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ABSTRACT

This manual is intended to provide information leading to reliable assessment of vision and hearing capabilities of children considered to have dual sensory impairments. Ongoing sensory assessment is necessary to determine the extent of residual sensory abilities that should be considered in educational programming decisions and to determine any changes in those abilities. The visual assessment involves review of relevant medical reports and previous assessment results, and assessment in the areas of reflexive visual processes, field of vision, ocular motility, and visual acuity. Auditory assessment may involve such alternative procedures as tangible reinforcement operant conditioning audiometry and visual reinforcement audiometry. The importance of naturalistic observations is emphasized. A list of 8 references and 11 recommended readings is included. (JDD)

SENSORY ASSESSMENT MANUAL

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by

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PREFACE

Perhaps no handicapping condition is as debilitating as the dual sensory impairment of deaf-blindness. All too often, young children with this type of condition have difficulty developing even rudimentary communication skills. This situation is further exacerbated by a relative absence of systematic research, assessment tools, and curricula expressly designed for persons with deaf-blindness. Fortunately, in recent years, the professional community has directed more attention to this population, and various research endeavors have been initiated to develop appropriate and useful materials.

One such effort is the Communication Skills Center for Young Children with Deaf-Blindness (CSC). This project was funded through a 5-year contract that was awarded in 1983 to the Teaching Research Division of the Oregon State System of Higher Education by the United States Office of Special Education and Rehabilitative Services. The overall goals of CSC were to develop, implement, evaluate, and disseminate communication interventions to increase the early communication and language competencies of young children (0 to 5 years) with deaf-blindness. Toward this end a multisite, consortium model was adopted. The CSC was administered through the Teaching Research Division and included as members the Portland, Oregon, Public Schools; University of Wisconsin-Madison, Waisman Center; St. Luke's Hospital, New York; and Utah State University, Exceptional Child Center. At each of these sites specific topics related to communication development in children with deaf-blindness were investigated.

This manuscript is only one of the products generated from the project. It is our hope that the document will be both interesting and helpful to the reader; and that, in some way, it will aid children with deaf-blindness.

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Introduction

Ongoing assessment of the sensory capabilities of young children considered to have dual sensory impairments is critical to the effective education of these children. Decisions regarding instructional methodologies and approaches are made on a daily basis by professionals serving these children; yet, the effectiveness of these decisions is determined largely by the degree to which the child's sensory abilities and limitations are taken into account. While this may appear to be an obvious point, it is not uncommon to find teachers and others who serve the target group who are operating <u>without</u> adequate knowledge of the extent of their students' impairments. This situation is especially common with children who lack sufficient communication skills to describe what they see and hear.

The primary reason for frequent (at least yearly) and thorough sensory assessment of children with dual sensory impairments is to determine the extent of residual sensory abilities. Educational programming for these children will be most successful, and functional, when the programs are designed to utilize sensory stimuli that the child <u>can</u> see or hear. An additional reason for continually updating sensory assessment data is to determine any changes, for better or worse, in the child's sensory abilities. Changes in the extent or degree of the child's sensory abilities may require modifications in instructional materials and/or methodology to meet the changing needs of the learner. Moreover, measurable changes in a child's sensory abilities should be communicated to the medical professionals serving the child so that they can provide the most effective medical interventions.

This manual is intended to provide information that leads to reliable assessment of children's vision and hearing capabilities. While the primary targeted users are educational service providers, other audiences may find this manual useful, including allied health professionals who conduct screening of difficult-to-test individuals for sensory deficits, and rehabilitation specialists who serve adults with multiple handicaps including sensory impairments. Most of the assessment procedures included in this manual can also be used to detect sensory deficits in young children through screening programs.

