Visual Dysfunction: Occupational Therapy

Indexing Metadata/Description

- **Title/condition:** Visual Dysfunction: Occupational Therapy
- **Synonyms:** Visual impairment: occupational therapy; visual defect: occupational therapy; low vision: occupational therapy
- **Anatomical location/body part affected:** Parietal lobe of brain (visual attention), occipital lobe of brain (vision), temporal lobes of brain (visual perception), eyes, cranial nerves (II–VI)
- **Description**
  - Vision is the process whereby the brain identifies, interprets, and responds appropriately to visual data. It is how the appearance of an object (e.g., shape, color, location, and spatial organization) is perceived by an individual\(^3\)
  - Light rays enter the eye and are transformed into electrical signals in the retina; these signals are transmitted via the optic nerve to the cortex, where they are processed\(^3\)
  - Visual dysfunction can affect visual acuity, visual fields, color vision, night vision, and/or ocular motility, as well as visual perception and visual motor integration, and can impact mobility and functional skills and abilities\(^3\)
- **Categories of visual dysfunction**
  - Low vision – bilateral vision loss that cannot be resolved with corrective lenses or medical/surgical intervention; includes decreased acuity, visual field loss, or both\(^2,3\)
  - Visual dysfunction may be age-related (e.g., cataracts, glaucoma, age-related macular degeneration, diabetic retinopathy),\(^3\) but it can occur at any age
  - Changes in vision may occur following a neurological event (e.g., traumatic brain injury [TBI] or stroke)\(^3,34,48\)
  - Ocular motor dysfunction – the eye mobility functions that allow the eyes to move in a smooth and coordinated manner are impaired. Areas of ocular motor function that can be affected include:
    - alignment of the eyes (binocular vision) – if the eyes are not aligned, diplopia (i.e., double vision) may occur\(^3\) This is the simultaneous perception of two images of a single object, displaced horizontally, vertically, or diagonally in relation to each other
    - vergence – ability to focus the eyes on a single point by simultaneous movement of the pupils toward (convergence) or away from (divergence) one another to adjust for different distances between the eyes and the visual target
    - accommodation\(^3\) – the ability to change the focus from distant to near or near to distant objects. Involves pupil constriction, vergence, and change in convexity of the lens
    - scanning\(^3\) – the ability to see visual data in an organized manner, most commonly from left to right
    - saccades\(^2\) – rapid eye movements from one point to another that affect tracking and reading. These high-speed movements bring new objects into central vision, where images can be seen in more detail
  - Unilateral visual neglect – a dysfunction in visual perception and attention to stimuli presented on one side of the body due to a brain lesion (e.g., stroke, tumor); failure to recognize or respond to stimuli on one side. The neglect is contralateral to the side of
the brain lesion and may be seen during activities, for example when a patient eats the food on only one side of his plate\(^3,4,8\)

- Unilateral neglect is more than just a visual condition, and may be referred to as hemispatial inattention. A patient with hemispatial inattention also may not respond to a voice when the person is on the affected side or a tactile stimulus on the affected side and may not be able to recall memories of objects or places that would normally be on that side
  - Visual field deficits\(^5\) – blind segments in one or more visual fields
    - Homonymous hemianopsia – blind areas in the right visual field of both eyes or left visual field of both eyes\(^5\)
    - Homonymous quadrantanopia – blind areas in right or left visual field that affect superior or inferior quadrants of both eyes\(^5\)
    - Bitemporal hemianopsia – loss of vision in temporal fields of both eyes\(^5\)
  - Visual perceptual dysfunction – impairment in the ability to integrate visual data taken in through the eyes with the sensory system for higher cognitive function\(^6\)

