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Color Blindness

Color blindness occurs when you are unable to see colors in a normal way. It is also known as color deficiency. Color blindness often happens when someone cannot distinguish between certain colors. This usually happens between greens and reds, and occasionally blues.

In the retina, there are two types of cells that detect light. They are called rods and cones. Rods detect only light and dark and are very sensitive to low light levels. Cone cells detect color and are concentrated near the center of your vision. There are three types of cones that see color: red, green and blue. The brain uses input from these cone cells to determine our color perception.

Color blindness can happen when one or more of the color cone cells are absent, not working, or detect a different color than normal. Severe color blindness occurs when all three cone cells are absent. Mild color blindness happens when all three cone cells are present but one cone cell does not work right. It detects a different color than normal.

There are different degrees of color blindness. Some people with mild color deficiencies can see colors normally in good light but have difficulty in dim light. Others cannot distinguish certain colors in any light. The most severe form of color blindness, in which everything is seen in shades of gray, is uncommon. Color blindness usually affects both eyes equally and remains stable throughout life.

Color blindness is usually something that you have from birth but you can also get it later in life. Change in color vision can signify a more serious condition. Anyone who experiences a significant change in color perception should see an ophthalmologist.

Researchers studying red/green color blindness in the United Kingdom reported an average prevalence of only 4.7 percent in one group. Only 1 percent of Eskimo males are color blind. Approximately 2.9 percent of boys from Saudi Arabia and 3.7 percent from India were found to have deficient color vision. Red/green color blindness may slightly increase an affected person's chances of contracting leprosy. Pre-term infants exhibit an increased prevalence of blue

color blindness. Achromatopsia has a prevalence of about one in 33,000 in the United States and affects males and females equally.

Red/green and blue color blindness appear to be located on at least two different gene locations. The majority of affected individuals are males. Females are carriers but are not normally affected. This indicates that the X chromosome is one of the locations for color blindness. Male offspring of females who carry the altered gene have a 50 percent chance of being color-blind. The rare female that has red/green color blindness, or rarer still, blue color blindness, indicates there is an involvement of another gene. As of 2004, the location of this gene was not yet identified.

Achromatopsia, the complete inability to distinguish color, is an autosomal recessive disease of the retina. Thus, both parents have one copy of the altered gene but do not have the disease. Each of their children has a 25 percent chance of not having the gene, a 50 percent chance of having one altered gene (and, like the parents, being unaffected), and a 25 percent risk of having both the altered gene and the condition. In 1997, the achromatopsia gene was discovered to reside on chromosome 2.

Color blindness is sometimes acquired. Chronic illnesses that can lead to color blindness include Alzheimer's disease, diabetes mellitus, glaucoma, leukemia, liver disease, chronic alcoholism , macular degeneration, multiple sclerosis, Parkinson's disease, sickle cell anemia , and retinitis pigmentosa. Accidents or strokes that damage the retina or affect particular areas of the brain eye can lead to color blindness. Some medications such as antibiotics , barbiturates, anti-tuberculosis drugs, high blood pressure medications, and several medications used to treat nervous disorders and psychological problems may cause color blindness. Industrial or environmental chemicals such as carbon monoxide, carbon disulfide, fertilizers, styrene, and some containing lead can cause loss of color vision. Occasionally, changes can occur in the affected person's capacity to see colors after age 60.

When to call the doctor

An ophthalmologist should be consulted at the time color blindness is first suspected.

Diagnosis

There are several tests available to identify problems associated with color vision. The most commonly used is the American Optical/Hardy, Rand, and Ritter Pseudoisochromatic Test. It is composed of several discs filled with colored dots of different sizes and colors. A person with normal color vision

looking at a test item sees a number that is clearly located somewhere in the center of a circle of variously colored dots. A color-blind person is not able to distinguish the number.

The Ishihara Test is comprised of eight plates that are similar to the American Optical Pseudoisochromatic Test plates. The individual being tested looks for numbers among the various colored dots on each test plate. Some plates distinguish between red/green and blue color blindness. Individuals with normal color vision perceive one number. Those with red/green color deficiency see a different number. Those with blue color vision see yet a different number.

A third analytical tool is the Titmus II Vision Tester Color Perception Test. The subject looks into a stereoscopic machine. The test stimulus most often used in professional offices contains six different designs or numbers on a black background, framed in a yellow border. Titmus II can test one eye at a time. However, its value is limited because it can only identify red/green deficiencies and is not highly accurate.

Treatment

As of 2004 there is no treatment or cure for color blindness. Most color vision deficient persons compensate well for their abnormality and usually rely on color cues and details that are not consciously evident to persons with typical color vision.

Inherited color blindness cannot be prevented. In the case of some types of acquired color deficiency, if the cause of the problem is removed, the condition may improve with time. But for most people with acquired color blindness, the damage is usually permanent.

Prognosis

Color blindness that is inherited is present in both eyes and remains constant over an individual's entire life. Some cases of acquired color vision loss are not severe, may appear in only one eye, and last for only a short time. Other cases tend to become worse with time.

Prevention

There is no way to prevent genetic color blindness. There is no way to prevent acquired color blindness that is associated with Alzheimer's disease, diabetes mellitus, leukemia, liver disease, macular degeneration, multiple sclerosis, Parkinson's disease, sickle cell anemia, and retinitis pigmentosa.

Some forms of acquired color blindness may be prevented. Limiting use of alcohol and drugs such as antibiotics, barbiturates, anti-tuberculosis drugs, high blood pressure medications, and several medications used to treat nervous

disorders and psychological problems to levels that are required for therapeutic benefit may limit acquired color blindness.

Parental concerns

Parents can inquire about other family members who have experienced color blindness. If such family members exist, parents can have their children tested for color perception at an early age. Screening for color perception is usually performed in grade school.