Since sensory deficits can affect a child's motor, cognitive, social and communicative development, it is imperative that children with developmental delays be screened for possible sensory problems. Children with neurological impairments and certain other potentially handicapping conditions (e.g., Down syndrome, post-natal asphyxia) are statistically at greater risk for sensory impairments than their age peers without such risk factors. Some children may exhibit delays that are directly attributable to reduced sensory abilities and can be adequately served only when the underlying sensory deficit is identified and treated, when appropriate. With children whose sensory impairments cannot be treated, compensatory interventions will increase the likelihood that they will achieve normal development in spite of their sensory deficits. Children whose delays cannot be attributed directly to sensory deficits are no less in need of early identification, treatment, and/or remediation of sensory problems.

Visual Assessment

The first step in a thorough visual assessment is a careful review of relevant medical reports and previous assessment results. Often the pathology or structural anomaly believed to cause a child's visual impairment has been diagnosed (e.g., cataract, retinopathy of prematurity, strabismus). These eye conditions have predictable, but variable effects. For example, a child with congenital cataract would be predicted to have reduced acuity and possible visual field limitations depending on the location of the cataract. The magnitude of these effects can only be determined through assessment of an individual's visual abilities. However, knowledge of an individual's visual diagnosis and the typical effects of the diagnosed condition will assure that assessments are directed at determining the parameters of the visual skills or abilities most likely to be impaired. While it is beyond the scope of this manual to include detailed descriptions of all visual impairments, this information is available from numerous sources, some of which are included in the list of future readings and references in the back of this manual. The practitioner who is unfamiliar with the effects of specific visual impairments should seek out this information from the literature or by consultations with educational or medical specialists in visual impairments.

Next, a variety of assessment procedures should be conducted in the following areas: reflexive visual processes, field of vision, ocular motility and visual acuity. Each of these areas should be assessed in an unhurried, systematic manner. Motivational strategies appropriate to the child should be used throughout the assessment to assure that the best possible performance is observed. Praise or more tangible rewards should be frequent and directed toward the child's participation and cooperation rather than on the "correctness" of the response alone.

Conclusions should never be reached on the basis of performance on a single trial; rather, several trials, ideally across several sessions, will more accurately reflect a child's ability and will limit the effects of attentional or motivational deficits that may confound the results of a single trial The child should not only have repeated opportunities to respond to a particular visual target, but should also have opportunities to make the same desired response to a variety of test objects. For example, a child who fails to respond (e.g., head-turn, track, shift gaze, reach) when a small, light-colored, or nonfunctional object is presented may respond quite differently to objects that are functional and/or are larger or brighter than the first object.

The validity of the results obtained during visual assessments is totally dependent on the accuracy of observations of the tester and the maintenance of appropriate testing conditions such as an absence of auditory and tactile cues that could elicit responses similar to the visual response being assessed. The best way to assure reliability of assessment results is to utilize two observers who previously agree on the criteria for determining acceptable responses. This may be especially important when assessing children with low levels of responding or those with extremely variable responses.

Retesting of an assessment item or items by a second tester is another way to increase the probability that the assessment results are an accurate reflection of the visual abilities of the child.

The following section will describe components of a comprehensive visual assessment.

Reflexive Visual Processes

There are two readily observable visual reflexes: the pupillary response to light and the protective blink reflex. The pupillary reflex involves constriction (decreasing in size) of the eye's pupil in response to a light source such as a penlight, and a return to original size following the removal of the light source. This procedure should be used with each eye separately and should ideally be conducted in a darkened room after 10-15 minutes of dark adaptation. An absent or abnormal pupillary response may be indicative of disruption of neurological functions and should be reported to the child's physician or eye specialist, especially if this represents a change from previous assessments.

An abnormal pupillary response does not, however, imply the absence of vision. The pupil's response to light can be temporarily impaired by some medications, or may be permanently impaired due to some structural anomaly of the eye. Since the pupillary response is reflexive, it is not subject to correction through educational interventions. Thus, the educational relevance of an abnormal finding is primarily limited to the detection of changes in the status of this reflex. Some children may, in the absence of a normal pupillary response, experience discomfort in bright light and may benefit from wearing dark glasses or a sun shield when exposed to such lighting conditions.

