of assistive technology will help with deciphering this information.

Visual-Cognitive Skills: Visual-cognitive skills involve both visual discrimination and problem solving. The task may be set up differently for children of varying functional vision abilities. As possible, the motoric component of the task should be adjusted to meet the needs of children with physical disability.

Causality Involving Visual Discrimination: An infant learns to activate an object based on initial random body movements that produce a sensory result. With repetition, the baby learns to apply intention to her body movements as she deliberately comes into contact with objects in her environments. As familiarity with an object occurs, she begins to associate using certain actions on that object to achieve a desired response. For example, a young infant will learn that a rattle provides a sound when it is shaken and a squeak toy makes a sound when squeezed.

Assessment factors include the novelty or the familiarity of object; developmental level of object schemes; and the child’s physical abilities and possible limitations for voluntary body movements. In the event of physical restrictions, it will be necessary to create a reactive environment in which even the slightest of volitional movement can cause a sensory result.

Object Permanence: The ability to remember the existence of an object even when it is no longer in view, touch, or sound is called object permanence. By nine months of age, object permanence is typically present; the infant at this age will demonstrate a continued search for an object hidden from view. The child who is blind demonstrates object permanence by displaying a continued search for an object that has been removed from touch.

Prior to nine months, the infant will demonstrate prerequisite behaviors such as visual pursuit of a moving object, pursuit of a partially hidden object, anticipation of a visual trajectory, search for a newly dropped object.

Assessment factors include the use an object or person that the child has an interest in (the more motivating, the increased desire to search); and familiarity of routine.

Means End Activities Based on Visual Discrimination: Examples of early means end behaviors include using a visually directed reach to obtain a toy, pulling a cloth or a string to obtain a toy, using a stick or dowel to obtain a toy, scooping food with spoon; and using a mobility device to detect obstacles and surface changes.

Visual Imitation: The ability to reproduce an observed motor response is called visual imitation. It may be reproducing a facial expression, a familiar action such as shaking a toy, or a novel action such as making a new communicative gesture or sign.

Assessment factors to consider include focal distance of presentation from the child; the level of contrast and size of objects involved; and familiarity or novelty of the action(s) involved.

Identification, Matching, Sorting, and Classification of Objects and Pictures: Visual recognition of people, familiar objects, and pictures is the first step. This may be demonstrated by a change in behavior when a familiar person, object, or picture is presented to the child. Person or object preferences should be noted.

Labeling of objects necessitates symbolic language of some form. Symbolic labeling may be demonstrated by verbal language, sign language, pictures, and tangible or pictographic symbols.

Matching occurs when a child is given a model of what objects go together. Matching is initially completed with pairs of familiar objects and moves into more complex matches such as putting an object and its corresponding picture together.

Finding pairs or groups of similar objects (clothing, daily living objects, toys) without a model is an example of sorting. Placing items into groups such as these objects or pictures are involved with eating and these objects or pictures of objects are involved with grooming are examples of classification. For the nonverbal child with physical disability, actual manipulation of the items into piles may not be necessary. The child may indicate her choices of where the objects go with a gross hand/arm movement or by eye pointing.

Assessment factors include: the familiarity of the object or picture content; clarity of picture (contrast, reduced visual clutter); size and color of object or picture; focal distance of presentation; and illumination level.

Identification, Matching, Sorting, and Classification of Colors: A preference for or a heightened response to certain colors may indicate color responsiveness that is the first step to identification of colors. Actual labeling comes with the ability to use symbolic language. Pairs of familiar items such as socks, matching fabric swatches, or other color coded items such as plastic teddy bears / matching primary colored plates can be used for matching, sorting, and classification tasks.

Assessment factors include the use primary colors and various shades of color items; varied intensities of colors; type, amount, and positioning of illumination.

Visual Sequencing: Visual patterns produced by stringing beads, nesting items, and story pictures are three examples of how a child might demonstrate the ability to copy a visual pattern.

Assessment considerations include visual familiarity, novelty, and overall complexity of items; the child's developmental level; and the amount, type, and positioning of lighting.

Environmental Factors of Consideration: The final portion of the FVA should be to observe the influence of the environment upon the child's visual discrimination abilities. Factors of consideration include:

1. *Sensitivity To And / Or Need for Light:* type, amount and positioning factors, sensitivity to glare, ability to adjust to sudden or gradual changes in illumination, etc.

2. *Sensitivity to "Visual Clutter:"* ability to discern figure-ground, and need for postural adjustment to reduce visual field so as to eliminate extraneous visual information.

3. *Need for Contrast / Color Cues / and Object Size Preferences:* changes in visual performance based on use of contrast, color, and/or increased object size.

This information can be used to modify the child's learning environment as needed. The modifications may be in the form of visual display, overall environment, assistive devices, and or personal effects changes such as the use of sunglasses.

SUMMARY

A functional vision assessment should be completed by a TVI, with the input from the child's educational team. A team process is critical to meet the educational needs of a young child with visual impairments who may or may not have additional disabilities. A team process that includes the family helps to ensure that a program is designed to meet the needs of the whole child.

Gathering preliminary medical and developmental information helps to build a picture of expectation. The evaluator must take time to gather information from the medical community, the family, the educators, and most importantly, the child herself. Careful attention to both the manipulated changes of the environment and the child's behavioral responses, however subtle, to these changes are two key ingredients to the success of a functional vision assessment.

The ultimate indication of success is the actual implementation of the assessment findings in the child's daily care, communication, play, and overall learning routines. Assessment results must be translated into functional information that provides guidance to how sensory information is displayed for an optimal learning opportunity.

If in the end, an adult's expectations of the child's visual capabilities are promoted to a higher level, if a communication system ultimately looks different because of information on how to best "visually package" its content, or if the child herself begins to use vision as an improved means of learning ... then it is safe to say that a successful functional vision assessment has been completed. For the goal of education with all children and especially for the child who so critically depends on others to provide an accessible route of learning, is to open the doors of possibility; of expanded expression and new discoveries.

Special Note: In addition to a Functional Vision Assessment, the child's educational team should work together to build a complete sensory profile that addresses the full sensory capabilities and needs of the child. This paper has only addressed the functional vision assessment needs of the child.

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