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Optometric assessment of the patient with mental retardation or special needs

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OPTOMETRIC ASSESSMENT OF THE PATIENT WITH MENTAL RETARDATION OR SPECIAL NEEDS

By

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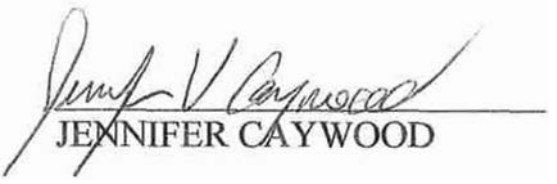
HANNU LAUKKANEN, M.Ed., OD



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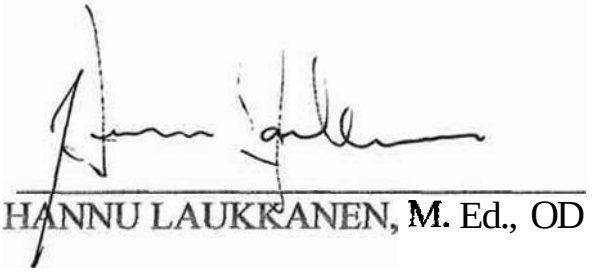

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ABSTRACT

This material covers a collection of tests, techniques, and equipment that can be utilized for the proper assessment of special populations. Aspects of the comprehensive vision exam are covered including the pre-examination period, entrance skills, ocular health, prescription dispensing, and the period following the exam. Topics covered include visual acuity, binocular vision, color vision, visual fields, measurements of accommodation, refractive error, intraocular pressure, and the anterior and posterior segment examination. Background information, clinical pearls, and a specific battery of tests are presented to facilitate visual examinations of the special needs patient.

MeSH KEYWORDS

Education, Medical
Human Mental Retardation/classification
Mentally Disabled Persons
Mental Retardation
Optometry/education
Questionnaires
Vision Tests

BIOGRAPHIES

Jennifer Valente-Caywood is originally from Tucson, Arizona. She graduated with a B.S. in Family Studies from the University of Arizona. At the University of Arizona, she was a member of Kappa Omicron Nu Honor Fraternity and the Golden Key National Honor Society. Jennifer is also currently a member of Beta Sigma Kappa National Optometric Honor Society. Upon graduation in 2005, Jennifer intends to practice optometry in Tucson, Arizona where she would like to specialize in serving the special needs population.

Jeremy Nett is originally from Cheyenne, Wyoming. He attended the University of Wyoming where he obtained a B.S. in Zoology and Physiology. While at the University of Wyoming, he was a member of Alpha Epsilon Delta Pre-professional Honor Society, Golden Key National Honor Society, and received a Trustee's Superior Student award. After working for two years in the environmental sciences, he chose to attend Pacific University's College of Optometry. Upon his graduation in 2006, Jeremy plans to pursue a clinical career in the Rocky Mountain region.

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Optometric Assessment of the Patient with Mental Retardation or Special Needs

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Optometric Management of the Patient with Mental Retardation or Multiple Special Needs

This paper outlines successful methods for performing eye exams on patients with mental retardation and/or multiple special needs. The first purpose of this paper is to familiarize the optometrist with this population of patients so he/she can best serve their needs.

The second objective of this course is to introduce the practitioner to those specific tests most likely to yield useful clinical information with this population. It is important to recognize that examinations with special populations can often differ from standard exams by both means and methods, but a complete and comprehensive examination should always be the goal. An exam should not be considered complete until an attempt to inspect the six main elements of visual health and function have been made including the following: visual acuity, refractive error, accommodation, binocularity, visual fields, and ocular health. This course is presented with relevant tests specific to each aspect of visual function followed by a summary of how to perform the less common, yet useful, tests. A series of clinical pearls are presented throughout the course to offer insight and information to assist the optometrist in his/her examination of special needs patients.

Introduction:

An estimated 6.2 to 7.5 million people have mental retardation. (1) It is 10 times more common than cerebral palsy and affects 25 times as many people as does blindness. One out of ten American families is directly affected by mental retardation. (2)

While mental retardation may be found in isolation, 85% of the time it exists in conjunction with other handicapping disorders such as Down's Syndrome, Cerebral Palsy, Turner's Syndrome, Fragile X Syndrome, etc. (2) According to the American Association on Mental Retardation, "Mental retardation is a disability characterized by significant limitations both in

intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills." **(3)** There are four basic classificationsof mental retardation based largely on IQ with consideration given to adaptive behaviors. The "mild group" embodies 90% of the people with mental retardation. The IQ of this group ranges from 50 to 69. The "moderate group" represents 5% of the population with mental retardation and their IQ's range from 35 to 55. The "severe group" comprises 2.5% of the population, their IQ's range from 20 to 40. The final group is the "profound" population, which also comprises 2.5%. The IQ range of profoundly retarded individuals is below 20 to 25. (2) It is important to note that a patient's developmental age cannot be determined strictly by IQ alone, but also by how the individual functions. Family, case managers, and support staff are invaluable in helping to describe a patient's abilities, limitations, and helping to categorize developmental age.

On the whole, patients with developmental disabilities are at increased risk for ocular abnormalities including refractive error, strabismus, ocular disease and functionality issues. Findings by Margaret Ronis revealed that one hundred percent of developmentally disabled individuals had accommodation dysfunction, ninety-two percent had oculomotor dysfunction and seventy-eight percent had visual perception dysfunction. (4)

Background Pearls:

Each special needs patient may have unique issues and adaptations. Understanding these personality related dynamics may be vital to completing a comprehensive exam. For example, some profoundly mentally retarded patients may exhibit "stranger wariness". Rigid social grouping is the norm with special needs individuals. Professionals must strive to approach these patients with an appropriate level of sensitivity.

- Allowing the patient to participate in as many decisions as possible helps him/her feel a sense of some control over the situation. Even small amounts of control hold special meaning for someone for whom most things are out of his/her control.

- Allow extra time for patients to respond to procedures; delayed processing often accompanies impairments.

Pre-Examination:

Planning and preparation for the exam begins long before the patient arrives. Questionnaires sent out in advance of the appointment allow the optometrist to gather information vital to understanding the unique needs of the patient and the level(s) of functioning. (5) The goal of the questionnaire is to allow the doctor to ascertain where that patient falls within the developmental spectrum. Professionals can obtain this information from the questionnaire and by asking questions regarding visual and developmental milestones. It is imperative that the doctor is aware of who will be accompanying the patient to the exam and how well they know the patients; a care facility might send an employee who does not know the patient well. Listed below are examples of questions for the patient's caregiver.

General Ability

- Can the patient recognize and identify letters?
- Does the patient have the ability to follow sequential instructions?
- What are the patient's interests and hobbies? skills? vocation(s)? activities of daily living?
- What is the patient's preferred method of communication?
- Does the patient habitually exhibit difficult or aggressive behaviors?
- Are there specific stimuli that agitate the patient?
- What is the patient's approximate developmental level or mental age?

Acuitv

- How far does he/she sit from the television?
- How does mobility in familiar areas differ from mobility in non-familiar areas?
- Does the patient tend to tilt his/her head or lean to one side or another? (this question may also reveal information about the patient's functional visual field and can help to assess the efficacy of the current prescription).

- Can the patient read? What is the patient's functional reading level? Does the patient enjoy reading? Does the patient spend time reading? If so, what do he or she read?