The protective blink reflex involves the reflexive closing of the eyes' lids when a threat to the eyes is seen. This reflex can usually be elicited by having the tester place one hand above and just in front of the child's face and rapidly lowering the hand so that it passes in front of the child's eyes. Another technique for eliciting this reflex is to flick the tester's fingers (without sound cues) in front of the child's face. Unlike the pupillary reflex, which is normally present at birth, the protective blink reflex typically develops within the first few months of life. Children who lack this reflex may be at greater risk for eye injury and could benefit from some sort of protective eyewear when in situations where airborne objects present a possible hazard, e.g., outdoors on windy days or around power tools or equipment in use.

Field of Vision

The normally functioning visual system is capable of viewing an area, or field, of predictable size and shape. When individuals fixate a stationary point directly in front of them each eye actually views an area that is approximately circular; the fields seen by each eye overlap so that the area in front of the individual is viewed by both eyes while the areas on the left and right peripheries of the field are within the view of only one eye.

Children with visual impairments should be assessed to determine whether they have limitations in their visual fields. Vision problems such as cataracts, retinal detachment, or macular degeneration may result in "blind spots" or areas within the visual field that can't be seen. Visual impairments such as glaucoma may restrict the peripheral areas of the field. Children with very poor vision in one eye may have limited peripheral vision on one side. Knowledge of the limitations of a child's visual field should be integral to the design and implementation of educational programs to be used with that child. The results of the assessment may also be of interest to the child's eye specialist and repeated tests can serve as a means to detect changes in the child's useful field of vision.

Children with field loss may require special attention to the placement of objects with which they are expected to interact, or to the physical arrangement of their learning environments. For example, children with only the central portions of their fields intact may benefit from closer grouping of multiple visual stimuli (e.g., objects used in grooming or eating, photos or symbols used in communication training) to preclude the need to repeatedly scan larger areas. (This approach would be limited by the child's visual acuity; i.e., small objects or those grouped too closely may not be discriminable to someone with reduced acuity.) Other adaptations in programming would be necessary for a child who has central field loss and useful peripheral vision. For example, programs to teach visual fixation, eye contact, or visually-directed reach often judge a child's response as correct only if head and eyes are oriented directly toward the defined target; however, the response of a child with central field loss should be judged quite differently.

The standard method used by medical specialists for assessing visual fields requires a level of cooperation that is difficult for most children and is unrealistic for the vast majority of young children to whom this manual is directed. A fairly gross approximation of this procedure can be conducted as part of educational assessment of vision. The procedure summarized below was described by Sailor, Utley, Goetz, Gee, & Baldwin, 1982 and is currently being validated by Utley for inclusion in a revised visual assessment manual to be produced by her through a federal grant (Utley, personal communication, July, 1988). In a darkened room using penlights with silent switches, the tester faces the child and holds one penlight at midline, 12"-13" from the child's face at nose level. A second light is positioned 10"-12" above, below, or to the sides of the first penlight, depending on the portion of the field being tested. Both lights should be parallel to the floor. Eight points should be tested in random order; in relation to the face of a clock these positions would correspond with the hour hand at 12 o'clock, 1:30, 3:00, 4:30, 6:00, 7:30, 9:00, and 10:30. The test should be repeated for each eye separately by occluding one eye and testing the other. Turn on the central (first) penlight and obtain fixation for 2-3 seconds. Then, simultaneously turn the central light off while turning on the second light. Watch for a gaze shift or head turn response.

All eight points should be checked in a random sequence, and any consistent failure to respond to the test light at one or more points should be noted. When the results of the assessment suggest possible field limitations the parameters of the loss should be evaluated by elaborating on the procedure above, varying the distance between the two penlights and testing more than eight points at each distance.

