Eschenbach Low Vision Training Program

Module 4: Stand Magnifiers

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The Seven Steps to Dispensing Low Vision Aids®

1. Make sure the patient is under the current care of an eye doctor and has a current refraction

2. Identify the patient’s visual goals

3. Determine the magnification required

4. Demonstrate the impact of illumination

5. Select the appropriate vision aids for the goals identified

6. Train the patient in the use and care of the chosen vision aid

7. Schedule a follow-up visit
Stand magnifiers…

• are ideal for tasks such as reading

• uniquely combine the greatest benefits of illumination and magnification

• work based on the principles of angular and relative distance magnification
Stand magnifiers…

- What they are
- How they work
- How to use them
- What types are available
- What are they made for
What is a stand magnifier?

A plus (+) lens mounted on ‘legs’ that fix the distance from the lens to the object.
How do stand magnifiers work?

- Eye-to-lens
- Lens-to-object
- Lens-to-image

Object size

Image size
Rules for using stand magnifiers properly:

1) Hold the stand magnifier firmly against the object to be viewed

2) Adjust eye-to-lens distance appropriately
Facts about stand magnifiers

Enlargement Ratio = Image Size/ Object Size
or,
Lens-to-Image Distance/ Lens-to-Object Distance

Lenses in Stand Magnifiers are always mounted at less than $f$ creating a Virtual Image
Low Vision Training Module #4

parallel
= f

> f
divergent*

< f
divergent
Facts about stand magnifiers

- Divergent light rays emerge from Stand Magnifier lenses. Users must accommodate.
- Required maximum accommodation = 1m/Lens-to-Image Distance
How much magnification does a stand magnifier provide?

- “Rated” magnification is manufacturer’s representation of power
- “Equivalent Power” indicates comparably powered spectacle
1. Equivalent Power (EP) = \text{Enlargement Ratio (ER)} \times \text{Accommodation}

2. EP = \text{ER} \times \frac{1}{\text{Eye-to-Image Distance (mm)}}

3. EP = \text{X} \times \frac{1}{\text{(Eye-to-Lens Dist. + Lens-to-Image Dist.)}}

- Enlargement Ratio fixed for specific magnifier (from Tech. Data for Stand Magn. page of catalog)
- Variable based on needs of user
- Fixed for specific magnifier (from Tech. Data for Stand Magn. page of catalog) or 1 minus eye-to-lens value on lens head
Example #1:

A user needs 24 diopters of power in near equivalent to read 1M print. An Eschenbach #1552 System Vario stand magnifier seems to be the right choice. Will this stand magnifier provide the needed power and at what eye-to-lens distance should it be held?

Answer to Part 1:

$$EP = ER \times Accommodation$$

$$24 = 7.8 \times Accommodation$$

$$Accom. = \frac{24}{7.8} = 3.1$$

So, this magnifier should work since 3.1D is a reasonable bifocal add.
Answer to Part 2: What is eye to lens distance?

From part 1, we determined we need to hold our stand magnifier so that 3.1D of accommodation are employed. The total eye-to-image distance (focal distance) then needs to be:

\[ F = \frac{1}{D} = \frac{1000\text{mm}}{3.1} = 322.5\text{mm} \]

Since: Eye-to-image distance = (Eye-to-lens dist.) + (Lens-to-image dist.)

Then: 322.5mm = (Eye-to-lens dist.) + 300mm \( \text{(from chart)} \)

Eye-to-lens dist. = 322.5mm – 300mm = 22.5mm \( \sim 1 \text{ inch} \)
Example #2:
A user needs 16 diopters of power in near equivalent to read 1M print. They wear a +3.00D bifocal addition. Which stand magnifier should they use and at what eye-to-lens distance should they hold it?

Answer to Part 1:
So EP needs to be close to 16D and the Accommodation is 3D so using the formula above, we need the ER to be close to 5.33D

\[ EP = ER \times \text{Accom.} \]

\[ 16 = ER \times 3 \rightarrow 16/3 = ER \rightarrow ER = 5.33D \]

The Technical Data section of the Eschenbach catalog shows that the #1553 has an ER of 5.9D which is pretty close and should suffice.
Answer to Part 2: What is eye to lens distance?

