

Optician's Guide to Visual Impairment

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Definition and Testing (10 Minutes)

Visual Impairment

“Reduced central acuity or visual field loss which even with the best correction provided by regular lenses, still results in visual impairment from a performance standpoint”

Ian Bailey O.D.

Visual Acuity:

The normal eye can distinguish two points separated by an angle of one minute.

Each letter on an acuity chart subtends a five-minute angle to the eye independent of distance.

The numerator denotes the distance the patient is from the chart.

The denominator denotes the distance from the chart that a person with normal vision can see the letters.

Visual Acuity

Acuity Charts

With Current Rx

20/20

Pinhole

+/- Recordings

Reduced Acuity Testing:

Reduce testing distance.

Use larger optotype size.

Count fingers

Hand motion

Light projection

Light perception

Visual Fields:

Normal Monocular: 95 degrees outward, 60 degrees inward, 75 degrees downward, 60 degrees upward.

Scotoma: Blind spot

Testing:

Perimeters

Amsler Grids

Confrontation Test

Legal Categories:

Motor Vehicle: 20/40 at MVD or 20/70 from Doctor. (Florida)

Legally Blind: 20/200 best corrected acuity or 20-degree field or less.

Only 25% of the legally blind are totally blind.

Causes of Impairment (20 Minutes)

Group One: Distortion without opacities of the initial refracting surface

Group Two: Opacities of the ocular media.

Group Three: Reduced retinal function.

Group Four: Retrobulbar involvement

Miscellaneous Conditions

Group I: Distortion w/o Opacities of the Refracting Surface.

Keratoconus: A progressive conical thinning of the central area of the cornea. Myopia and irregular astigmatism increase as the condition progresses.

Group II: Opacities of the Ocular Media

Cataract: An opacity or cloudiness of the crystalline lens. May be congenital (present at birth), senile (due to age), or traumatic (due to injury).

Cornea: Scar

Due to injury or disease.

Group III: Reduced Retinal Function

Diabetic Retinopathy: Retinal changes caused by Diabetes Mellitus—a condition caused by a lack of insulin in the bloodstream. It creates a premature aging of the blood vessels.

Hemorrhages, new vessel growth, and fibrous tissue growth can create retinal detachments and visual field losses. Laser beams are used to seal off the hemorrhages.

Retinitis Pigmentosa: A disease in which the rods of the retina are slowly destroyed and the remainder of the retina atrophies. The loss of rods initially effects the patient's night vision and creates a mid-peripheral field loss. As the condition progresses, the peripheral field is reduced.

Age Related Macular Degeneration: (ARMD) A condition commonly seen in elderly patients, in which the cones in the macular area progressively deteriorate. As the condition advances, a central vision loss will occur; however, peripheral vision remains intact.

Glaucoma: A condition in which poor aqueous outflow creates high intraocular pressure. This elevated pressure damages the optic nerve and retinal function. The condition effects peripheral vision first.

Field Loss

Field loss can be established by computer analysis, or the manual use of a tangent screen

Field loss is permanent and usually starts in far periphery where it is often unnoticed by patient

Albinism: A congenital condition in which the body is unable to produce pigment. This results in a light-colored iris and an underdeveloped macular area.

Group IV: Retrobulbar Involvement

Retrobulbar Neuritis: An inflammation of the orbital portion of the optic nerve. It occurs without visible changes to the eyeball. This condition results in a central field loss which can be aided by magnification.

Miscellaneous Conditions:

Retinopathy of Prematurity: Also known as "Retrolental Fibroplasia", creates an opacity in the vitreous and retinal vascularization with detachments. This condition is caused by exposing a premature infant to high levels of oxygen soon after birth. These patients usually have extremely poor visual acuity.

Optical Aids: (30 Minutes)

Generally, as magnification increases; field of view, working distance, and working space are reduced.

To estimate required magnification, divide the best corrected acuity by the required acuity. Ex. Best Corrected = 20/200

$$\text{Required acuity} = 20/40$$

Estimated Magnification = 5X

Types of Magnification:

Relative Size Magnification: Increasing the size of the object - Large print books.

Relative Distance Magnification: Reducing the distance from the object.