Visual Field

- How does the patient maneuver around stairs and curbs? (This question may also give us information about the patient's depth perception and functional visual field).

Contrast Sensitivity and Depth Perception

- How is the patient's hand-eye coordination for common tasks? (for example, picking up a cup from the table).

Assessment of the Current Prescription

- How long has the patient had his/her current prescription?
- For what specific activities does the patient wear his/her prescription?
- How do the spectacles fit the patient's face?

Compliance

- How frequently (number of days per week) and for how long (hours per day) does the patient wear his/her prescription?
- Does the patient wear the correction for the activities for which they were prescribed?

When the patient first enters the office, the doctor should observe how the patient and caregiver(s) (if applicable) interact. The practitioner needs to develop a feel for the patient's body language. These careful observations will give the doctor an idea of what manner would be the best way to approach the patient, and allows the practitioner to gauge the patient's responsiveness and ability to communicate.

In gathering a complete medical history, the professional needs to be familiar with the medications generally prescribed for this population and their side-effects. It is not uncommon for a special needs patient to have been prescribed multiple or numerous pharmaceuticals. Anti-seizure medications have been reported to cause concentric contraction of the visual field and blurred vision. (6) Anticonvulsant medications reduce extraocular muscle performance. Several central nervous system pharmaceutical agents used to treat obsessive-compulsive disorders, anxiety, and hyperactivity such as Paxil®, Xanax @ and Cylert ® list blurred vision as possible side effects. Anticholinergic drugs are often prescribed to manage symptoms of Cerebral Palsy, but can also cause dry, irritated eyes and varying degrees of cycloplegia along with blurred vision. (7)

Pre-examination Pearls:

- Request records from previous eye exams. Patient with special needs will often have an extensive history of ocular and systemic health issues. Obtaining these records prior to the exam will allow the doctor to prepare for the unique needs of the patient.
- The patient's method of communication is arguably the most important piece of inforrnation to learn prior to the exam.
- The education record of a visually impaired child enrolled in special education will typically contain previous functional vision assessments and eye exams. These records can be requested and are an excellent resource before the exam.
- Establishing a level of trust with the patient is essential in order to obtain a maximum level of participation. Discuss and demonstrate genuine care about the patient's interests. Establishing trust and rapport is even more important with a special needs patient than it is with a non-special needs patient examination.
- Request a caregiver/special education teacher or a staff-worker to accompany the special needs patient on the first visit. This will aid in obtaining helpful information regarding the patient's disabilities and

strengths. This also facilitates an interdisciplinary team approach by allowing more members of the team to have input. In addition, it fosters better communication and helps to promote common management goals.

Examination:

The quality of life for many developmentally disabled individuals is dependent on the degree of functional vision they possess. (4) There are numerous methods for assessing functional vision via acuities, binocular function, refractive errors, visual fields, color vision and ocular health. Familiarity with a variety of tests for each visual function allows the professional flexibility when responses from habitual tests are inconsistent or when patient cooperation is minimal.

There are several different classes of tests used for determining visual acuity. Each category relates to the patient's ability to respond. Discrimination acuities are more specific than other methods, but require letter and symbol recognition. Less specific tests include preferential looking tests. Finally, there are purely physiological tests such as optokinetic nystagmus (OKN) and visually evoked potentials (VEP), which yield less specific information than other acuity tests. It is important to note that results from preferential looking tests, such as the Candy Bead and Bailey-Hall cereal tests, are not always equivalent to those from letter discrimination acuity tests.

A. Visual Acuity

1. Letter recognition- Letter recognition tests are generally more successful when the patient has a developmental age of at least five or six years. The best tests for determining visual acuity via letter recognition are Snellen and Bailey-Lovie acuity tests. Standard Snellen acuity tests have been traditionally considered the "gold standard"; however, the Bailey-Lovie Test is better psychometrically because of its equally progressive LogMar format. The traditional advantage of letter tests is that most

practitioners have a high level of comfort and experience working with them. Another advantage to letter tests is that they are universally available and well standardized.

2. HOW- The HOTV test is appropriate with developmental ages between three and seven years. If a patient is non-verbal or does not know the alphabet, he/she can still perform this test via matching by pointing to corresponding letters on a near card. It is important to note that the HOTV symbols blur to dissimilar shapes (much like Snellen), hence it may be possible for the patient to identify the correct letter even though the letter may be seen as very "blurry". Even given this limitation, HOTV does correlate well with Snellen acuities. A benefit is that HOTV is insensitive to "letter reversals" and it is useful even with those patients who may only know a few letters of the alphabet.

3. Lea Symbols- The Lea symbol acuity test is usually successful with developmental ages between two and one half years and five years. **A** big benefit of this test is that it is works well with non-verbal patients because they can point to the matching symbol on the example card. It has also been recommended by the American Academy of Ophthalmology. Another significant advantage is that all the Lea symbols blur to circles, thus the patient will be less likely to experience a sense of failure when all of the symbols below acuity threshold appear the same. During testing, the patient perceives that he/she is answering correctly while the optometrist obtains an accurate assessment of the visual acuity threshold. This test can be performed at distance or at near and correlates well with HOW acuities. (8)

Figure 1: Matching technique with Lea symbols

4. Lighthouse Flash Card- The lighthouse flashcard acuity test is appropriate for developmental ages two to three years. An advantage to the test is that it is a forced choice test in which the patient must correctly identify an apple, a house, or an umbrella. Lighthouse results are comparable to that of HOTV because both are symbol recognition tests that blur to dissimilar shapes. Therefore a "correct" response on either test may be the result of a lucky guess and may over estimate the acuity threshold. **As** mentioned before, the disadvantage of Lighthouse symbols is that they do not blur to similar images, which in turn may yield better acuities than obtained with Landolt C, Broken Wheel, or Lea symbol acuity measures.
5. Broken Wheel- The broken wheel test uses a Landolt C target in conjunction with a picture of a car, making it useful with developmental ages down to three years of age. The forced choice Broken Wheel test is performed by displaying two cars side-by-side, one with the letter "**O**" for wheels, the other with Landolt C's. The patient is then asked to point to the car with broken wheels. The advantage of the Broken wheel acuity test is that it is very sensitive to blur. Slight blur causes the images of the broken wheels and non-broken wheels to appear the same, whereas with the same level of blur, many Snellen letters may still be discriminated due to letter morphology. Another advantage of the broken wheel test is that is a forced choice test, so it can be repeated again and again without changing the demand or risking memorization. There is only a 25% probability that a patient is guessing if he or she correctly identifies three out of four presentations. The broken wheel test is another symbol test that does correlate well with Snellen acuities.
6. Teller Acuity Card- Teller acuity cards measure grating acuity. Teller cards are especially useful for patients with cortical impairment because this preferential looking test does not require

a high level of form perception ability. It is appropriate for the developmental ages of two years and below. Each card has stripes on one side, an isoluminant gray field on the other, and a small observation hole in the center. To administer the test, the doctor holds the card up to his/her face and views the patient response to presentation of the card through the observation hole. The natural human tendency is to orient the eyes/head to the high contrast stripes rather than the gray isolurninant portion of the card. The examiner observes the gaze of the patient to determine if the patient detects and orients to the stripe stimulus. Prior to card presentation, the examiner should be ignorant to which side of the card contains the stimulus stripes to avoid bias. Optimally, the patient should have unrestricted horizontal motilities in order to respond in a manner detectable to the cardholder. Head turns and pointing at the side of the cards with the stripes are also acceptable responses. Each level of grating acuity is presented four times. The patient moves on to the next higher frequency grating acuity until the orientation response is extinguished and the patient can no longer correctly respond to three out of four presentations at a given acuity level.