Since we were given the Accommodation (bifocal add) of +3.00D, then the total eye-to-image distance (focal distance) needs to be:

$$F = \frac{1}{D} = \frac{1000\text{mm}}{3\text{D}} = 333\text{mm}$$

Since: Eye-to-image distance = (Eye-to-lens dist.) + (Lens-to-image dist.)

Then: $333\text{mm} = (\text{Eye-to-lens dist.}) + 260\text{mm}$ (from chart in catalog)

Eye-to-lens dist. = $333\text{mm} - 260\text{mm} = 73\text{mm} \sim 3\text{ inches}$
Example #3:

A user needs 28 diopters of power in near equivalent to read 1m print. They wear a +4.00D bifocal addition. An Eschenbach #1551 System Vario is recommended. The user, however, complains of a blurry image and insists on lifting the device up off the page. What happened?

\[
\begin{align*}
\text{EP} & = \text{ER} \times \frac{1 \text{ meter}}{(\text{Eye-to-Lens Dist.} + \text{Lens-to-Image Dist.})} \\
28 & = 10 \times \frac{1 \text{ meter (1000mm)}}{(\text{Eye-to-Lens Dist.} + \text{Lens-to-image Dist.})}
\end{align*}
\]

Where:

\[
\frac{1 \text{ meter (1000mm)}}{(\text{Eye-to-Lens Dist.} + \text{Lens-to-image Dist.})} = 4.00
\]
Example #3:

Where:

\[
\frac{1 \text{ meter (1000mm)}}{\text{Eye-to-Lens Dist. + 340mm}} = 4.00
\]

Then:

\[
\frac{1 \text{ meter (1000mm)}}{-90mm + 340mm} = 4.00
\]
Illuminated Stand Magnifiers

Illumination

- Enhances contrast of object
- Reduces required magnification
Illuminated Stand Magnifiers

Light sources are typically either:

- Light-emitting diodes (LEDs)
- Incandescent Light Bulbs
Illuminated Stand Magnifiers

Light Emitting Diode (LED)

• Most commonly used option
• In either traditional ‘bulb’ design or surface mounted design (SMD)
• Bluer spectrum
• Energy efficient
• Long life (up to 50,000 hours)
Illuminated Stand Magnifiers

Light Emitting Diode (LED)

- Some manufacturers offer different color options or caps to fit over the LED ‘bulb’ to allow for different color temperature options (e.g., less bright, but less glare)
- Offers choice for user to find what is most comfortable for them
Illuminated Stand Magnifiers

**Incandescent bulb**

- Less blue light in spectrum
- Economical
- Need to be replaced when burn out
Illuminated Stand Magnifiers

Other: Halogen bulb

- Rarely used in stand magnifiers anymore
- More yellow spectrum
- Brighter than incandescent
- Relatively short life
Non-Illuminated Stand Magnifiers

- Bar Magnifiers
- Bright Field Magnifiers
- Around the Neck Magnifiers
Non-Illuminated Stand Magnifiers

• Bar Magnifiers
  o Provide shadow-free viewing
  o Often include red line guides
  o Used for reading long lines of print
Non-Illuminated Stand Magnifiers

- Brightfield Magnifiers
  - Allow for maximum light to enter the magnifier
  - Provide brighter field of view and distortion free image
  - Inconspicuous design, similar to a paper weight
Non-Illuminated Stand Magnifiers

- Around the Neck Magnifiers
  - Perfect for hands-free extended viewing
  - Include an adjustable cord to hang around the neck
  - Lightweight with rubber grip on feet
Advantages:

- Fixed focal length
- Lens mounted parallel to object
- Less fatiguing

Disadvantages:

- Not hands-free
- Less portable
- Limited field of view
Stand magnifiers are designed for extended viewing tasks of near objects.

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Extended Viewing tasks of near objects:

Enjoying Hobbies

Reading
Extended viewing tasks of near objects:

- Reading mail
- Doing Crossword Puzzles
What they are
How they work
How to use them
What types are available
What are they made for
Questions?
Thank You!