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**ICD-10 codes**

- H53 visual disturbances
  - H53.0 amblyopia ex anopsia
    - H53.00 unspecified amblyopia
    - H53.01 deprivation amblyopia
    - H53.02 refractive amblyopia
    - H53.03 strabismic amblyopia
  - H53.1 subjective visual disturbances
    - H53.12 transient visual loss
    - H53.13 sudden visual loss
    - H53.14 visual discomfort
    - H53.15 visual distortions of shape and size
    - H53.16 psychophysical visual disturbances
    - H53.19 other subjective visual disturbances
  - H53.2 diplopia
  - H53.3 other and unspecified disorders of binocular vision
  - H53.4 visual field defects
    - H53.40 unspecified visual field defects
    - H53.41 scotoma involving central area
    - H53.42 scotoma of blind spot area
    - H53.43 sector or arcuate defects
    - H53.45 other localized visual field defect
    - H53.46 homonymous bilateral field defects
    - H53.47 heteronymous bilateral field defects
    - H53.48 generalized contraction of visual field
  - H53.5 color vision deficiencies
  - H53.6 night blindness
  - H53.7 vision sensitivity deficiencies
  - H53.8 other visual disturbances
  - H53.9 unspecified visual disturbances

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(ICD codes are provided for the reader’s reference, not for billing purposes)

- **Reimbursement**
  - Reimbursement for therapy will depend on insurance contract coverage
  - No specific issues or information regarding reimbursement has been identified

- **Presentation/signs and symptoms**
  - Age-related vision changes\(^2\)
    - Macular degeneration – decreased visual acuity, central scotoma, difficulty reading and recognizing faces, decreased contrast sensitivity
    - Diabetic retinopathy – scotomas, poor contrast and color discrimination, impaired night vision, fluctuations in acuity
- Cataracts – diplopia, impaired night driving, poor contrast sensitivity, decreased acuity
- Glaucoma – decreased night vision, impaired ocular mobility, central visual field deficits
- Presbyopia – difficulty seeing close objects or small print clearly. Typically noticed after age 40 and can be treated with corrective lenses

–Ocular motor dysfunction
- Decreased saccadic (ability of eye to rapidly look from one place to another) eye movements that impact reading, driving, and walking
- Decreased vertical eye movements – the ability to look up and down
- Diplopia
- Convergence insufficiency – inability to stay focused on one point
- Problems with accommodation – inability to quickly change focus from far to near
- Eye misalignment, problems with binocularity (ability to use both eyes to work together to focus on an image)

–Neurologic-related/visual perceptual
- Visual neglect
- Light sensitivity
- Nystagmus (i.e., involuntary rapid eye movements)
- Inability to fixate on objects, poor visual attention
- Headaches, especially after visual tasks

–Functional impairments (may be related to low vision, neurological issues, or combination of both)
- Inability to recognize faces
- Bumping into objects
- Difficulty reading
- Getting lost
- Impaired mobility
- Driving problems
- Examples include not being able to see road signs clearly, difficulty judging distances and speed, problems seeing in low light or at night, difficulty adapting to glare from headlights, and loss of side vision

–In children
- Avoiding academic tasks
- Complaints of dizziness, nausea, headaches after visual work
- Falling asleep while reading
- Blurred vision
- Difficulty with reading and reading comprehension
- Poor memory
- Decreased attention and concentration
- Difficulty with form discrimination, which is the ability to recognize and differentiate shapes and forms
- Inability to recognize and identify pictures
- Poor visual searching ability
- Decreased visual motor integration (e.g., poor eye-hand coordination)

**Causes, Pathogenesis, & Risk Factors**

**Causes**

• Aging of ocular anatomy
• Diabetic retinopathy – damage to the nerves and blood vessels of the retina
• Cataracts – opacity or clouding of the lens of the eye
• Retinopathy of prematurity

• Stroke (for additional information on treatment and assessment of unilateral visual neglect in patients with stroke, see *Clinical Review...Stroke Rehabilitation: Unilateral Neglect;* CINAHL Topic ID Number: T708897)

• Multiple sclerosis (for additional information on assessment and treatment of patients with multiple sclerosis, see *Clinical Review...Multiple Sclerosis: Occupational Therapy;* CINAHL Topic ID Number: T708894)

• Parkinson disease

• TBI (1,33) (for additional information on assessment and treatment of patients with TBI, see the series of Clinical Reviews on this topic)

• Cerebral palsy (CP) (1) (for additional information on assessment and treatment of patients with CP, see the series of Clinical Reviews on this topic)

• Optic nerve hypoplasia (2)

• Glaucoma (11) – damage to the optic nerve typically (but not always) caused by high intraocular pressure (for additional information on treatment and assessment of patients with glaucoma, see *Clinical Review...Glaucoma: Occupational Therapy;* CINAHL Topic ID Number: T708886)