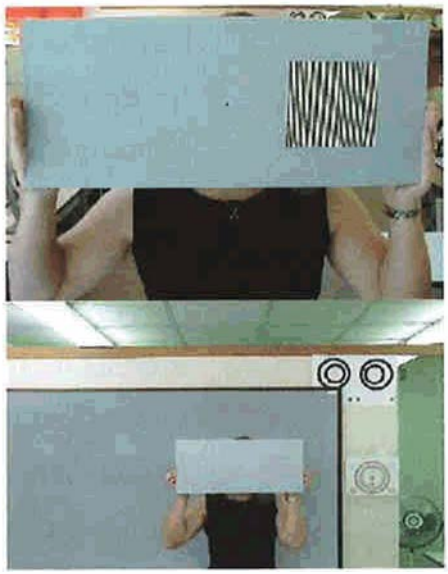


Figure 2: Same Teller card demonstrating different acuity demands.

7. Cardiff cards- Cardiff cards are another form of preferential looking cards that employs form discrimination with vanishing optotypes. It differs from Teller Grating acuities in that it has a vertical orientation and no observation hole. A set of Cardiff cards is printed with eleven different acuity level age standards. This test

is useful for patients who function between a one to three year old level of perceptual development. As with the Teller cards, the advantage of Cardiff testing is that no language is required. A disadvantage of this test is that it, too, assumes unrestricted ocular motilities, but in the vertical meridian. With Cardiff cards, the doctor observes whether the patient's eyes move to either the isoluminant optotype "picture stimulus" or the blank area of the card. The test is continued until the patient can no longer identify the location of the stimulus on the card on two out of three presentations.

8. Other useful tests for determining acuity that may not be readily available include the Bailey-Hall Cereal Test, good for developmental ages between eighteen months and three years of age; the Candy Bead Visual Acuity Test (CBVAT), useful for the developmental ages between ten to twelve months, and the Optokinetic Drum Visual Stimulus Test (OKN). The OKN test is appropriate for developmental ages between eighteen months and seven years. The OKN test requires no conscious effort by the patient to respond to the stimulus. The Visual Evoked Response/Potential (VER/VEP) is an electrodiagnostic probe that can grossly determine a patient's level of acuity. It is not commonly found in general optometric practices, but may be available in tertiary health care facilities.

Acuity *Pearls*

If responses are inconsistent when measuring visual acuity, switch to a different acuity test, preferably one that can be repeated without risk of patient memorization.

With patients who are non-verbal, utilize the patient's usual mode of communication to indicate a choice.

B. Binocular Vision Assessment-

"Patient's with multiple problems have a higher than average incidence of binocular abnormalities that interfere with normal development and function. The assessment of binocular vision is an integral part of the examination. It is important for the early detection and treatment of many disorders." (2)

1. Briickner- An advantage of the Briickner is that it is helpful for low functioning patients and patients with limited visual ability such as patients with cortical impairment. (With cortical impairment the structures of the visual system are present, but information from an outside stimulus is not properly processed.) The Briickner requires minimal cooperation and participation from the patient. By dimming the room lights, the patient's attention is naturally drawn to the fixation light. The Briickner is useful for determining small angle strabismus, amblyopia, retinal abnormalities (such as retinoblastoma) and refractive error. To perform the procedure, shine your ophthalmoscope at both of the patient's eyes simultaneously from a distance of one meter and compare the red reflexes. If one eye has a brighter reflex it is more likely to be strabismic, have greater uncorrected hyperopia/astigmatism or have an ocular health abnormality.
2. Hirschberg-The Hirshberg quantifies any strabismus detected with Briickner's. An advantage to this test is that it is helpful with patients with cortical impairment because negligible patient cooperation is required. A disadvantage of the Hirshberg is that the quantity of strabismus can only be grossly estimated. To perform the Hirshberg, aim a light source along the midline of the eyes at eye level at a distance of 40 cm. Both the optometrist and the patient have both eyes open. While the patient is looking at the light, the optometrist notes the location of the corneal light reflexes in relation to the center of the cornea. If the relative positions of the light reflexes are symmetrical, it is assumed that no strabismus is present. (The light reflexes align the same monocularly as they do binocularly.) If the Pürkinje light reflexes are not positioned at equivalent corresponding locations, then the angle of strabismus can be estimated by the amount of displacement from the center of the cornea, with 1 mm equaling approximately 22 prism diopters. (9)

When strabismus is present, determine if it is a constant or alternating pattern by comparing which eye is he fixating on the light source.

3. Angle Lambda/Monocular Light Fixation (MLF)- This test provides a gross evaluation of monocular fixation performed only when there is asymmetry previously detected with the Hirschberg test. To perform the test, the optometrist's left eye is aligned with the patient's right eye, and positioned 40 cm away. The patient's left eye is occluded and the optometrist's right eye is closed. The optometrist places a light source on-axis with the patient' right eye while the patient is instructed to look at the light. The optometrist views the corneal light reflex in relation to the center of the pupil. The amount of decentration is estimated in millimeters. When the corneal light reflex is decentered nasally an exo- deviation is present, whereas a temporal deviation represents an eso- deviation. The quality of fixation is also assessed (jerky, searching, steady or constant). The procedure is repeated for the patient's left eye.
4. Krimsky test- The Krimsky test is performed following the MLF and the Hirschberg only when a strabismus has been uncovered. The use of a prism enables the practitioner to quantify the magnitude of the strabismus. The Krimsky is performed monocularly like the MLF. In addition, the practitioner places a correcting prism over the deviating eye of the patient until the deviation of the light reflex seen in the strabismic eye matches that seen in the non-tropic eye. The magnitude and direction of prism is recorded.
5. Cover Test- The unilateral and alternating cover test are also extremely helpful methods to objectively determine phoric or tropic vergence postures. It may be difficult to maintain the patient's attention, so an interesting, engaging fixation target is essential for obtaining optimal cover tests results.

Figure 3: Distance cover test objectively measures phoric posture.

6. Near Point of Convergence (NPC)- Perform the

NPC subjectively and objectively, if possible. Use an engaging target to capture the patient's attention and note the distance where fixation is lost and which eye releases fixation first.