Ocular Motility

The term ocular motility covers all areas of vision dealing with the status of the muscles that control eye movement. This includes eye alignment as well as the performance of skills such as tracking a moving target and shifting gaze from one stationary target to another.

The corneal light reflex test is an accepted method for assessing eye alignment and can readily be conducted with children from the group targeted in this manual. The procedure is to direct a penlight toward the point directly between the eyes of the child from a distance of approximately 12 inches away. The tester's face should be directly behind the light with eyes in direct line with the child's eyes. Turn on the penlight and keep it stationary while viewing the reflection of the light on the surface of each eye. When the child fixates on the light the reflection will be centered in at least one pupil; eyes in normal alignment will show a reflection in the center of both pupils. (An exception to this case would be found in children with bilateral central field loss, whose eye alignment would be judged by the symmetry of the reflection in relation to some other visible portion of the eyes.) Reflections that are asymmetric, in which the location of the reflection differs between eyes while they fixate a light, are indicative of abnormal eye alignment, or strabismus.

Strabismus is a broad diagnostic category referring to eyes that deviate from proper alignment. These deviations may be in any direction (up, down, inward, or outward), may be present constantly or seldom, and may alternate between eyes or consistently affect only one eye. Many forms of strabismus can be effectively treated in early childhood through medical interventions, and these treatments should always be used, when appropriate, to benefit children from the manual's targeted group.

Children with uncorrectable eye alignment problems experience varying degrees of difficulty in performing eye movements. The extent to which this impairment affects a child's visual abilities can best be assessed through other means. Assessment should include situations in which the child is simultaneously presented with two objects of interest while the observer notes the presence, and efficiency, of the child's shift of gaze between the two objects. To test this visual skill somewhat formally, trials should be arranged so that the observer can place two objects, preferably objects known to be of interest, on a flat surface in front of the child and observe the child's response. The observer is located directly across from the child and lifts the objects, one in each hand, from below the flat surface and releases them in position on the flat surface. An alternative method of presentation is to arrange the objects on the flat surface behind a screen and then remove the screen. If present, the gaze shift should be observed for abnormalities in the symmetry of the eye movements and in the speed and accuracy in locating and fixating the second object.

Assessment should also include systematic observations of the child's eye movements when tracking a moving object. Trials should be conducted so that tracking can be assessed under various conditions, including objects that move across a plane horizontal to the child at eye level, along the vertical path (up-down) in front of the face, and in a circular path surrounding the facial region. Normally, the eyes should demonstrate symmetrical, smooth movement under all tracking conditions. Abnormal tracking would include jerky eye movements, inability to cross mid-line, or any asymmetric eye movements.

Since the ability to track an object (assuming that one can see it) is dependent on muscle coordination, repeated practice of these movements can lead to improvement in the child's tracking abilities. Such practice should occur within the context of functional daily activities and within educational programs. Tracking targets could include people or objects such as cups, spoons, toys, articles of clothing, school buses, and so on.

<u>Visual Acuity</u>

Visual acuity refers to the clarity with which a person sees a form or pattern. Visual acuity is typically expressed in Snellen notation as a fraction, i.e., 20/some number. In Snellen notation, 20/20 represents normal visual while 20/100, for example, suggests that the person can see at 20 feet (top number) what the normal eye sees at 100 feet (bottom number). Since most forms of visual impairment involve reduced acuity it is important to assess the child's residual visual acuity and to report changes in acuity to the child's eye specialist(s). Visual acuity scores can also be used to compare the effects of prescription lenses, other visual aids, or medical interventions such as surgery or prescribed medications.