• Perinatal hypoxia-ischemia (35)

• Epilepsy (for additional information on assessment and treatment of patients with epilepsy, see *Clinical Review...Epilepsy: Occupational Therapy (OT);* CINAHL Topic ID Number: T709002)

**Pathogenesis**

• Impairment can be caused by problems within the eye (e.g., degeneration of the macula—the central part of the retina), with the connections to the brain (e.g., optic nerve), or in an area of the brain involved with processing and interpretation (e.g., visual cortex, visual association cortex)

• The retina translates visual images into electrical signals that are sent to the brain; visual dysfunction occurs when there is a disruption in the delivery of signals to the brain due to injury, neurological dysfunction, weakness, or disease

• Lesions in the visual pathways including the optic nerve, optic chiasm, tracts traveling to the lateral geniculate nucleus, the optic radiation, visual cortex in the occipital lobe, and visual association cortices in the posterior temporal lobe and posterior parietal lobe can disrupt signals from the retina to the brain

• A patient may have both low vision and neurologically related visual impairments (e.g., status post stroke with age-related low vision)

**Risk factors:** Risk factors for visual dysfunction vary according to underlying diagnosis

• Over 65 years of age – prevalence of vision impairment is 2 in 3 persons (12)

• Risk factors for macular degeneration (13)
  – Advanced age – persons over 60 years of age have increased risk
  – Cigarette smoking
  – Family history of macular degeneration
  – Having light or blue eyes
  – Ethnicity: higher incidence in Whites
  – Sex: higher incidence in females
  – Poor diet: low in omega-3 fatty acids and leafy green vegetables and high in omega-6 fatty acids
  – Hypertension
  – Obesity

• Risk factors for cataracts (42)
  – Increasing age
  – Diabetes
  – Excessive exposure to sunlight
  – Smoking
  – Obesity
  – High blood pressure
  – Previous eye injury or inflammation
  – Previous eye surgery
• Risk factors for diabetic retinopathy:
  – Poor blood sugar control
  – Duration of diabetes
  – High blood pressure
  – Smoking
  – Pregnancy

**Overall Contraindications/Precautions**

› Adults with visual impairments may be at risk for falls.
› Proceed with caution in patients with unilateral neglect, as they may not have awareness of any stimuli or sensory input presented to the affected side and are at increased risk for injury (e.g., arm getting caught in wheelchair).
› Patients with homonymous hemianopsia are at increased risk of bumping into or failing to notice things on the side of the hemianopsia and can be startled when approached from the hemianopic side.
› If patient reports a sudden appearance of many floaters (i.e., spots, strings, or hairs that seem to float in the visual field), sudden flashes of light, or a shadow over a portion of the visual field, these may be signs of retinal detachment, which requires immediate medical attention.
› Sudden loss of vision is an emergency—most causes are serious. Anyone who experiences a sudden loss of vision should see an ophthalmologist or go to the emergency department immediately.
› See specific Contraindications/precautions to examination and Contraindications/precautions under Assessment/Plan of Care.

