Instructing Clients in the Use of Low Vision Devices: Lighting, Contrast, and Glare Control

Lighting

There are three rules for selecting a light:

1. The bulb’s position should be adjustable.
2. The light should have a bulb generally equivalent to a 60W to 100W incandescent bulb. The client will have to determine which type of bulb (e.g., incandescent, fluorescent, diode) is best.
3. The light should have a shade so it does not shine into the client’s eyes. A double shade has - one shade inside the other – (the inside one is sometimes referred to as a reflector) and helps keep the lamp cooler. A double shade does not improve the brightness on the page.

NOTE: Types of bulbs are discussed in greater detail in Module 3.

Controlling Brightness

The illumination (brightness) of the light on an object (e.g., a page) is directly proportional to the wattage of the bulb. In addition, it is inversely proportional (opposite) to the distance from the bulb to the object—that is, the farther away the light is positioned, the dimmer the object looks. The relation is actually inverse distance squared—that is:

\[ \text{illumination} \propto \frac{W}{d^2} \]

W = wattage of bulb and d = distance from bulb to object.

How brightness changes with light distance:

If a bulb is moved 2X farther away, it will appear to be ¼ of the original brightness and needs to be made 4X brighter to keep the illumination the same. If a bulb is moved 3X farther away, it has to be 9X brighter.
Brightness also varies as the bulb is angled farther from the perpendicular. It decreases by the factor \( \cos \theta \), so the equation becomes:

\[
\text{illumination} \propto \frac{W}{d^2} (\cos \theta)
\]

**Positioning the Light**

The lamp should be positioned so that it does not shine directly into the client’s eyes. The light also should not reflect off the page directly into the eyes. To check for reflections, a mirror can be placed on the page being read, and if the light (preferably turned off) is visible in the mirror, it is in the wrong place. If the client tends to use one eye, it is generally better if the light is on the same side as the eye being used.

As stated previously, the maximum brightness occurs when the light is striking the page perpendicularly:

\[
\theta = 0, \quad \text{so} \quad \cos \theta = 1.
\]
Contrast

Contrast refers to how well the object stands out from the background. In terms of printed material, the best (100%) contrast is provided by perfectly black letters on a pure white background. Reduced contrast would be provided by light gray letters on a white background. The worst contrast is provided by gray letters on a gray background, which would appear uniformly gray and letters would not be visible at all. The better the contrast, the easier it is to see the print.

Reduced contrast can also make it difficult to see the details of facial features, making it harder to recognize people.

When occupational therapists measure a client’s contrast sensitivity, they determine how sensitive the client is to lower levels of contrast. Reduced contrast sensitivity is a normal aging-related change. Older clients might comment “they don’t print newspapers like they used to,” but the change is not in the printing but rather in the client’s eyes - that is, reduced contrast sensitivity.

Different contrast levels can be seen in the chart to the right. As one reads across and then down the lines, contrast gradually decreases. The client reads the letters until they cannot see any more, indicating the limit of the client’s contrast sensitivity.
Instructing Clients in the Use of Low Vision Devices: *Lighting, Contrast, and Glare Control*

The actual contrast of the object with its background (extrinsic, – or outside the eye; e.g., a faded newspaper) may differ from the way the object looks to the client (intrinsic, –or due to changes in the eye; e.g., cataracts). The subjective view may be called the *perceived contrast*; in other words, even though the physical contrast has not changed (a new black-and-white paper), the way it looks to the client can change.

The perceived contrast of an object from the background can be increased in the following ways:

1. Change the object or the background, or both, to make the contrast better. For example, substitute a new black-and-white newspaper for a faded newspaper, or use a black felt-tipped pen in place of a regular pen or a pencil.

2. Increase the illumination on the object being viewed and control for glare from scattered light. For example, use a brighter light and, if necessary, a typoscope (reading guide) for printed material.

3. Modify the light entering the eye to reduce scattering of light inside the eye. Because contrast can be reduced by a type of light scattering that increases with shorter wavelengths (toward the blue end of the spectrum), a filter should be used that selectively blocks these rays more, that is, a “blue-blocker” or amber (or yellow) colored lens.

   **NOTE:** *Contrast* is discussed in greater detail in Module 3.

**Other Lighting Considerations**

The occupational therapist should make sure that any magnifier used does not block the light and cast a shadow on the print.
Instructing Clients in the Use of Low Vision Devices: Lighting, Contrast, and Glare Control

Reflections from overhead lights can interfere. Sometimes it helps to turn these lights off.

Most illuminated magnifiers are battery powered, although some units can be plugged into the wall. It is very important that the client know how to change the batteries and be able to demonstrate this to the occupational therapist. Instructions should be included with the magnifier. Changing batteries requires a degree of dexterity, and the occupational therapist needs to assess this factor.

Glare Control

Filters and hats with brims can reduce glare when clients are outside in bright light and can increase comfort.

Some clients feel that certain filters improve their vision indoors. These filters are generally lightly tinted (so as not to absorb a lot of light) and either yellow or amber. Although a tinted lens reduces the contrast of objects, sometimes the client perceives enhanced contrast and thus visibility. If the client perceives that a filter improves vision, the occupational therapist should not discourage the client from using it.
Hats can also be a big help indoors if the client is bothered by overhead lighting. A problem particularly in office buildings with banks of unshielded fluorescent lights in the ceiling. Even individuals who have normal sight can be bothered by this type of lighting. A visor or a hat with a brim can eliminate this type of glare.

A typoscope (reading guide) can also be helpful to control glare from the page when reading. When using a typoscope, the client simply slides the typoscope down the page, preferably with the two thumbs, as they read. The typoscope should be wide enough to expose the full line and high enough to expose two or three lines of print.