



Wasatch View Eye Care

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Color Blindness

Overview

Color blindness is better described as a color-deficiency because in the vast majority of people with the condition can see colors, but lack the ability to perceive them the way most people do. By far most people with colorblindness have a red-green deficiency. When a colorblind person looks at a red apple, they will say it is red because they know it is red, but will perceive the actual color differently. It is an inherited trait that mainly affects men because it is an X-linked recessive gene. The colorblindness gene codes for a “substitution” in retinal photopigments which leads to a larger overlap of green and red sensitivities. There is no treatment for the condition. However, lenses can be worn that enhance the differences between red and green hues. It may also limit some career choices people have.



Signs & Symptoms

A person that is colorblind will not notice any symptoms because they just view colors differently. However, they may read tests or items that require accurate color perception incorrectly.

Causes

Colorblindness is an inherited trait and is caused by an alteration in the gene that codes for the photopigment in cone cells. Cone cells are what allow us to have detailed and color vision.



Cone

In colorblind individuals the photopigment functions differently and causes a different color perception. The reason for this is a larger overlap in the green and red sensitivities



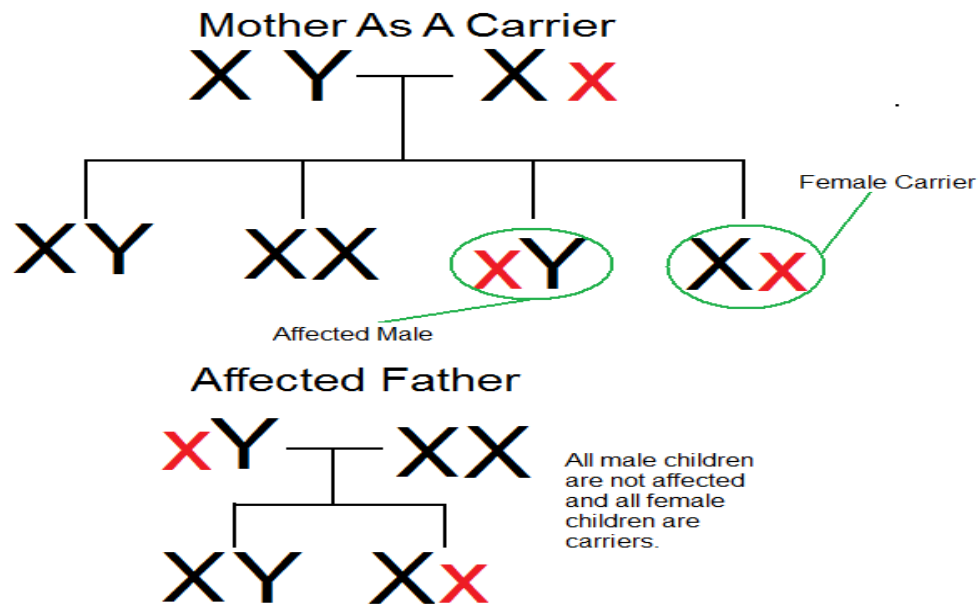
Normal Color Vision



Colorblindness

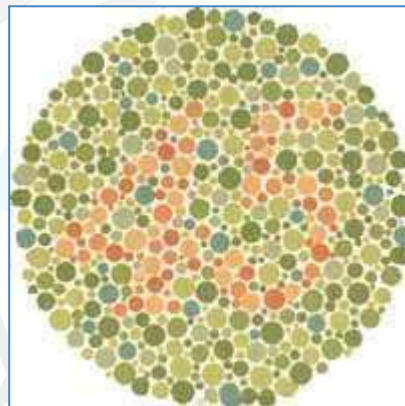
Larger overlap of green and red cone sensitivities

The gene that codes for colorblindness is located on the X chromosome and is recessive (X-linked recessive). Because of this it affects men much more commonly than women. Men have one X chromosome and get the condition when they have the gene. Women have two X chromosomes and require two of the genes to be colorblind, which is rare. Between 2% -6% of men are colorblind and 0.5% of women are colorblind. Women are typically carriers and have a risk of passing it on to their sons (1 in 2 chance). Below is a pedigree chart that demonstrates the inheritance patterns most commonly seen.



Testing & Evaluation

Testing for color blindness is usually done with pseudoisochromatic plates that display certain patterns or numbers. People with color blindness are unable to see the number or pattern as those without color blindness do. Below is an example.



Another more specific method of testing for color blindness is using the Farnsworth D-15 Dichotomous Color Blindness Test. This test has the testee arranged colored discs in a transitioning pattern. It gives specific information about the type of color blindness the individual has (protanopia/red-blindness, deuteranopia/green-blindness and tritanopia/blue-blindness). A link to an online version of the test is shown below:

<https://www.color-blindness.com/color-arrangement-test/>

Management

There is no treatment for color blindness. Special contact lenses can be used to help some people with color blindness distinguish the difference between colors. Enchroma has a line of colored lenses that come in non-prescription and prescription options. The lenses “selectively filter out

wavelengths of light at the precise point where this confusion or excessive overlap of color sensitivity occurs.” Their website is listed below:

<https://enchroma.com/>.



Some careers require good color perception like being a lab technician who needs to interpret test results based on color or an electrician who needs to tell the difference between different colored wires. Because of this those with color blindness may need to limit their career options. In children it is important to know of colorblindness so teachers can adjust their lessons to provide a better learning environment. This is a good reason to have your children get an eye exam prior to starting school

Websites

All About Vision: <http://www.allaboutvision.com/conditions/colordeficiency.htm>

American Optometric Association: <http://www.allaboutvision.com/conditions/colordeficiency.htm>

National Eye Institute: <https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases/color-blindness>