**Examination**

› History
  • **History of present illness/injury**
    – **Mechanism of injury or etiology of illness**
      - Document cause and onset of vision problems, if known, and general progression since onset.
    – **Course of treatment**
      - **Medical management:** Document current lens correction (if applicable), optical devices, including prisms, used or prescribed. Ask about previous surgical procedures, such as laser eye surgery or cataract surgery.
      - **Medications for current illness/injury:** Determine what medications the physician has prescribed; are they being taken? Are they effective?
        - Medications for glaucoma include beta-adrenergic antagonists (e.g., timolol, levobunolol), prostaglandin analogs (e.g., latanoprost, travoprost, bimatoprost), adrenergic agonists (e.g., brimonidine, dipivefrin), and carbonic anhydrase inhibitors (e.g., dorzolamide, brinzolamide).
      - **Diagnostic tests completed:** Review the results of vision assessments that have been completed.
        - **Vision tests**
          - **Snellen notation:** for visual acuity; numerator represents distance at which letters are seen and denominator represents distance from which a person with standard vision could see the same line. 20/20 is considered normal vision.
          - **Reading test:** standard vision is average newsprint size at standard distance of 1 meter/40 inches.
          - **Amsler grid:** the patient is asked to stare at a dot on a grid with one eye. This test detects visual field losses or damage to the macula should patients perceive wavy lines or missing squares on the grid.
          - **Grading acuity tests:** detecting parallel lines with various widths.
          - **Scanning laser ophthalmoscope (SLO):** tests for macular perimetry by scanning an invisible infrared beam into retina to obtain an image of the retina.
          - **Electrodiagnosis**
            - **Electroencephalography (EEG):** provides information on electrical activity in different parts of the brain such as the occipital lobe (visual cortex).
            - **Visual evoked potential or response (VEP or VER):** tests function of visual pathways by measuring the electrical signal recorded at the scalp over the occipital cortex in response to photo stimulus. The light-evoked signal is small.
in amplitude and hidden within the normal EEG signal, so is amplified by repetitive stimulation and time-locked,
signal-averaging techniques
- Visual evoked potential mapping (VEPM) –assesses large areas of the brain
- Imaging studies – may be used to assess for lesions within the brain or optic pathways caused by trauma, vascular
events, or neurologic conditions
  - CT
  - MRI
  - PET
- **Home remedies/alternative therapies:** Document any use of optical devices such as video magnification (closed
circuit television), pocket magnifiers, and increased contrast lighting and whether or not they help(40-47)
- **Previous therapy:** Document whether patient has had occupational or physical therapy for this or other conditions and
what specific treatments were helpful or not helpful(8)
  - **Aggravating/easing factors:** Document factors that improve vision, such as enlarged print, lighting, and colors, as well
as factors that increase symptoms (e.g., photosensitivity)(2-3)
  - **Body chart:** Use body chart to document location and nature of symptoms
  - **Nature of symptoms:** Document nature of symptoms (constant vs. intermittent, blurry vision; double vision; changes
from day to day)(2-3) Document nature of perceptual impairment:
    - Metamorphopsia – in which objects appear distorted or larger or smaller than actual size(17)
    - Perceptual completion – in which an object appears complete even when part of the object falls in part of the visual field
that is damaged(17)
  - **Rating of symptoms:** Use a visual analog scale (VAS) or 0–10 scale to assess symptoms and/or pain at their best, at their
worst, and at the moment
  - **Pattern of symptoms:** Document changes in symptoms throughout the day and night, if any (a.m., mid-day, p.m., night);
also document changes in symptoms due to weather or other external variables
  - **Sleep disturbance:** Document number of awakenings/night
  - **Other symptoms:** Document other symptoms patient may be experiencing that could exacerbate the condition and/or
symptoms that could be indicative of a need to refer to physician
  - **Respiratory status:** Document patient’s respiratory status; is there a need for supplemental oxygen? Does the patient
have any history of respiratory compromise? Conditions associated with blurred vision and shortness of breath include
hypotension, type 2 diabetes mellitus, myasthenia gravis, and transient ischemic attacks
  - **Barriers to learning**
    - **Are there any barriers to learning? Yes__ No__
    - **If Yes, describe _________________________
  - **Medical history**
    - **Past medical history**
      - **Previous history of same/similar diagnosis:** Document previous history of visual problems and surgical intervention
for visual dysfunction. Document whether the patient has worn glasses or contact lenses in the past
      - **Comorbid diagnoses**
        - Ask patient about other problems, including diabetes, secondary complications of diabetes,(19) cancer, heart disease,
hypertension, stroke, TBI, neurological complications, ocular disease, respiratory disease,(14) complications of
pregnancy, psychiatric disorders, and orthopedic disorders(48)
    - **Medications previously prescribed:** Obtain a comprehensive list of medications prescribed and/or being taken
(including OTC drugs and supplements)
      - Some medications can cause vision problems as a side effect(20)
        - Antihistamines
        - Anticholinergics
        - Digitalis derivatives
        - Certain antihypertensives (guanethidine, reserpine, and thiazide diuretics)
        - Indomethacin
        - Phenothiazines
        - Antimalarials
- Ethambutol
- A variety of medications can result in color vision deficits\(^{(44)}\)
- Rassi et al. describe several drug types frequently prescribed to older adults that can potentially alter color perception:
  - Lanoxin (Digoxin) – a cardiac stimulant
  - Lasix – a diuretic
  - Hydroxychloroquine (Plaquenil) – an antimalarial sometimes prescribed for rheumatoid arthritis
  - Sildenafil (Viagra)
  - Tamoxifen - used to reduce breast cancer risk
- The authors pointed out that it is not uncommon for older adults to be unaware of their color deficits and that this has implications for rehabilitation professionals working with them, including:
  - Color-coding interventions for seniors with low vision to facilitate localization and identification of objects may not be effective
  - Many older adults rely on the color of their pills to identify and discriminate them
  - Assistive technology devices to facilitate ADLs often use buttons and controls that require color discrimination\(^{(48)}\)
- **Other symptoms:** Ask patient about other symptoms he or she may be experiencing. Ask about any redness, swelling, headache, pain, itching, dryness, discharge/drainage, or a sense that something is in the eye\(^{(20)}\)

