

**Office of Vocational Rehabilitation
Bureau of Blindness and Visual Services**

ENVIRONMENTAL FACTORS TO CONSIDER IN ENHANCING FUNCTIONAL VISION

For the individual with functional vision there are two strategies for optimizing the use of this vision. The use of low vision aids and changing or modifying the environment the individual functions in can greatly improve what a person sees. Low vision aids are optical and non-optical aids prescribed by a Doctor of Optometry specializing in low vision. These aids are task specific and may include high powered glasses, magnifiers, telescopic devices, electronic magnification devices, special lighting or sun lenses.

The focus of the information provided here is on strategies used in modifying the environment to enhance functional vision.

Sometimes simple changes in the environment can greatly enhance a person's ability to complete a specific task, including job performance in the work environment. Take a closer look at illumination, color and contrast, size and distance, organization and time.

ILLUMINATION- Factors to consider:

Type of Light Source:

- Incandescent lights provide a yellower, high contrast more direct light with near ideal rendering of colors and produce minimal glare; this type of lighting is described as providing a warm and comforting view and is often preferred over fluorescent, but this should be tested on an individual basis. Incandescent lighting was scheduled to be phased out of use in California in 2018 and in the U.S in 2020. However, researchers at MIT have created a more energy efficient version by surrounding the filament with a special crystal structure in the glass; they can bounce back energy which is usually lost in heat while still allowing the light through; they refer to this technique as "recycling light" because the energy which would usually escape is redirected back to the filament where it can create new light.
- Fluorescent lighting disperses a blue white light evenly and without shadows over a wide area; because it generates a lot of light without using a lot of electricity it is the type of lighting used most often in public places; can cause glare though
- Consider full spectrum bulbs, natural light bulbs (similar to natural sunlight, produce high brightness with even and cool illumination, reduce eye strain, colors appear balanced and true to life)
- OTT Lite and Verilux are two brands of portable lights using full spectrum bulbs
- Halogen light produces the brightest and whitest light but generates a lot of heat and should be used with caution and always with a coated bulb; for

some halogen light can enhance contrast between print and background but for others it generates too much glare

- LED lighting is another option; three features make it appealing: it is energy efficient, full brightness is achieved instantly, and it has incredibly long life expectancy; LEDs come in a variety of different colors; two factors should be considered when considering LED lighting: the Kelvin rating and spread distribution; a 2700K rating would produce more yellowish light, 4500K more white with a cool or daylight effect, and above 5000K more bluish in color; spread distribution can range from narrow to wide and selection can depend on the task to be completed
- Using colored lights (pink, peach, yellow) may enhance contrast
- Some individuals see better on a cloudy day than on a sunny day

Amount of Light:

- What is the amount of wattage needed to see best
- You may think that more or brighter light is always better, in certain instances and with certain eye conditions more light can cause glare that reduces visibility for the individual
- Lighting for a near task need not be more than 60 watts if you use a lamp; moving the lamp $\frac{1}{2}$ the distance closer doubles the intensity of the light
- Installing dimmer switches allows the individual greater control over the amount of light in the room

Position of the Light:

- Try bringing the light source closer to the task or work site to get maximum benefit rather than relying on diffuse overhead lighting alone
- While placement of the light source behind the person's shoulder is a good angle for some, it is not always the best for every person
- Some tasks such as craftwork may require a light source shining directly on the person's hands
- Two lights placed at opposite angles to the task sometimes serve to increase intensity while diffusing light

Glare:

- Glare is light scatter
- This light scatter can cause physical discomfort
- Glare can also cause a loss of clarity of vision
- Besides light reflected off a page that someone is reading, glare can also be caused by a reflection off the ceiling, walls, objects, floor or anything with a glossy finish such as paint, wax, polished or lacquered surfaces, metal and some bright colors
- Wearing sunglasses and/or hats with brims and visors can reduce glare
- Noir is a brand of sunlense that provides a wide array of colors and light transmissions

- Sunshine streaming into a room can add to glare; if this is a problem, keep lights on during the day to equalize indoor and outdoor light sources and/or use curtains, blinds or shades to regulate light

Potential Modifications for Illumination Control:

- Change the light source
- Combine light sources
- Increase or decrease the amount of illumination
- Alter position of person or light source
- Use devices that aid in control of illumination: visors, hats, sunlenses, lamp shades, color filters, blinds, shades, matte finish background material as opposed to glossy

COLOR AND CONTRAST- Factors to consider:

- Contrast is the visibility of a target against its background
- Adding contrast enhances visibility
- Contrasting colors, such as black and white, help objects or shapes to stand out; for example, use a dark placemat under a light-colored plate; or a dark mat under a work activity
- Often other color backgrounds increase visibility such as black print on a yellow background
- Some people see certain colors and not others depending on the nature of their eye pathology; determine which colors are best
- Complexity of the background surface is a factor; solid colors work best; patterns, stripes or checks can be confusing

Potential Modifications for Color and Contrast:

- Determine which contrast and color combinations work best
- What background works best against the visual target to enhance what the individual is seeing
- Simplify the visual background

SIZE AND DISTANCE- Factors to consider:

- Enlarging what you are looking at helps to see it better
- Changing the viewing distance by moving closer to something makes it appear bigger

Potential Modifications for Size and Distance:

- Examples of enlarging the target include changing the font size of print (use a clean phont such as Tahoma, Arial, or Helvetica, or Verdana)
- Large print is more visible and is generally considered to be 18 Pt
- The American Printing House for the Blind has developed guidelines for optimal readability and a specific phont style called APHont
- Screen enhancing computer software is available to enlarge print; change the accessibility settings on electronic devices
- Use bold line marking pens or write bigger
- Using optical aids (low vision aids) such as microscopic lenses, magnifiers

and telescopes makes the image larger on the retina to increase visibility

- The use of microscopes and magnifiers requires a closer viewing distance; telescopes “bring the object closer” but reduce the field of view

ORGANIZATION-

- Analyzing a work task and its sequential components and structuring the work environment will enhance efficiency in completion of the task
- Organizing a sequential task makes it easier to perform
- Using trays, bins or containers with edges or sides helps to contain items needed and keeps them within arm’s length
- Reducing “visual clutter” in the background helps the individual visually locate what they need
- Remember to incorporate the use of color, contrast and illumination

TIME- Factors to consider:

- Required viewing duration for performance of task; how long does it take to do the job?
- Competitive standard; compare the actual time it takes the individual to complete the job and the competitive employment standard

Potential Modifications for Time:

- Increase skill and performance through practice and training (is a job coach needed)
- Analyze and if needed reorganize the work environment
- Change the sequence of work tasks
- Structure break periods
- Use adaptive aids and assistive technology when indicated to enhance productivity
- Use adaptive aids and assistive technology when indicated to enhance productivity (e.g. screen magnification and screen reader software, closed circuit television, low vision aids)
- Consider referral to job coaching agency
- Incorporate the other modifications listed above