Additional Binocularity Tests:

1. Viewer Free Random Dot Cube- The Viewer Free Random Dot Cube measures depth perception and global stereopsis.
2. The benefit of this device is that no polarized lenses are required, a key with patients who are uncomfortable with the tactile stimulation of wearing lenses and frames.
3. Lang I and II Stereotest- An advantage to the Lang stereotest is that it tests global stereopsis using common objects such as a cat, a star, and a car to determine three different levels of disparity in arc seconds (1200", 600" and 550" with Lang I, 600", 400" and 200" with Lang II). The patient must bi-foveate to see the global "float", so this test is very sensitive for detecting small angle strabismus. Another advantage of the Lang stereotests is the composition of the cards; the plastic prism overlay eliminates the need for polarized glasses and helps makes the cards very durable. A disadvantage is that Lang stereotests must be precisely aligned with the visual axes; shifting the cards slightly to the left or right will cause the objects to lose their "float". The patient must have the ability/motility to point or describe the location of the objects for the test to be administered successfully.
4. Random Dot E- An advantage to this forced choice test is that it comes with a raised card blank that provides kinesthetic and tactile feedback to the patient about the hidden shape they will be looking for in the random dot card. Another advantage is that although the test card provides just one global demand, the test can be administered at different distances in order to test different

Figure 4: Random Dot E sterotest with sample card

disparities. For example at 50 cm, detection requires a disparity sensitivity of 504 arc seconds, whereas at **16** feet the corresponding disparity is 52 arc seconds. The disadvantage of this test is that polarized lenses are required. A non-verbal patient can perform this test by pointing to the card they identify as containing the shape.

5. Worth Dot- This test measures secondary fusion. It can be administered in primary gaze as well as in different fields of gaze and at different distances to map out the binocular field of the patient. A disadvantage to this test is that it easy for the patient to remember that there are four lights. This would allow the patient to respond "correctly" even though they are not seeing four lights. To prevent memorization from occurring the doctor can interchange similar appearing flashlights that have three and five dot patterns or pictures and present them randomly when mapping the binocular field. To perform the Worth Four Dot procedure, have the patient wear red/green glasses over their correction. In normal room illumination present the patient with the Worth Four Dot flashlight at 40cm. **Ask** the patient how many colored dots are seen, then record the number of dots and colors reported. Four dots are normal, five dots indicate that the patient is diplopic, and two or three dots indicate that the patient is suppressing. Repeat the test at six meters, if there is a different number of dots seen at the two distances find the distance from the patient at which there is a change in the number of dots seen and record.

Figure 5: Variations of the Worth Four Dot test for fusion

Gross depth perception and spatial localization can also be grossly tested by having the patient quickly touch their fingertip to the end of a penlight presented in different gaze positions.

C. Color Tests- Color vision testing may be especially important for the multiply-handicapped patient because some strategies for communication and education are based on color-coding.

1. Color Vision Testing Made Easy (CVTME)- CVTME is effective for mentally retarded patients and is relatively easy to administer. This test is most beneficial with patients who have a developmental age of three years and above. The test consists of fourteen psuedo-isochromatic plates and is administered in the same manner as the Ishihara. The targets of this test are objects easily identifiable and engaging, such as a boat, circle, dog and star. This would be the preferred test if the patient has verbal capabilities but is not able to recognize the number characters used in the Ishihara. If the patient is unable to verbally describe the characters, the test can be performed by giving the patient a cotton swab and having them trace the characters on the color plates. To prolong the life of the cards, avoid letting patients use fingers to trace the embedded shapes

Figure 6: Color Vision Testing Made Easy plates

2. Ishihara- If the patient is able to verbally describe the stimulus characters, the test is performed in the same manner as with non-special needs patients. The color plates are presented to the patient and he/she identifies what characters are seen. Like the CVTME, the Ishihara test can be administered by having the patient trace the stimulus with a cotton swab.

3. Wool (Yarn) Test- The Wool/Yarn test is performed by having the patient match colors of yarn. This test is an alternative when other color tests are unsuccessful or inappropriate for the developmental age of the patient. The practitioner can get a rough idea of potential deficits based on the colors of yarn the patient has trouble matching.

D. Visual Fields- If a patient that has difficulty following instructions it may be necessary to distract the patient with a central fixation target. Use an interesting target to keep the patient's attention directed straight ahead. A penlight or trans-illuminator serves as a good peripheral stimulus that can be brought into the field peripherally or switched on after being positioned within the field. Have an assistant or the patient's caregiver stand behind the patient and move the peripheral stimuli into the patient's field of view. Observe the patient's response for when the stimulus is first detected. Be careful not to give the patient any clues as to which field is being testing. You should repeat stimulus presentation in each field until consistent responses are obtained.

Binocularity Pearls:

- Always start with binocular testing prior to monocular testing because most patients do not like occlusion; they may be overly sensitive to the tactile "feel" of the occluder.
- Test ocular motilities by utilizing interesting objects to promote fixation and visual engagement with the target.
- Many tests, such as Random dot stereograms and the Worth Four Dot require verbal feedback. Take into account the developmental level and response speed of the patient when choosing the best test to sample behavior.
- Match the patient's verbal skills with the verbal skill required by the test.
- Perform relative vergence ranges (step vergences) with loose prisms or a prism bar until the patient is unable to fuse. Breaks in fusion can

also be objectively detected during this test by carefully observing the patient's eyes.

- Evaluate and characterize any nystagrnus, especially in different positions of gaze and different amounts of convergence. If a null point exists, a patient will take up the appropriate head posture to maintain gaze at the null point during demanding acuity tasks.
  Do not be surprised to see unique oculomotor presentations with multiply handicapped patients; there may be neurological insults impinging upon different control centers in the oculomotor system.

E. Tests of accommodation are especially important with special needs patients because many different muscles and nerves may be affected. The retinoscope is an invaluable tool in objectively accessing accommodation when phoropter procedures or lens tests produce lackluster results. If the three aspects of accommodation, including amplitude, facility, and posture, fall within normal ranges, the practitioner can have confidence that the accommodative system is functioning properly.

1. Accommodative amplitude-In order to aid the intellectual development of the patient, it is important to determine the amplitude of accommodation. Attach an age appropriate fixation card to the retinoscope and begin at a distance of 40cm. Have the patient call out the shapes or letters on the card or ask the patient to find certain objects or letters contained on the card. Slowly decrease the distance to the patient until there is a sudden increase in accommodative of lag (apparent "with" motion of the retinoscope streak). The dioptric equivalent of the distance at which the sudden change occurs is the objective amplitude of accommodation. (10) Perform the procedure binocularly, then monocularly. The minimum amplitude of accommodation expected depends on the age of the patient and can be determined from the Hofstetter formula: Minimum amplitude of accommodation (diopters) = 15 - (0.25 x age of patient in years). The

patient should have twice the amplitude of the near demand; for example, a patient with a 33 cm working distance should have an amplitude of six diopters or more to function comfortably. Near lenses may be prescribed to alleviate problems arising from insufficient amplitude of accommodation.

2. Accommodative posture via Monocular Estimate Method (MEM) retinoscopy- MEM retinoscopy is useful for objectively estimating the accommodative response at near. Adjust the room illumination to a level that is appropriate for reading. Have the patient wear their best correction. Fasten an age appropriate MEM target to your retinoscope and present it at the patient's near working distance. Pass a vertical streak along each eye and estimate the amount of movement of the streak. With motion indicates an accommodative lag, while against motion would likewise indicate an accommodative lead. Quickly place the corresponding lens power in front of the patient's eyes and pass the streak back and forth before the patient responds to the monocular lens. Compare the amount of movement and repeat the procedure until neutral is found. (10) MEM retinoscopy can be performed at different distances to sample different postures. The acuity demand of the target also changes the expected accommodative lag. With a 20/100 target at 40 cm, the examiner would expect a lag of 0.62 D; a 20/30 demand target would be expected to reduce the lag to 0.25 D. Patients who demonstrate excessive lag amounts or leading postures may benefit from a near prescription.

Figure 7: Retinoscope with MEM targets.

