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| Color deficiencies are extremely commonplace, especially among men since the genes for the green and red photopigments are X-linked.  Since males only have one X-chromosome, they have only one chance of receiving genes for functional ospins. In fact, one in ten males, or ten percent of the male population, suffers from some abnormality in their color vision, involving mainly red-green color deficiencies, while less than one half of a percent of women suffer from a deficiency.   The two basic classes of red-green color deficiencies are dichromats, who are completely red green color blind, and anomalous trichromats, who just have a reduced sensitivity to either red or green (Bowmaker).  Instead of having a visual pigment for both the red (long wavelength) spectral region and the green (middle wavelength) spectral region, dichromats have only one visual pigment in the middle to long wavelength region.  The earliest detailed case of dichromacy dates back to more than 200 years ago with the famous chemist John Dalton.  Throughout his life, Dalton continually confused bright reds with deep greens and even shades of pink with blue.  Dalton believed that his inability to perceive colors normally was due to the vitreous humor, or fluid filling the eye, being colored blue.  After his death, at his own request, an autopsy was performed, but they found that the humors of his eye were expectantly transparent, with the normal yellow coloration; in other words, the fluid was not blue.  Just recently, technology has allowed scientists to isolate Dalton’s opsin genes and determine that his color deficiency was due to the lack of the gene coding for the middle length, or green, photopigment (Bowmaker).  The second class of red-green color deficiencies, anomalous trichromacy, consists of many different deficiencies caused by a reduced sensitivity to either red or green.  The most common form of anomalous color vision is deuteranomaly, which is a reduced sensitivity to green; about five percent of men suffer from deuteranomaly.  A reduced sensitivity to red is referred to as Protanomaly and occurs in only about one percent of men. Despite the two main forms of anomaly, there is still sufficient variation among the individuals suffering from the color deficiency.  Genetically, anomaly can be explained quite easily; the retina expresses the normal S (blue) gene, either a normal L (red) gene, or M, green gene, and then a hybrid gene, which codes for a visual pigment that is neither long nor middle, but in between. The hybrid gene is created when crossing over within a gene takes place and regions of the L and M genes are combined into a single gene.  No matter the form the color deficiency takes, a considerable amount of men suffer from color deficiencies due to the close proximity of the L and M genes on their single X chromosome, causing their perception of color to differ from that of women (Bowmaker).  Although women do not often suffer from color deficiencies since they have two X chromosomes available to supply normal L and M genes, their color perception can still be affected because of the presence of their two X chromosomes containing two sets of vision genes.  The likelihood of a hybrid gene being formed during meiosis, due to the misalignment and recombination of the L and M sequences, is just as likely in woman as men, since it involves an X chromosome, which both genders have.  However, if a woman ends up with a hybrid gene on one X chromosome, she can still have a normal L gene and a normal M gene on the other chromosome.  If a woman does end up with a hybrid gene, a normal L gene, and a normal M gene, though on different chromosomes, X inactivation insures that the three variants are expressed in separate population of cones before one of the X chromosomes is inactivated, making the woman have three spectrally different cone types for long to medium wavelength photoreceptors.  In addition to her unharmed short wavelength receptor (blue), whose genes are found on the autosomal chromosome number seven, the woman has a total of four cone types, as opposed to the common three cone types of red, green, and blue see in a trichromatic person.  Since she has four different cone photoreceptors, the woman will be tetrachromatic, adding a fourth dimension of color vision.  Scientists also refer to woman who are tetrachromatic as being heterozygous for anomalous color vision, since anomalous color vision in males results in the deficiency caused by the hybrid gene.  If the women with the hybrid gene did not have the second X chromosome with the normal L and M genes, aside from being male, she would have anomalous color vision.  Some color researchers, including Rob Tow, believe at least twelve percent of all women are tetrachromatic, capable of seeing colors even a man with normal color vision could never see. One little mutation during crossing over can form a hybrid gene, which for women can add a whole new dimension to color, but for men cause a color deficiency (Neitz).  This biological evidence makes it clear that males and females will not perceive colors exactly the same or have the same color experience. These differences in color perception will thus influence color preference because any one color can appear different to many different people. Since women have two X chromosomes and thus two sets of genes coding for long and middle wavelength sensitive pigments, will they consistently prefer the same kinds of colors?  Does the genetic makeup also insure that men will consistently prefer the same kinds of colors?  Research shows that color perception differs between genders, but does color preference also differ between men and women?  If men and women are asked to choose the color they most prefer between two seemingly identical colors will their difference in color perception result in males preferring the same color and women preferring the same color?    ([Intro1](http://docs.google.com/introduction.html))([Intro2](http://docs.google.com/intro2.html))([Intro3](http://docs.google.com/intro3.html))([Intro4](http://docs.google.com/intro4.html))  [[Home](http://docs.google.com/home.html)][[Introduction](http://docs.google.com/introduction.html)][[Hypothesis](http://docs.google.com/hypothesis.html)][[Procedure](http://docs.google.com/procedure.html)][[Data](http://docs.google.com/data.html)][[Conclusions](http://docs.google.com/conclusions.html)][[Bilio/Links](http://docs.google.com/biblio.html)]  [2002 Projects][2001 Projects][2000 Projects][1999 Projects][1998 Projects] |