

# Erik the Red Sees Green

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## All about color and vision

### How do we see color?

In the back of your eye, in a part called the retina, are tiny cells called rods and cones. Rods and cones take in everything you see and turn it into information that is sent to your brain. The cones allow you to recognize color.

There are three kinds of cones—green, red, and blue. The cones mix colors, working together to help you see countless different shades. If one or more of the kinds of cones are missing or aren't working properly, your brain receives different information than most people. You have color vision deficiency (CVD).



### Who has color vision deficiency?

For every one girl who is color-blind, there are about twenty boys who are. About one out of twelve boys has some degree of CVD.

### Why do more boys have color vision deficiency?

Ninety-nine percent of cases are red-green deficiencies, like Erik has. This type is inherited from parents—like curly hair or blue eyes. It is present from birth and is permanent.

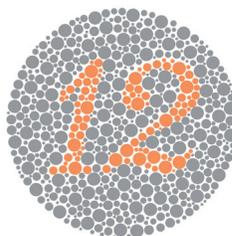
Boys are affected more because the X chromosome carries CVD. Girls have two X chromosomes—boys have one X and one Y chromosome. Chromosomes include all the information from your parents that make you, you. If a boy's one X chromosome includes color defective information he will be color deficient, but a girl must inherit two color defective X chromosomes to be color deficient. The other one percent of CVD cases includes very rare blue deficiencies and even rarer true color blindness—when a person sees only shades of black, white, and gray. These affect both boys and girls with the same frequency.

## Do all people with red-green color vision deficiency see the same?

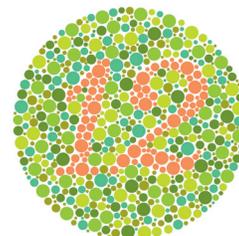
No! CVD is categorized as slight, moderate, severe, or absolute. Erik would most likely be categorized as moderate to severe. People with slight CVD can go for years without realizing it unless they are tested.

### How is color vision tested?

An optometrist or an ophthalmologist does a full eye exam to diagnose CVD. The most well known test for red-green color deficiency was developed by Dr. Shinobu Ishihara in 1917. Ishihara tests have different colored dots arranged in a pattern that displays a number—a number that may not be visible to a person with CVD. The test can even be used on young children who do not know numbers yet but can trace the pattern with their fingers.



*Most people can see the numeral 12 in this image.*



*But people with some kinds of CVD will not be able to see it in this image.*

### Can color vision deficiency be cured?

Scientists are working on it, but there is no cure for CVD at this time. Color correcting lenses and glasses to reduce glare help some people distinguish shades, but they don't enable the wearer to see the colors as other people without CVD do.

### How can I help a person with CVD?

People with CVD learn how to interpret the world they see, even if it is different from what you see. If they ask you if something matches, tell them! But try to resist the urge to quiz them—"What color is my shirt?" or "What color is that car?"—because you are curious. People with CVD agree that gets old fast!



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