3. Accommodative facility- The facility of accommodation is informative in that it tells the practitioner about the flexibility of the accommodative system. The measure of facility demonstrates the ease or difficulty with which the patient shifts focus to and from near and far tasks. To test

facility, insert +/-2.00 lens flippers in front of the patient while the patient is instructed to direct their attention to an age appropriate fixation card that attaches to the front of the retinoscope. It should take no longer than three seconds to regain the habitual near lag posture between lens flips. (10) Patients who need more time to establish their baseline posture may have a facility problem. Accommodative facility difficulties may be resolved with the aid of vision therapy techniques or near lenses.

Accommodative Pearls

- Studies have clearly shown that multiply handicapped children, particularly those with cerebral palsy, often exhibit accommodative paresis or spasm. (11)
- As a population, individuals with developmental disabilities tend to under-accommodate.

Refraction:

1. Static retinoscopy-Static retinoscopy is performed out of phoropter with working distance lenses (typically -1.50 D) in place to fog the patient and a retinoscope lens rack. Retinoscopy provides an objective measurement, and is often the most useful means of obtaining the refractive status with the special needs population. Retinoscopy is also useful for detecting media opacities. Remember that with abnormal head postures, artificial cylinder may be induced. The most difficult aspect of retinoscopy is keeping the patient's fixation in the distance for the duration needed to complete the task. An interesting target such as a puppet or a cartoon/movie playing on a television may help the patient hold furation.

Figure 8: Retinoscopy lens racks.

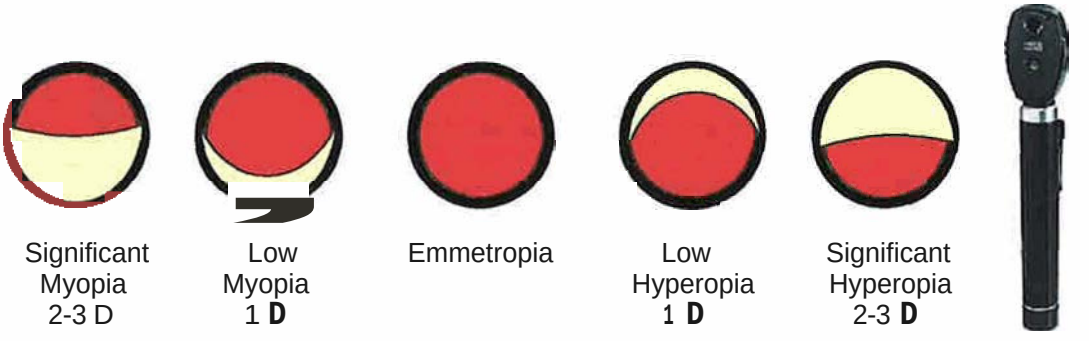
2. Mohindra retinoscopy- Mohindra (or near dynamic) retinoscopy is another objective technique for determining refractive error. In this procedure, the patient is seated in a dark room with one eye occluded and instructed to focus on the light from the retinoscope. The test is performed with the doctor 50 cm from the patient. The net refractive error is determined by adding –1.25 D to the gross sphere power, not –2.00 as may be expected from the working distance.
3. Cyclopegic retinoscopy- Cyclopegic retinoscopy is performed in the same manner as with a non-special needs patient. This test can be especially helpful for patients with accommodative fluctuation or other abnormalities. Cyclopentolate is considered to be the standard for a cycloplegic exam; however, Tropicamide may be substituted. It is important to note that the time window for using Tropicamide is smaller than with stronger cycloplegics.
4. Auto-refractor (AR)- Autorefraction is useful as a back-up to retinoscopy, especially to help determine difficult astigmatic powers and axes. AR is performed in the same manner as with a non-special needs patient. Habitual difficulties encountered with this method include fixation maintenance and over-accommodation. Cycloplegia improves auto- refraction accuracy and reliability. (12)

Figure 9: Hand held auto-refractor

5. Keratometry /Keratoscope/ Placido Disc- Corneal irregularities and the amount of astigmatism and axis can be estimated from the scatter and the pattern of the waves or mires. The keratocope is aimed at the patient's eye while the reflection of the concentric rings is viewed and judged by the practitioner.
6. Refractive crescents via direct ophthalmoscopy- A direct ophthalmoscope can be utilized for determining gross refractive error when other methods are ineffective, or when the practitioner wants to confirm previous results. To perform the test, position your scope about 40 cm from the patient and observe the red reflex. When a refractive error is present, the reflex

appears like phases of the moon due to the relative position of the illuminated retinal area. **A** thin, light crescent or no crescent indicates the absence of significant refractive error in that median. **As** the size of the crescent increases, the significance of the refractive error increases. For example, a crescent that fills half of the pupil is approximately two diopters of hyperopia or myopia. To determine whether a crescent indicates myopia or hyperopia, observe the orientation of the crescent relative to the position of the ophthalmoscope. **A** crescent that forms towards the head of the scope indicates hyperopia; a crescent that appears oriented towards the bottom of the scope indicates myopia. Turn the scope 90 degrees to evaluate the refractive error in the alternate meridian to gauge the level of astigmatism present; a large change in crescent size would indicate a significant level of astigmatism.

Orientation and Size of the Refractive Crescents in the 90 Degree Meridian



Generally, a 1/2 full pupil reflex indicates about two to three diopters of refractive error, 1/4 full is about one diopter and 3/4 full is in the three to six diopter range. Higher refractive errors (≥ 6 D) can be difficult to observe because the reflex fills the pupil; however, with practice, one can learn to discriminate between high ametropes and emmetropes. **(13)**

Refraction Pearls:

The refraction should done out of phoropter, using Halberg or Janelli clips over an existing spectacle correction or with a trial frame.

- The dioptric power necessary to obtain a clear view the fundus using the direct ophthalmoscope can also be helpful in estimating the refractive error when retinoscopy findings are questionable. To figure the estimated refractive error, subtract the doctor's uncompensated refractive error from the total power displayed on the ophthalmoscope.
- If uncertain about the results of the refraction, have the patient return to the clinic later in the week to repeat the retinoscopy. Confirmation of previous findings may be necessary prior to prescribing.
- Corneal abnormalities are more prevalent among the special needs population (example: keratoconus in Downs Syndrome individuals).
- Keratometry allows the practitioner to do a quick evaluation of the tear film by observing the duration to distortion of the mires.

Ocular Health

A. IOP

1. Goldman Applanation Tonometry- GAT is considered the gold standard for determining intraocular pressure. Disadvantages to Goldman include the need to instill anesthetic drops, obtaining cooperation for long durations of fixation, uncomfortable postural demands needed to sit in the instrument, and patient apprehension about "instruments touching the eye". Handheld tonometers, such as the Perkins Tonometer can alleviate the need for the patient to be confined to the slit lamp.
2. Tono-Pen- The Tono-Pen is small, handheld and unobtrusive. It is also portable so it is useful for patients in wheelchairs. Other advantages include the ability to take multiple, quick measurements and the option to review the results at a later time. If necessary, utilize an assistant or the patient's caregiver to help the patient maintain their fixation. A disadvantage to of the procedure is that it requires anesthetic. The Tono-Pen is excellent for irregular shaped corneas (many special needs patient have corneal abnormalities and high astigmatism).

