



Information about Color Vision Deficiencies

Normal Color Vision

The human retina has vision cells known as “rods” and “cones”. The “rods” are mostly responsible for peripheral vision and night vision, while the “cones” provide central detail vision and allow us to see colors. There are basically 3 types of cones in our eyes that are able to see red, green, and blue colors. All other colors that are seen are actually mixtures of these colors. For example when viewing an object, if the red and green cones are triggered then the brain sees yellow. The shade of yellow that is seen is determined by the number and combination of red and green cones that are triggered.

What is Color Deficiency?

Some individuals are born without all of the color-sensitive cones. As a result, they can see many colors, but they are unable to appreciate all the different shades of these colors. Since they are unable to see every subtle shade of certain colors, the brain compensates by incorrectly selecting the shade of color it believes to be the closest. As a result, color deficient individuals confuse certain shades of colors. These people are often incorrectly referred to as “colorblind.” Since they actually do see colors, the more appropriate description for an individual with a limited ability to see colors is “color deficient”. It is actually somewhat rare to be completely colorblind.

Who is Color Deficient?

Color deficiency is usually genetically determined by our X chromosome. Since females have two X chromosomes, if one is deficient, the other one makes up for it. Therefore, it is less common for women to be color deficient. It is estimated that less than 1% of women are color deficient.

Since males have one X and one Y chromosome, they are more likely to be born color deficient. Males generally inherit their color deficiency from their mother’s side of the family. It is estimated that approximately 5-10% of males have some form of color deficiency.

The most common form of color deficiency is the reduced ability to see all shades of the color green. The second most common is the lack of seeing all shades of the color red. Blue deficiency is not as common since our retina also has vision cells known as “rods” that have some ability to see blue light.

What Does A Color Deficient Person See?

Human color sensitivity is very complex and can vary among individuals. Therefore, not every person that is color deficient will be the same. A person that is color deficient generally has trouble seeing different shades of a color and they will tend to confuse the darkness of a color with the actual shade. Thus, telling the difference between similar colors can be difficult. For example, a person with normal color vision may say that one pair of socks is beige and the other pair is greenish-beige. A person that is color deficient may say that both pairs of socks are beige, but one pair is darker in color.

Living With Color Vision Deficiencies

Most color vision deficiencies can be detected with a color vision test during a comprehensive eye examination. Most optometric offices and some ophthalmology offices routinely test for color vision deficiencies during an eye examination. Color vision testing is mainly helpful for career planning since some professions require perfect color vision.

Most individuals with color deficiencies live normal lives without limitations. Congenital color vision deficiencies are not progressive or degenerative, therefore no treatment is indicated other than being educated about the condition. Color-deficient individuals have often “learned” what different shades of colors look like and often do not even know they have a deficiency.