Visual acuity tests traditionally measure recognition acuity (i.e., the capacity to recognize, or discriminate, between letters or other symbols). Testing can be done at far-point (with viewing distances of 10 to 20 feet) and at near-point (13 to 16 inches). The Snellen letter chart, which requires a labeling response, and the Snellen E chart, which requires labeling or pointing to the direction (up, down, left, right) of the "legs" of the test targets, are the standards in the field. These tests should be used whenever the child can perform the necessary responses. An alternative recognition acuity test was developed by Lippman (1971); the HOTV test, marketed by the GoodLite Company, Forest Park, Illinois, can be presented as a matching task in which the child matches a symbol on the chart by selecting one of the four symbols (H, O, T, and V) from an array. This selection can be accomplished by pointing, sustained eye gaze, or other alternate communicative responses. Many children older than 2-3 years can be tested for acuity using the matching version of the HOTV test.

Because of the relatively sophisticated responses required for recognition acuity testing, young children and older individuals with certain handicaps (e.g., retardation, communication deficits) have traditionally been excluded from participating in visual acuity testing. However, the recent development of the Teller Acuity Cards (Teller, McDonald, Preston, Sebris, & Dobson, 1986) marketed by the Vistech Corporation, Dayton, Ohio, allows for the testing of virtually all children to determine their resolution, or grating, acuity (i.e., the capacity to resolve a grating pattern) as indicated by visual fixation of test targets. This test uses a series of hand-held grey cards with a black and white striped area on either the left or right side of the card. The observer views the child's eyes (through a central "peephole" in each card) to determine whether the child preferentially looks at one side of the card. Once this judgment is made the observer loc . at the front of the card to determine the actual location of the test target, and makes a decision as to whether the child saw the target. When grating targets below the child's threshold are presented the child sees a plain grey card and does not show a visual preference for either side. The availability of this test procedure, along with the age-related normative data provided by the test's developers, now allows for the testing of children from birth until they develop the skills necessary to perform on traditional recognition acuity tests.

The specific procedures for administering visual acuity tests are provided by their marketers along with the test materials themselves. The revised user's manual for the Teller Acuity Cards is especially thorough. Each test should be administered in accordance with the suggested procedures to assure valid results. All acuity tests involve presentations of decreasingly smaller targets until the child's threshold (smallest target seen) is determined. Acuities should be assessed for both eyes together (binocular testing) and for each eye separately (monocular testing). The results of binocular testing most closely approximate the child's actual viewing conditions in daily life; however, the results of monocular testing can have significant implications for educational and medical interventions with children whose acuity status differs between eyes. For instance, an increased discrepancy between the acuities of the eyes might warrant a medical intervention such as glasses or eye-patching, as well as modifications in the physical arrangement of the learning environment (e.g., object placement, seating) to offset the loss of clarity in a portion of the child's visual field.

The results of acuity testing should be considered when selecting appropriate visual stimuli for use in instruction. Since the scores represent the threshold, or lower limit, of the child's ability, symbols chosen for use in printed material or for display on computer terminals and communication devices should be well above threshold size. Likewise, other visual stimuli used in intervention, such as objects or someone's hand making gestures or signs, should be evaluated for appropriateness based on the results of acuity testing. Since factors such as viewing distance and contrast between target and background will differ from test conditions to functional settings, the ultimate test of stimulus appropriateness is the learner's performance.

Auditory Assessment

As with vision assessment there are many purposes for assessing a child's hearing. These include: quantifying the extent and severity of the hearing loss, evaluating the effects of medical treatment and of prosthetic aids or devices, and determining appropriate educational programs and/or adaptations needed to create optimal learning environments for children with hearing impairments. During the early years in the life of a child with a hearing impairment both medical and educational interventions are critical to minimizing the effects of the impairment on the child's overall (and, especially, language) development. These interventions will be most effective when needed assessment data are available.

Historically, young children and those with developmental delays have been considered difficult to assess by audiometric procedures. The procedures most often used by audiologists with older children and adults are puretone audiometry (in which tones of varying frequencies and intensities are presented to either the left or right ear via headphones worn by the person being tested) and speech audiometry (in which spoken words are used to determine loudness thresholds and discriminative abilities). Many young children lack the cooperation and receptive language skills required to participate in the standard versions of these assessment procedures.