3. Non-contact tonometry- Non-contact tonometry is useful when patients are apprehensive about the instillation of drops or the Goldman apparatus. However, this test is difficult to use when the patient is unable to maintain fixation or physically unable to sit in the instrument. Be sure to demonstrate the puff of air delivered by the apparatus on the patient's hand to reduce apprehension.
4. Portable pneumatic tonometers- The Keeler Pulse Air tonometer is also useful for determining IOPs. Before taking the reading, explain and demonstrate the puff off air on the patient's hand. The Pulse Air is portable, which makes it useful for wheelchair-bound patients. Advantages to pneumatic tonometry include non-transmission of infectious disease, no anesthetic drops are required, no staining is necessary and once mastered, is relatively easy to use. A disadvantage is that the unit does make some noise, which may make patients wary. Another unit that is relatively new to the market is the cordless Reichert PT100 Portable NCT, which is used in a similar manner to the Keeler Pulse Air.

Figure 10: Keeler Pulsair used on special needs patient

5. Digital Tension Estimation-When automated pressures cannot be obtained because of physical limitations or patient anxiety, sampling digital tension can be useful. The study "Assessment of intraocular pressure in children by digital tension" demonstrated that digital tension estimation was reliable especially in the "normal" (6 to 22 mmHg) range. (14) To perform the procedure, have the patient close their eyes while looking down. Use one finger to steady the eye in position against the orbital fat, then apply pressure with a second finger above the tarsal plate. The relative softness or hardness can then be determined by the globe's resistance. Record the pressure as "low", "moderate", or "high" and whether a difference in tension is noted between the two eyes.

D. Anterior exam

1. **A** gross inspection of structures can be completed without equipment or instruments. **A** direct ophthalmoscope with some added plus also helps the doctor get an assessment of several anterior structures.
2. **A** 20 diopter lens and a penlight can be used to more carefully assess lids/lashes, conjunctival health and the clarity of the cornea.
3. Limbal glow- can be used to check the anterior chamber angles. It can also detect a bowed iris (iris bombe), which may suggest a propensity for angle closure. (15) Place your trans-illuminator to the lateral side of the patient's face, approximately one inch lateral to the orbit and slightly posterior. **Ask** the patient to open his/her eyes widely and then rotate the trans-illuminator so that it is parallel with the cornea laterally and approximately perpendicular to the nose. Observe the amount of glow that is transmitted through the chamber angle and that is visible on the nasal side of the globe.
4. Hand held slit lamp- This portable instrument is a valuable tool when working with patients who are unable to move into the exam chair. It is used in the same fashion as a traditional slit lamp. **A** standard slit lamp, however, is recommended if possible, due to the high prevalence of anterior segment abnormalities and disease in the population.

Figure 11: Handheld Biomicroscope

E. Posterior exam

1. Binocular Indirect Ophthalmoscopy - Turning down the illumination on the binocular indirect ophthalmoscope (BIO) may encourage the patient to better cooperate with this procedure. Patients with severe developmental disabilities may be unwilling or unable to sit for funduscopy even with reduced illumination. With such cases, a referral to other specialists licensed to administer general anesthesia may be necessary. (16)

1. Non-Dilated Posterior Exam via Direct Ophthalmoscope (DO), Indirect Ophthalmoscope (MIO) or PanOptic® Ophthalmoscope or Keeler® Wide Angle Dual Magnification Scope- This procedure is performed in the same fashion as with a non-special needs patient. A key factor is getting the patient to maintain a steady fixation. To accomplish this, it may be necessary to utilize the patient's caregiver or an assistant. The ophthalmoscope is also useful in assessing anterior features such as lids and lashes.
2. The Direct Ophthalmoscope as a Monocular Indirect Ophthalmoscope- This procedure is performed in a manner similar to binocular indirect ophthalmoscopy, but does not require the patient to be dilated. This procedure combines a direct ophthalmoscope with a 20 diopter. The optometrist holds the 20 D lens directly in front of the patient's eye, while peering through the ophthalmoscope at the 20 D lens from a distance of approximately 30cm away. The ophthalmoscope beam is then focused and centered in the 20 D lens, while the image of the retina is observed through the ophthalmoscope. Another advantage to this technique is that much less light intensity is needed for this procedure, so patients may be more likely to cooperate with this portion of the internal ocular health assessment.

Post Examination:

At the conclusion of the examinations, findings should be thoroughly discussed, documented, and distributed to parents, caregivers, and educators. When describing results, try to avoid the term "normal"; a better way to make comparisons could be, "A person with good sight would reach this level, whereas you are achieving at this level because...". Be sure to emphasize the positive. Patients are aware of their limitations and shortcomings; professionals should attempt to foster confidence and pride in their patient's strengths and successes whenever possible. Vision therapy should be employed to bolster binocularity or treat amblyopia when possible.

Spectacle Prescriptions and Dispensing

The importance of prescribing lens corrections for special needs populations was established in a study by Bader and Woodruff. The study concluded that positive behavioral changes resulted from refractive error correction. As might be expected, the earlier age at which a correction is worn, the more significant the impact on behavior. (17) This study demonstrated that individuals who wore spectacle correction improved in their gross motor skills, and more importantly, fine motor skills. These individuals were better able to print their names along with other simple words from memory. In addition, this study pointed out that individuals who were suffering from anisometropia, in particular, benefited from an effective lens correction.

Dispensing Pearls

- The patient's habitual posture should be taken into consideration relative to head, neck and trunk control. Bifocals may not be appropriate if the patient cannot move his/her head to look out of the distance portion of the lenses when walking. The lenses may become an impediment to mobility issues in such cases. A better option may be to prescribe two sets of single vision lenses for these patients.
- When prescribing multiple single vision lenses, it is important that the frames are easily distinguishable by both the patient and the caregivers. That way, confusion as to which pair is for distance and which pair is for near can be minimized.
- If bifocals are prescribed, first determine whether the patient has adequate oculomotor control and spatial awareness to properly utilize both the upper and lower portions of the lenses.

General Pearls

- When scheduling the first exam with a patient with special needs, plan on a minimum of one hour for the first visit so the patient can

gradually adapt to the environment of the clinic. Multiple visits may be required to complete a comprehensive vision examination.

If a patient is uncooperative or fearful, consider completing the functional portion of the exam during the first visit, and rescheduling the dilation for a later visit.

Involve the patient as well as the caregivers (whenever possible). Getting the patient to respond at the outset of the exam will keep them interested and make them more likely to participate later on in the exam as well.

Use the highest level assessment procedure possible given the patient's developmental level.

Be flexible with testing, switch to an alternative test whenever difficulty is encountered.

In order to maintain the interest and conserve attentional resources, utilize brief sessions of testing interspersed with breaks.

Be generous with sincere praise for participation. Encourage the patient to feel positive about their performance.

Whenever possible, illustrate, diagram, and use concrete examples of what you see.

Sprinkle novel attention "grabbers" throughout your exam to maintain a high level of anticipation to upcoming surprises.

Figure 12: Finger puppets and bright colors are effective attention "grabbers".

These patients are often taking multiple drugs. Confirm that they have taken all the recommended dosages for the day, so they are functioning at their "normal" level.

Be aware of which drugs that effect accommodation or acuity.

If the patient is more comfortable being in area other than the exam chair and it does not impede the exam, try the exam from the preferred setting.