### Social/occupational history

- **Patient’s goals:** Ask patient, family, and/or caregiver about the impact of the visual impairment on the patient’s daily tasks.\(^{(11)}\) Document what the patient, family, and/or caregiver hope to accomplish with therapy
- **Vocation/avocation and associated repetitive behaviors, if any**
  - Document patient’s work or school situation and visual needs in his or her place of employment/school
  - Document if patient drives\(^{(21)}\) and/or has noted any difficulties with driving, such as with glare and depth perception
  - Document patient’s participation in sport activities/recreation
- Document patient’s participation in hobbies or crafts

### Functional limitations/assistance with ADLs/adaptive equipment

- Document patient’s participation in IADLs (e.g., managing medications, shopping, household activities)\(^{(38,40)}\)
- Document how visual deficits impact function\(^{(11)}\)
- Document use of assistive or adaptive equipment, including glasses, contact lenses, large-print reading materials, low-vision magnifiers, use of tablet or smart phone apps for low vision\(^{(45)}\)

### Living environment

- Document environmental factors that affect vision, such as amount of lighting for a task, amount of contrast, amount of movement in a visual scene, pattern or clutter in background, length of time in a visual task\(^{(11)}\)
- Document who lives with the patient and the amount of assistance the patient receives in daily activities
- Complete a home assessment as appropriate
- Home assessments for patients with visual dysfunction should include evaluation of lighting, contrast (the visible qualities of objects against a background), visual distractions (elements of the environment that obscure visibility such as clutter), glare, and compensation strategies (the ability to use other sensory systems, devices, or methods to enhance safety or independence)\(^{(22)}\)

### Relevant tests and measures: (While tests and measures are listed in alphabetical order, sequencing should be appropriate to patient medical condition, functional status, and setting)

- **Arousal, attention, cognition (including memory, problem solving)**\(^{(2,3)}\)
  - Assess level of alertness, orientation, visual attention, and sustained attention
  - Assess visual cognition, pattern recognition, visual memory
  - Assess ability to follow instructions, memory, organization skills, planning, and safety awareness skills

- **Assistive and adaptive devices**
  - Assess use of low-vision assistive devices\(^{(2)}\)

- **Balance**
  - Assess balance, both standing (eyes open and eyes closed) and sitting
  - Observe balance during visual activity, such as visual tracking or target activity while standing
Clinical Test of Sensory Integration and Balance (CTSIB)—patient is assessed on different surfaces (e.g., ground, foam) with differing visual input (33).

Berg Balance Scale (BBS) or Dynamic Gait Index (DGI) — measure patient’s ability to maintain balance in functional situations (33).

**Ergonomics/body mechanics**

Observe any postural compensatory techniques, such as forward neck flexion or rounded shoulders (25).

**Functional mobility** (including transfers, etc.)

Observe mobility and transfers, assess need for mobility devices (e.g., cane, walker).

**Perception** (e.g., visual field, spatial relations)

Visual screening tools for ocular motor control, such as eye alignment, binocular fusion, ROM, fixation, localization, and control (24).