In an effort to increase the number of young children who can take part in audiometric testing a number of alternative procedures have been developed. These procedures involve training the child to make a reliable, observable response in the presence of auditory test stimuli. The earliest work in this area lead to the development of a procedure called tangible reinforcement operant conditioning audiometry, or TROCA (Fulton & Lloyd, 1975; Lloyd, Spradlin, & Reid, 1968). Using the TROCA procedure, children as young as 9-months-old have been successfully trained to make a button press response in the presence of an auditory stimulus by reinforcing correct responses, usually with small food items.

A similar operant procedure, involving a head turning response in the direction of the sound, was first described by Moore, Wilson, and Thompson (1977). Their procedure, often referred to as visual reinforcement audiometry or VRA, rewards a child's correct responses by activating a visual display (animated toys, lights) for a few seconds on the child's left or right side, depending on the location of origin of the sound stimulus. Children as young as 6-months-old have been successfully tested using VRA (Wilson & Thompson, 1984).

The most recent contribution in this area is that of Goetz, Utley, Gee, Baldwin, and Sailor (1981). Their procedure involves training a head-turning (or other) response to the onset of a light. During training, one of the two lights located on either side and slightly in front of the child is turned on, and the child is reinforced for turning to the light. In the next phase of training, a sound is presented with the light; sounds are produced by noisemakers (e.g., bells, rattles, tape-recorded speech) located behind each of the light fixtures. Once reliable responding occurs, the light stimuli are gradually faded and eliminated and the child's response is controlled by the auditory stimulus alone.

The preceding discussion suggests that there are a number of available procedures for training even very young children to make reliable responses to auditory stimuli in preparation for a professional audiometric evaluation. Because of the wide ranges of age and ability represented among the target group, no one procedure will be appropriate for all children. A knowledge of the specific child's response capabilities and reinforcer preferences is crucial in selecting one of the training procedures described above. Even more crucial, perhaps, is a commitment by service providers to devote the time necessary to accomplish this training. The literature cited above suggests that almost all children can be trained to respond reliably to sound cues; yet, in practice, this training rarely occurs. Apparently this training is considered less important than other needed interventions. However, if one takes the long view, it can be argued that the potential benefits to the child justify these efforts. Preparation for audiological evaluation leads to better diagnosis and medical treatment of the child's impairment and the prescription of appropriate aids which, in turn, leads to increased auditory input for the child.

Continuing Observations of Sensory Abilities

Adults providing services to the target group of young children with dual sensory impairments should use every opportunity to observe the child's use of sensory input in school, home, and community settings. These naturalistic observations provide information beyond that obtained with the more structured assessment procedures previously described. By noting, on an ongoing basis, the characteristics of sensory stimuli the child does and does not respond to, the observer gains a clearer picture of the sensory abilities of the child. Naturalistic observations often confirm and expand upon the results of structured assessment; they may also conflict with previous findings and suggest a need for further testing to identify the source of the disparity in results.

Children may demonstrate better performance in their natural environments due to their level of motivation or interest. On the other hand, children may show fewer sensory abilities in real life settings when the conditions for viewing and listening are not controlled. Factors that influence daily visual performance include the size, color, and shape of the target; the viewing distance; the amount of contrast between the target and its surroundings; the intensity of natural and artificial lighting; the presence of glare or shadows on the target; and the target's speed if moving. Factors that affect a child's ability to hear include the loudness and frequency(s) of the sound, the distance and direction from the sound source, and the presence of background noise that may mask the sound cues intended to elicit a child's response.

The greater the amount of information available regarding a child's sensory abilities under various environmental conditions, the more likely it is that persons who provide educational services to the target group will maximize the use of residual sensory abilities in the learning process and will avoid the frustration, to all concerned, that comes from using sensory stimuli that can't be seen or heard by the child.

Recommended Reading

Those who wish to expand their knowledge of sensory impairments and assessment procedures through further reading may find the following citations to be of interest.

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