If patient is uncooperative or apprehensive about instilling diagnostic drops, it may be easier to allow the patient to close his/her eyes while drops are applied to the respective medial canthus. Gently lift the upper lid to allow the drops to dissipate. It is important to occlude the nasolacrimal duct with slight pressure for about one minute. (18)

- Whenever the developmental level of the patient permits, utilize subjective test responses to augment objective test results. Special needs populations often have a strong desire to please the doctor. These patients may try memorizing acuity tests or responding in a manner they perceive will not disappoint the optometrist. Use a random approach to acuity tests.

Summary:

Working with special populations can be financially and professionally fulfilling once the practitioner has the requisite skills and experience. Having trained staff to assist with testing is very helpful and reduces examination time. A skilled assistant can assist the professional with many different tests including acuities, color vision, stereopsis, etc.

Sadly, the nation's special needs population is visually under-served. The few optometrists who have made special needs patients their specialty are insufficient to fulfill the need. To quote Warburg, "The best way to learn how to work with this population is to be exposed to them, be around them. We have the duty to serve them because what has been done in the past has not been enough to meet their needs." (19) A rewarding, positive, and educational way to become more involved and experienced with this population of patients is to become involved with the Special Olympics-Lions Club International Opening Eyes (SOLCIOE) organization in your state.

The purpose of this course has been to introduce the optometric practitioner to visual assessment of the special needs patient. Background information, clinical assessment pearls and a specific battery of tests were

presented with the goal of facilitating visual examinations of the special needs patient.

Relevant appendices are included to assist the practitioner. Appendix I is a listing of the sources where tests mentioned in this course can be obtained. Appendix II is a compendium of tests organized by visual function. Each test has been subjectively ranked by the authors as to its appropriateness for a variety of handicaps including speech, hearing, motor and cognitive development. The appendixes (including helpful websites) are followed by a bibliography and the work concludes with a self-assessment quiz covering the material in this course.

Appendix One: Equipment

Bailey-Hall Cereal Test
Multimedia Center
School of Optometry
University of California, Berkeley
Berkeley, CA 94720

Broken Wheel Test of Visual Acuity, Optokinetic Drum, Worth Dot and other equipment
Bernell Corporation
750 Lincoln Way East
PO Box 4637
South Bend, IN 46634
Tel: (800) 348-2225
http://www.bernell.com

Handheld Slit Lamp
Haag-Streit Services, Inc
7 Industrial Park
Waldwick, NJ 07463
http://www.haagstreituk.com

HOTV Vision Test
Good-Lite Company
1540 Hannah Ave.
Forest Park, IL 60130
Tel: (708) 366- 3860
http://www.good-lite.com/

Keeler Instruments
456 Parkway Ave.
Broomall PA 19008
Tel: 800.523.5620
http://www.keelerusa.com/

Lea Symbols
Precision Vision
721 North Addison Road
Villa Park, IL 60181
Tel: (708) 833-1454

Random Dot Butterfly and other Random Dot targets
Synthetic Optics Corporation
903 Mohawk Rod
Franklin Lakes, NJ 07417

Reichert Ophthalmic Instruments
3374 Walden Ave.
Depew, NY 14043
Tel: (716) 686-4500
Fax: (716) 686-4545
http://www.reichertoi.com

Teller Acuity Cards
Vistech Consultants, Inc.
1372 North Fairfield Road
Dayton, OH 45432

Teller Acuity Cards, Random Dot E, Lang Stereo Test
Stereo Optical Company, Inc.
3539 N. Kenton
Chicago, IL 60641
(800) 344- 9500
http://www.stereooptical.com/MainPages/Home.htm

Tono-Pen XL
Mentor O & O, Inc.
3000 Longwater Drive
Norwell, MA 02051
(800) 628-5227

Welch Allyn Medical Products
Corporate Headquarters
4341 State Street Road
Skaneateles Falls, NY 13153-0220
Tel: (800) 535-6663
Fax: 315-685-4091
http://www.welchallyn.com/medical/

Appendix Two: Table of **Procedures** for **Special Needs Patients**

Procedure Rating:
1 – Not useful
2 – The test is adequate, but may be difficult to perform or provide gross measurements.
3 – The test may be appropriate, but other tests may provide more standardized results.
4 – The test is useful, provides standardized results and can be performed with relative ease.

Note: the **hearing impairment** would **not alter the** testing procedure **provided** that a **care-giver could** assist in communicating instructions to **the** patient Once a **test** is demonstrated to the **patient** they **understand the pattern** and can **perfrom** the **test** as any other patient **Regarding the** patients who have a motor impalnnent or who are mute, we can *perfrom* **the** VA testing by having **them either** point to a response on a near card **or verbalize** a response.

	Hearing Impairment and Developmental Age of Two Years	Motor Impairment and Developmental Age of Two Years	Mute Patient with Developmental Age of Two Years	Hearing Impairment and Developmental Age of Six Years	Motor Impairment and Developmental Age of Six Years	Mute Patient with Developmental Age of Six Years
Visual Acuity						
Snellen	1	1	1	4	4	4
HOTV	1	1	1	4	4	4
Lea Symbols	4	4	4	3	3	3
Broken Wheel	1	1	1	4	4	4
Lighthouse Flash Card	4	4	4	3	3	3
Teller Acuity Cards	4	4	4	2	2	2
Cardiff Cards	4	4	4	2	2	2
Bailey Hall Cereal Test	3	1	3	2	1	2
CBVAT	3	1	3	2	1	2
OKN Drum	3	3	3	3	3	3
Binocular Vision						
Bruckner	4	4	4	4	4	4
Hirschberg	4	4	4	4	4	4
MLF	4	4	4	4	4	4
Krimsky	4	4	4	4	4	4
Cover Test	3	3	3	4	4	4
NPC	4	4	4	4	4	4
Random Dot Cube	2	2	2	4	4	4
Lang Stereo Test	4	4	4	4	4	4
Random Dot E	2	2	2	4	4	4
Worth Dot Test	1	1	1	4	4	4
Color Vision						
Color Vision Testing Made Easy	2	2	2	4	4	4
Ishihara	2	2	2	4	4	4
Wool Yarn Test	3	3	3	3	3	3

	Hearing Impairment and Developmental Age of Two Years	Motor Impairment and Developmental Age of Two Years	Mute Patient with Developmental Age of Two Years	Hearing Impairment and Developmental Age of Six Years	Motor Impairment and Developmental Age of Six Years	Mute Patient with Developmental Age of Six Years
Accommodation						
Retinoscopic push-up amplitude	4	4	4	3	3	3
Flipper Facilities	3	3	3	4	4	4
MEM	3	3	3	4	4	4
Refraction						
Static Retinoscopy	4	4	4	4	4	4
Mohindra	3	3	3	3	3	3
Cyclopegic Retinoscopy	4	4	4	4	4	4
Auto-refractor	2	2	2	4	4	4
Keratometry	2	2	2	4	4	4
Keratoscope	3	3	3	3	3	3
Refractive Cresents	2	2	2	2	2	2
IOP						
Goldman	4	4	4	4	4	4
Tono-pen	4	4	4	4	4	4
Keeler Pulse-Air	4	4	4	4	4	4
NCT	4	4	4	4	4	4
Digital Tension	2	2	2	2	2	2
Anterior Exam						
Gross Inspection	2	2	2	2	2	2
20 D Lens and Penlight	3	3	3	3	3	3
Limbal Glow	3	3	3	3	3	3
Ophthalmoscope	3	3	3	3	3	3
Stationary Slit Lamp	4	4	4	4	4	4
Hand Held Slit Lamp	4	4	4	4	4	4
Posterior Exam						
DFE with BIO	3	3	3	4	4	4
MIO	4	4	4	4	4	4
DO	4	4	4	4	4	4
20 D Lens + DO	3	3	3	3	3	3

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Optometric Assessment of the Patient with Mental Retardation or Special Needs Self Assessment Quiz

1. What ratio most accurate describes the number of Americans directly affected by mental retardation?

   A. 1 in 25
   B. 1 in 50
   C. 1 in 10
   D. 1 in 18

2. According to Ronis, what has been reported as the most common visual dysfunction in the developmentally disabled population?