- Hirschberg technique — fixation on a pen light and observing light reflection in eyes to see where the light is reflected on cornea. This helps to detect if there is any ocular misalignment (24).
- Cover test — focus on a central target, with one eye covered to see if uncovered eye can fixate (24).
- Saccades test — alternate fixating between two objects at 6 inches apart and 16 inches from bridge of nose to observe the eyes’ ability to rapidly and smoothly move between objects (24).
- Tracking test — moving a pen light or target through 9 gaze positions to observe speed, coordination, and ROM of eyes (24).
- Convergence test — moving a pen light toward the bridge of nose until it reaches point of convergence, usually 3 inches from bridge of nose, to observe the eyes’ ability to converge (24).
- Target and fixation — patient visually locates and fixates on a target (24).

Test of Visual-Perceptual Skills (Non-Motor) (TVPS) (23).

Motor-Free Visual Perception Test (MVPT) (23).

Visual attention and scanning evaluations (24).

- Letter cancellation — with single letters arranged in a row, patient is asked to cross out a target letter. Patients with unilateral visual neglect will avoid scanning one side of the page, while asymmetrical performance indicates problems with visual attention (24).
- Line bisection test — patient is asked to draw a line through the center of two horizontal lines. Patients with unilateral visual neglect will draw the line ipsilateral to their lesion (24).

**Self-care/activities of daily living** (objective testing)

Observe performance in areas of self-care, meal preparation, home management, shopping, money management, and community activities (26).

Very Low Vision Instrumental Activities of Daily Living (IADL-VLV) — assessment of completion (time and accuracy) of a series of tasks, including table search, clock reading, sign recognition, signature placement, and clothes sorting (39).

**Sensory testing**

Assess tactile sensation (e.g., sharp/dull, temperature, light touch).

**Special tests specific to diagnosis**

Standardized tests

- TVPS—Revised (TVPS-R) (23) — measures visual perceptual skills in children aged 4–12 years in areas of visual discrimination, visual memory, visual-spatial relationships, visual-form constancy, visual-sequential memory, visual figure ground, and visual closure.
- MVPT—Revised (MVPT-R) (23) — visual perceptual assessment in areas of spatial relationships, visual discrimination, figure ground, visual closure, and visual memory for children aged 4–11 years.
- Brain Injury Visual Assessment Battery for Adults (biVABA) (27) — confrontation field tests.
- Behavior Inattention Test (24) — measurement of visual inattention through conventional tests and functional tasks.
Assessment/Plan of Care

Contraindications/precautions
- Patients with this diagnosis are at risk for falls; follow facility protocols for fall prevention and post-fall-prevention instructions at bedside, if inpatient. Ensure that patient and family/caregivers are aware of the potential for falls and educated about fall-prevention strategies. Discharge criteria should include independence with fall-prevention strategies.
- Patients with unilateral neglect have poor awareness of their affected side. Use caution with presentation of sensory stimuli.\(^2\)

Diagnosis/need for treatment
- Any visual dysfunction that results in decreased ability to perform ADLs/IADLs or limits a patient’s independence or safety may indicate need for occupational therapy services.
- Based on a study examining occupational therapy practice patterns as they relate to low vision and visual dysfunction, researchers in the United States identified a perceived need for specific practice guidelines for addressing visual dysfunction.\(^{26}\)
  - The study consisted of a survey and semi-structured interview of occupational therapists working with visually impaired individuals. A total of 82 participants responded to the survey and 8 practitioners participated in the interview.

Rule out: The patient’s medical team will rule out many diagnoses prior to determining the underlying cause of the patient’s visual dysfunction.
- Vestibular dysfunction: patients with vestibular dysfunction may present with blurred vision, oscillopsia, and/or diplopia; however, symptoms tend to worsen with head movements and resolve when the head is still.

Prognosis
- Prognosis depends on the type of visual dysfunction: low vision, ocular motor dysfunction, unilateral neglect, visual field deficits, or visual-perceptual deficits. Generally, low vision due to macular degeneration is not reversible.