Angular Magnification: Telescopes and Magnifiers

Projection & Electronic Magnification: CCTV, Overhead Projector, Computer

Microscopes:

Plus, spectacle lenses from 4.00 to 64.00 diopters.

$$\text{Focal length in cm} = \frac{100}{D}$$

Shorter focal distance creates relative distance magnification.

Advantages:

Both hands free

Wide field of view

Astigmatic correction

Binocular vision, less than 10 diopters

Disadvantages:

Fixed focal length

Short working distance

Close distance may cause fatigue

Types of Microscopes:

Half-eyes with base in prism.

Full field spectacles

Diffraction Spectacles

Multi-order diffraction technology

Telescopes:

Telescopic lenses bend the rays of light so when they leave the telescope, they appear to be coming from the same direction as an object closer to the eye; thus, the object appears much larger.

Label indicates power and field of view ex: 7X20, 7.5 The image is 7 times larger than normal, objective lens is 20mm, and the field of view is 7.5 degrees.

Telescopes:

Advantages:

The only aid which provides distance magnification.

Disadvantages:

Reduced field of view

Exaggerated movement of objects viewed.

Spatial orientation.

Telescopes - Afocal

When the objective and ocular lenses are separated by a distance equal to their focal lengths, it is afocal and only produces angular magnification.

Types of Telescopes:

Handheld

Clip-on

Biopic

Full Field

Telemicroscopes

Telescopes: Focal

Adapting Telescopes for intermediate or near.

Increase power of objective lens (adding a reading cap to the front of the telescope)

Working distance is equal to the focal length of the reading cap

Equivalent Power = (Dcap) (MTS)

Example: 2x Telescope & 5 D Cap(20cmWD)

EqP = (2x) (+5.00) = +10.00 D

Same power as microscope with longer WD

Handheld Magnifiers:

If the lens to object distance is equal to the focal length of the lens, the emergent rays are parallel. Then the eye to lens distance is variable.

Hand magnifiers should be used with distance glasses.

Labeled magnification is usually equal to the dioptric power divided by four.

Handheld Magnifiers:

Stand Magnifiers:

Stand magnifiers consist of a convex lens supported by a plastic or metal base.

The support usually positions the lens at a height slightly shorter than the focal length, therefore, light rays leaving the lens are somewhat divergent.

Patients should look through their near correction and keep their eye to magnifier distance constant.

Types of Stand Magnifiers:

- Spherical
- Aspheric
- Aplanatic
- Illuminated
- Gooseneck

Miscellaneous Magnifiers:

- Neck magnifiers
- Bar magnifiers
- Optivisor / Magna-focuser
- Loupes
- Pocket magnifiers

Field Expanding Devices:

- Reverse telescopes - Provide expansion of field and minification.
- Fresnel prisms
- Mirrors

Contact Lenses

- Correct irregular astigmatism and high refractive errors.
- Cosmetic iris lenses
- Occluder lenses
- Contact lens telescope - Strong minus contact lens with strong plus spectacle lens.

Electronic Devices: (15 Minutes)

- Closed Circuit Television (CCTV)
- Artificial Intelligence

Training (5 Minutes)

- Positioning
- Scanning
- Locating
- Focusing
- Tracking
- Storing, Handling & Care

Glare Control: (5 Minutes)

- Prescription sunglasses - fixed tint
- Corning CPF lenses
- Clip-on, Slip-in, Wrap-around sunglasses

Yellow enhances contrast - yellow acetate film.

Lighting / Illumination

Strong enough to provide maximum contrast without bleaching or causing glare.

Shaded gooseneck lamp to direct light on to reading material.

Computer Programs (5 Minutes)

Windows

JAWS

Synthesized Speech

Voice Recognition

Braille

Louie Braille – 19th Century France

Six Dots Compose Alphabet

Perkins Brailler

Non-optical Aids: (5 Minutes)

Treatment Options: (5 Minutes)

A. Central magnification with microscopes, telescopes, or electronics.

B. Relocation of fields (with prisms or mirrors)

C. Minification

D. Illumination and/or glare control

E. Contact lenses

Low Vision Team: (5 minutes)

Prescriber

Dispenser / Trainer

Orientation & Mobility Teacher

Vision Resource Teacher

Counsellors

Questions?

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