   A. Oculomotor
   B. Accommodation
   C. Stereopsis
   D. Pupillary

3. Which adverse effect was not reported to be associated with anti-seizure medications?

   A. Poor extraocular muscle performance
   B, Blurred vision
   C. Visual field defects
   D. Cyclopledgia

4. The Lang I Stereotest samples _____ stereopsis?

   A. Local
   B. Global
   C. Combined
   D. Total

5. Which of the following acuity tests would be best to use with a non-verbal, wheelchair bound patient lacking hand and arm control, but with normal ocular motilities?

A. Candy bead visual acuity test
B. Bug squash test
C. Snellen acuity test
D. Cardiff.

6. When performing the Hirshberg test, your patient's reflex OD is similar to the MLF baseline, however, the reflex OS is displaced nasally. How would the deviation be described?

A. esophoria
B. exotropia
C. exophoria
A. esotropia

7. If the Hirshberg reflex was decentered **1.5** millimeters, what would the magnitude of the deviation be?

A. 1.5 prism diopters
B. 100 prism diopters
C. 7 prism diopters
D. 22 prism diopters

8. Accommodative spasm/paresis most often accompanies which of the following conditions?

A. Cerebral Palsy
B. Fragile X syndrome
C. Turner's Syndrome
D. Down's Syndrome

9. Which of the following methods is least useful for determining refractive error at distance?

A. Photorefraction
B. Static retinoscopy
C. MEM retinoscopy
D. Autorefraction

10. What is the proper setup for performing monocular indirect ophthalmoscopy using a direct ophthalmoscope?

A. **20 D** lens **is** placed before the eye, and the examiner is positioned **10** cm in front of the patient
B. 78 D lens is placed before the eye, and the examiner is positioned **50** cm from the patient
C. **20 D** lens is placed directly in front of the direct ophthalmoscope, and the examiner is positioned **50** cm in front of the patient
D. **20 D** lens is placed before the eye, and the examiner is positioned **30** cm in front of the patient

11. While performing the Briickner test, you notice that the left eye has a brighter reflex. What potential abnormality could be present in this patient?

A. Retinoblastoma
B. Corneal dystrophy
C. Heterochromania
D. All of the above

12. Which of the following tests for binocularity and refractive error?

A. Briickner
B. Krimsky
C. Lang Stereotest
D. OKN

13. The "moderate" classification for mental retardation comprises what percentage of individuals with mental retardation?

A. 90 %
B. 10 %
C. 5 %
D. 2.5 %

14. What factors should be considered before prescribing bifocals to multiply-handicapped patients?

A. Oculomotor control
B. Height of add section
C. Head, neck and trunk control
D. All of the above

15. A question on a pre-examination questionnaire asking about the distance the patient sits from the television would most closely relate to which visual skill?

A. Acuity
B. Depth Perception
C. Sensory fusion
D. All of the above

16. Which is not a valid reason for requesting the presence of caregivers, parents, and educators at the initial visit?

A. Calming effect
B. Perform tests if practitioner cannot get patient to cooperate
C. Contribute inforrnation
D. Help grab patient's attention for fixation based tests

17. What is the most likely reason a patient would report seeing 5 dots on the Worth 4 Dot Test?

A. Patient is suppressing an eye
B. Binocular vision is normal
C. Patient is diplopic
D. Patient has achieved third degree fusion

18. Which of the following is the most important to assess with special populations?

A. Refractive error
B. Binocular vision
C. Accommodation
D. Ocular Health
E. All of the above factors are important to determine with special needs patients.

19. Which of the following statements concerning digital tension is **false?**

A. The procedure is performed with two fingers
B. Digital tension has a significant correlation to NCT in normal ranges
C. Digital tension results must be converted to a numerical equivalent
D. Digital tension is taken with patient's eyes in down-gaze

20. MEM retinoscopy is useful to measure which of the following?

A. Accommodative posture
B. Near refraction
C. Highest amount of plus power patient can tolerate
D. Strabismic deviations

21. Traditional direct ophthalmoscopy may **not** be useful in determining which of the following?

A. Binocular fixation
B. Refractive error
C. Visual Field
D. Lid Health

22. A disadvantage to the Viewer Free Random Dot Cube is that it requires polarized lenses.

A. True
B. False

23. Which of the following group of tests are best for unmasking a small angle strabismus?

A. Lang Stereotest, Brückner, and cover test
B. Stereo Fly, Lea Card and confrontational fields
C. Wirt Circles, MLF and ocular motilities
D. None of the above

24. For a patient with a hearing impairment and a developmental age of two years, which is the most appropriate test for assessment of visual acuity?

A. Broken Wheel
B. HOTV
C. Lea Symbols
D. Snellen

25. Which is the following color vision tests is the least specific concerning the type and depth the of color vision deficiency?

A. Ishihara
B. Color Vision Testing Made Easy
C. Wool Yarn Test

D. Farnsworth Lantern test

26. Which of the following is the most reliable refractive test for a patient with the developmental age of two years?

A. Refractive error estimation via direct ophthalmoscope

B. Manifest autorefraction

C. Dry retinoscopy

D. Cyclopegic retinoscopy

27. Color vision testing may be especially important for the multiply-handicapped patient because some strategies for communication and education are based on color coding.

A. True

B. False

28. Findings by Margaret Ronis revealed that _____ of developmentally disabled patients had oculomotor dysfunction.

A. 54%

B. 28%

C. 76%

D. 92%

29. Anticholinergics are often used to manage symptoms of patients with _____, which can cause dry, irritated eyes and varying degrees of cycloplegia and associated blurred vision

A. Down's Syndrome

B. Cerebral Palsy

C. Turner's Syndrome

D. Fragile X Syndrome

30. Retinoscopy is often the only reliable and accurate means of determining the refractive status with special needs populations.

A. True

B. False

31. **How could a** practitioner modify symbol recognition acuity to reduce memorization?

A. Wait 5 seconds between presentations

B. Wait 15 seconds between presentations

C. Have **patient** close **eyes** between presentations

D. Have assistant randomly point to **symbols**

Optometric Assessment of the Patient with Mental Retardation or Special Needs

Self Assessment Quiz Key

1. C
2. B
3. D
4. B
5. D
6. B
7. D
8. A
9. C
10. D
11. A
12. A
13. C
14. D
15. D
16. B
17. C
18. E
19. C
20. A
21. C
22. B
23. A
24. C
25. C
26. D
27. A
28. D
29. B
30. A
31. D