Referral to other disciplines
- Vision rehabilitation specialist or neuro-ophthalmologist for further assessment and treatment for patients with acquired visual deficits.\(^{6}\)
  - Certified vision rehabilitation therapist: for teaching compensatory techniques, vision assistive technology.
  - Certified low vision therapist: for optical and non-optical devices, visual skills training, and environmental adaptations.
- Optometrist for diagnosis and treatment of vision disorders, prescription of glasses, contact lenses, vision therapy.\(^{29}\)
- Developmental optometrist for further assessment of visual skills and referral for vision therapy.\(^{6}\)
- Ophthalmologist for eye diseases, need for eye surgery.\(^{6}\)
- Social worker for social concerns related to adjustment to vision loss.\(^{30}\)
- Optician for fitting and purchase of glasses/lenses.\(^{29}\)
- Physical therapy for gait and balance issues.\(^{33}\)

Other considerations
- There is a relationship between the vestibular system and visual system that is important for perceiving body motion in relation to visual fields.\(^{25}\)
  - There is an assumption that due to this relationship, normalizing postural reactions (through sensory integrative treatment) can help to improve control of the extraocular muscles that move the eye.\(^{25}\)

Treatment summary
- There are two treatment approaches for patients with visual dysfunction: visual processing component skills training and compensatory skills training/environmental adaptation.\(^{10}\)
  - Visual processing component skills training
    - Visual scanning or eccentric viewing strategies.\(^3\)
    - Training strategies skills such as sweeping eye movements, timed visual tracking activities, scanning, tracing exercises, and repetitive writing exercises can help with reading and writing tasks for persons with visual field deficits.\(^2,3\)
    - Vision rehabilitation that includes optometry, occupational therapy, and social work can increase the level of function in visual tasks.\(^{28}\)
- In a study conducted in the United States, 97 patients with best corrected vision of 20/100 or worse, mentally competent, able to communicate in English, and able to complete intervention were randomly assigned to either an individual rehabilitation protocol or a family rehabilitation protocol
- Functional Assessment Questionnaire and Functional Vision Performance Test to collect objective and subjective data on visual performance such as spot reading, short-term text reading, identifying paper currency and clock reading were used both pretest and posttest
- While there was no statistically significant difference between the individual treatment group and the family treatment group, both groups showed improvement in objective and subjective measures of function after vision rehabilitation
- Visual perceptual interventions may assist with improving ADL ability in children with CP
- In a pre/post test design study in South Korea, 56 children (ages 4–7 years) were assessed pre and post intervention\(^{36}\)
  - The intervention included visual-motor coordination, figure-ground perception, constancy, and spatial-relations activities
  - WeeFIM scores improved, with statistically significant changes post intervention
- Researchers in Australia found that a home web-based therapy program enhanced occupational performance and visual perception skills for children with CP\(^{41}\)
  - Children ages 8–18 with spastic-type unilateral cerebral palsy participated in a program of upper limb, cognitive, and visual perceptual training and gross motor activities
  - Following the 20-week program, the Test of Visual-Perceptual Skills was administered. The intervention group had higher scores
- Compensatory skills training or environmental adaptations
  - Home safety assessments and modifications for visually impaired persons can help to prevent falls\(^{15}\)
  - In a study conducted in New Zealand, 391 community-dwelling individuals aged 75 years and older, with visual acuity of 6/24 or worse, were randomly assigned to an exercise and home safety education and modification program (98 participants), a home safety program only (100), an exercise program only (97), or social visits by the research staff (96)
  - Home exercise program for strength and balance retraining did not appear to be effective in reducing falls in subjects with visual impairment
  - Forty-one percent fewer falls were reported in subjects who participated in the home safety program versus those who did not
- Low vision services that train persons with low vision in the use of low vision assistive devices may help with the acquisition and appropriate use of these devices\(^{31,40,47}\)
  - Use of problem-solving strategies to increase participation in ADLs/IADLs and leisure and social activities\(^{40,47}\)

