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# UV and GLARE: The Two Enemies of Human Eyes.

UV and GLARE are the two most known enemies of eyes and in most cases the source for both is solar radiation.

The protection of eyes and its surroundings from the adverse effect of UV rays have been a topic of interest ever since it has been understood that constant exposure of the eyes to UV rays is a major hazard to health and can have an abiotic effect. Abiotic action produces chemical changes in the cornea and lens affecting the protein in the cells. The extent of tissue damage depends on the intensity of the energy reaching the tissue and time of exposure which is very much dependent upon its wavelength. Very short wavelengths, for example, Excimer Laser are used to shape cornea in photo refractive surgery. However, longer wavelengths UV rays in the range of 300 nm to 370 nm have a long term adverse effect.

Based upon their wavelengths, UV rays are most generally classified in three bands:

- UV-C being the most energetic is the shortest in wavelength between 100 to 280 nm and is the most harmful because it carries the maximum energy. Thanks to the ozone layer that does not allow UV- C to reach the earth.

- UV- B is between 280 to 315 nm that is mostly absorbed by the cornea but some amount will pass through the crystalline lens.

- UV- A is between 315 to 380 nm is close to visible light which is particularly absorbed by the crystalline lens.

An exposed eye is always more susceptible to UV rays as constant exposure of the eyes to UV rays is one of the important reasons that can lead to cumulative impact in the form of accelerated appearance of cataract , skin aging and other corneal, conjunctival and retinal problems.

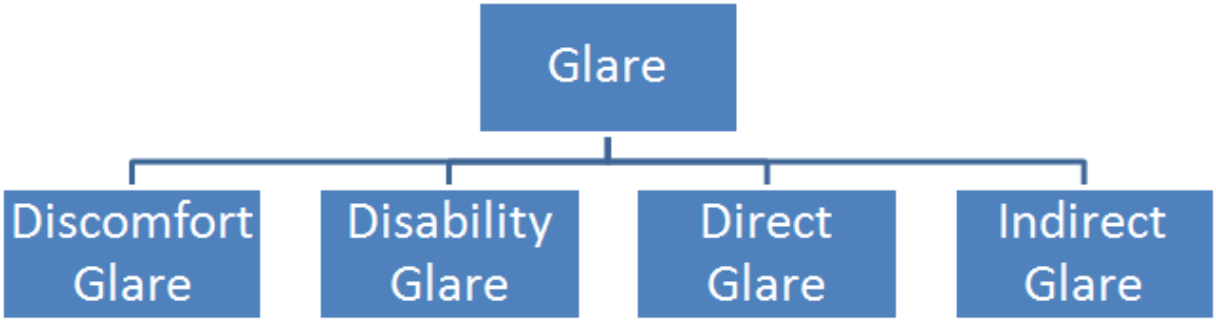
The protection from UV rays is only possible when the UV protection lenses are used as eye wears. The transmission of UV rays can be blocked by using lenses that have following properties:

- The lens material itself does not allow transmission of UV rays.
- The lens surface is treated with surface treatment that prevents UV transmission.
- The lenses are dipped in some material to ensure UV protection.
- The lenses are tinted like sunglasses.

GLARE is produced by brightness in the visual field that is sufficiently greater than the luminance to which the eyes are adapted. It causes annoyance, discomfort or impair visual performance. Glare may also be defined as:

- A form of over – illumination.
- Glare is the difficulty seeing in the presence of very bright light.
- A facial expression of squinted eyes and look of contempt.

The chief sources of glare are overhead lights, task lights, windows, reflective sources and the presence of bright and dim light in the visual field. Glares are of different types as shown in the following graph:



Discomfort glare refers to the sensation one experiences when overall illumination is too bright, as seen on a snow field under a bright light. A person is at greater risk for experiencing discomfort glare when the source has a higher luminance and when the source is closer to the fixation point. Computer users usually suffer from discomfort glare who are gazing horizontally in the room.

Disability Glare refers to the reduced visibility of a target due to the presence of light source elsewhere in the field. It occurs when light from the glare source is scattered by the ocular media. This scattered light forms a veil of luminance which reduces the contrast and thus the visibility of the target. Scattered light raises the luminance of both the target and the background to same extent, thereby reduces the contrast. Disability glare is basically caused by cataract, keratoconus, corneal edema, vitreous opacities etc.

Direct Glare is defined as the visual discomfort resulting from insufficiently shielded light sources in the field of view. Glare coming directly from an overhead lighting fixture is direct glare.

Indirect Glare can come from many points. Almost all surfaces reflect light to some extent. Walls, floors, ceilings, tables, computer screens, machines, and the materials being worked on can all be sources of indirect glare for a worker. Light bouncing off mirrors is also indirect glare.

Outdoor enthusiasts like boaters, drivers, bikers, golfers and joggers may find it difficult to navigate with glare in their visual field. Light reflected from different surfaces like a flat road or smooth water or hood of the car generally is horizontally polarized. The meaning of the statement is, instead of light being scattered in all directions, reflected light travels in a more horizontally oriented direction. This creates an annoying impact and sometimes may prove very dangerous.

Polarized lenses are very effective to minimize the adverse impact of horizontal rays. They contain a special filter that blocks this type of intense reflected light and thereby reduces glare.

Glare causes multiple effects on our visual performance. Some of the common problems are:

1. Glare reduces contrast sensitivity
2. Glare deteriorates the quality of color discrimination
3. The discomfort glare also causes light sensitivity

4. Glare also affects dark adaptation. Poor dark adaptation is one of the early signs of macular degeneration.

Glare is one of the largest enemies today not only indoors but also outdoors. Though polarized lenses improve comfort and visibility, but their usage are not very effective with LCDs or LEDs found on the dashboards of some cars. With polarized lenses, you may also be unable to see your cell phone or GPS device. However, the visual hygiene that polarized lenses ensure by eliminating glare is something like a tranquil "cocoon" for your eyes, improving visual performance and reducing the symptoms.

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