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| Decreased ability to perform ADLs/IADLs due to low vision^{(3)} | Increase independence in ADLs/IADLs | **Compensatory strategies**  
Environmental adaptations, such as contrast lighting, enlarged objects/keys^{(9)}  
Access to community resources such as talking books, telephone directory exemption, radio reading services^{(21)}  
Compensatory techniques, such as using talking devices^{(32)}  
**Prescription, application of assistive devices and equipment**  
Training in use of optical devices, such as magnifying glasses, telescopes^{(3,9,40)} | Adapt compensatory techniques, environment, assistive devices as patient’s condition changes | Provide patient and family/caregivers with education and training on use of adaptations and assistive devices |
| Decreased ability to perform ADLs secondary to visual field deficit\(^{(40)}\) | Increase independence in ADLs | **Functional training**  
Awareness of blind side,\(^{(40)}\) teaching to visual scan  
**Prescription, application of devices and equipment**  
Use of optical devices such as mirrors and prisms to reflect light and give a reversed image\(^{(5)}\)  
**Compensatory strategies**  
Use of markers, anchors to identify patient’s place through touch\(^{(5)}\) | Increase field of scanning as patient improves in awareness of visual field deficit  
Adapt compensatory techniques, environment, assistive devices as patient’s condition changes | Provide patient and family/caregivers with education about application and/or proper use of optical devices |
| Decreased oculomotor control\(^{(8)}\) | Improve oculomotor control | **Functional training**  
Training tracking exercises or oculomotor skill development\(^{(3)}\) | Progress from easiest direction for person to move his or her eyes to the most difficult\(^{(8)}\) | Home program of vision exercises |
| Decreased reading skills\(^{(4)}\) or participation | Improve reading skills and participation\(^{(40)}\) | **Functional training**\(^{(40)}\) | Progress difficulty of visual information by increasing amount of visual information, decreasing size of visual information as patient improves in saccades and tracking and using preferred retinal locus | Home program of vision exercises  
Use of adapted lighting and filters at home |
|---|---|---|---|---|
| Retraining of residual visual skills, such as fixation stability, saccades, and tracking eye movements\(^{(4)}\)  
Warren’s exercises\(^{(4)}\) – reading letters from left and right columns to increase speed and accuracy in saccades  
Training a preferred retinal locus in the peripheral retina\(^{(4,16)}\)  
**Compensatory strategies** Use alternative lighting, control glare, and consider use of filters to address discomfort\(^{(40)}\) | | |
| Decreased driving ability\(^{(4)}\) | Safe and independent driving | **Functional training**  
Training residual oculomotor skills, spotting (fixation), scanning, and eye-hand-foot coordination skills\(^{(4)}\)  
Training road sign recognition\(^{(4)}\) | Progress visual activities from visual objects to application to car, such as putting visual cues on windshield of car\(^{(4)}\)  
Progress to a driving rehabilitation program for practice on different roadways, speed, and noise\(^{(4)}\) | Home program of vision exercises and eye-hand coordination exercises |

**Desired Outcomes/Outcome Measures**

- Maximum independence in daily activities (e.g., reading, driving) with assistive devices as needed  
  - FIM, WeeFIM, TVPS-R  
- Improved safety with ADLs/IADLs  
  - FIM, WeeFIM, IADL-VLV, DGI, CTSIB, Medical Outcomes Study Short-Form36 Health Survey (SF-36)

**Maintenance or Prevention**

- Regular visits to optometrist/ophthalmologist for eye health\(^{(20)}\)  
- Avoidance of excessive consumption of alcohol for better eye health\(^{(20)}\)
Avoidance of smoking

Keep blood pressure, cholesterol level, and diabetes under control

Appropriate occupational and/or sport-related protective eyewear

Patient Education

See Neuro-Optometric Rehabilitation Association for more information, http://noravisionrehab.com/

American Occupational Therapy Association (AOTA) guide for living with low vision, https://www.aota.org/~media/Corporate/Files/AboutOT/consumers/Adults/LowVision/Low%20Vision%20Tip%20Sheet.ashx

Coding Matrix

References are rated using the following codes, listed in order of strength:

- **M** Published meta-analysis
- **SR** Published systematic or integrative literature review
- **RCT** Published research (randomized controlled trial)
- **R** Published research (not randomized controlled trial)
- **C** Case histories, case studies
- **G** Published guidelines
- **RV** Published review of the literature
- **RU** Published research utilization report
- **QI** Published quality improvement report
- **L** Legislation
- **PO** Published government report
- **PF** Published funded report
- **PP** Policies, procedures, protocols
- **X** Practice exemplars, stories, opinions
- **GI** General or background information/texts/reports
- **U** Unpublished research, reviews, poster presentations or other such materials
- **CP** Conference proceedings, abstracts, presentation

References


