Lighthouse Guild

Effective Color Contrast

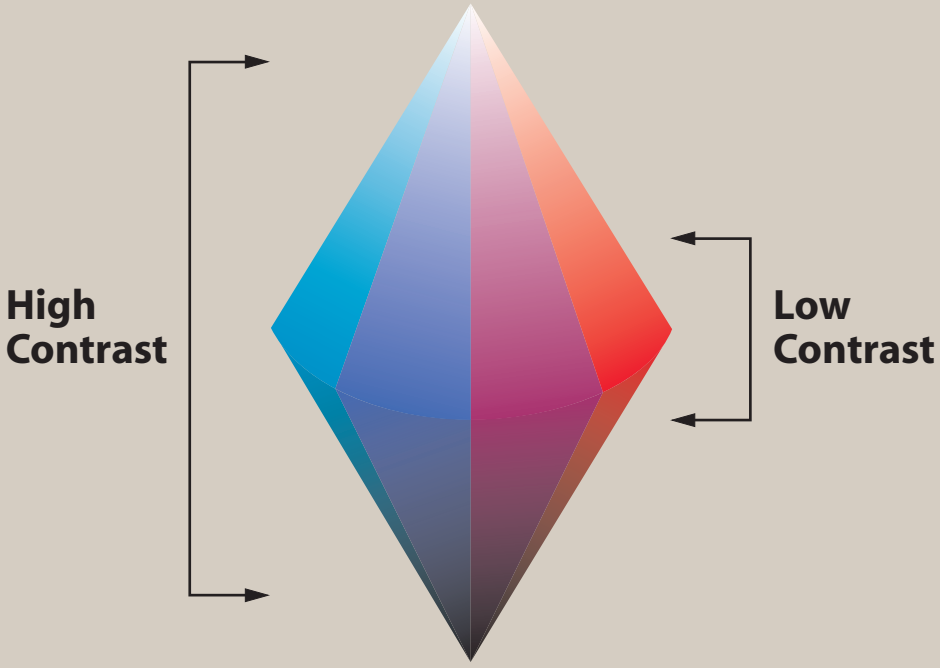
Designing for People with Partial Sight and Color Deficiencies

This brochure contains three basic guidelines for making effective color choices that work for nearly everyone. Following are explanations of the three perceptual attributes of color — hue, lightness and saturation — as they are used by vision scientists.

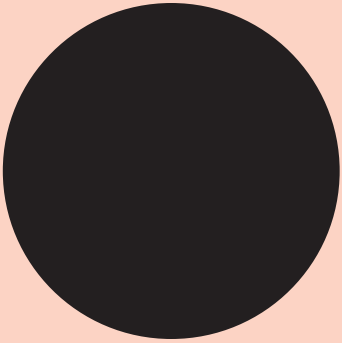
How does impaired vision affect color perception?

Partial sight, aging and congenital color deficits all produce changes in perception that reduce the visual effectiveness of certain color combinations. Two colors that contrast sharply to someone with normal vision may be far less distinguishable to someone with a visual disorder. It is important to appreciate that it is the contrast of colors one against another that makes them more or less discernible rather than the individual colors themselves.

Here are three simple rules for making effective color choices:



1. Exaggerate lightness differences between foreground and background colors, and avoid using colors of similar lightness adjacent to one another, even if they differ in saturation or hue.



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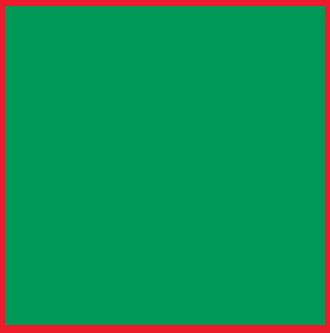
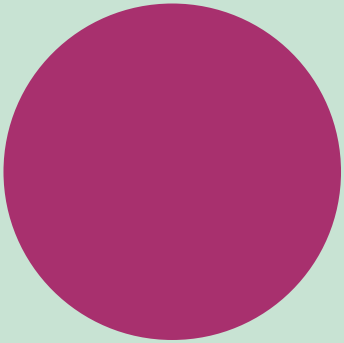


Not as effective

Don’t assume that the lightness you perceive will be the same as the lightness perceived by people with color deficits. You can generally assume that they will see less contrast between colors than you will.

If you lighten your light colors and darken your dark colors, you will increase the visual accessibility of your design.

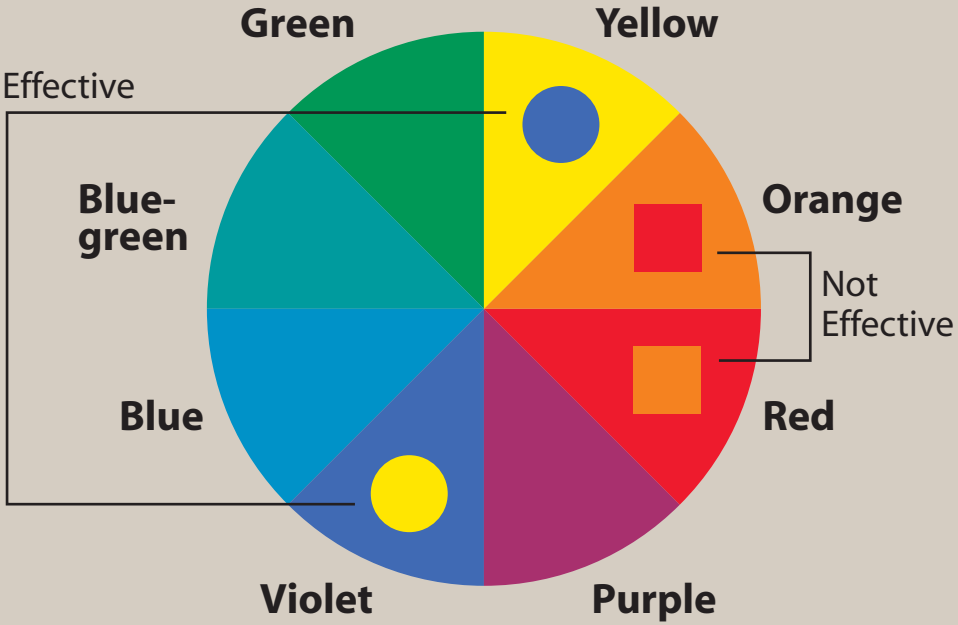
2. Choose dark colors with hues from the bottom half of this hue circle against light colors from the top half of the circle. Avoid contrasting light colors from the bottom half against dark colors from the top half. The orientation of this color wheel was chosen to illustrate this point.



Effective

Not as effective

For most people with partial sight and/or congenital color deficiencies, the lightness values of colors in the bottom half of the hue circle tend to be reduced.



3. Avoid contrasting hues from adjacent parts of the hue circle, especially if the colors do not contrast sharply in lightness.

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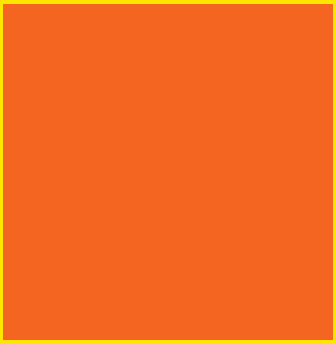
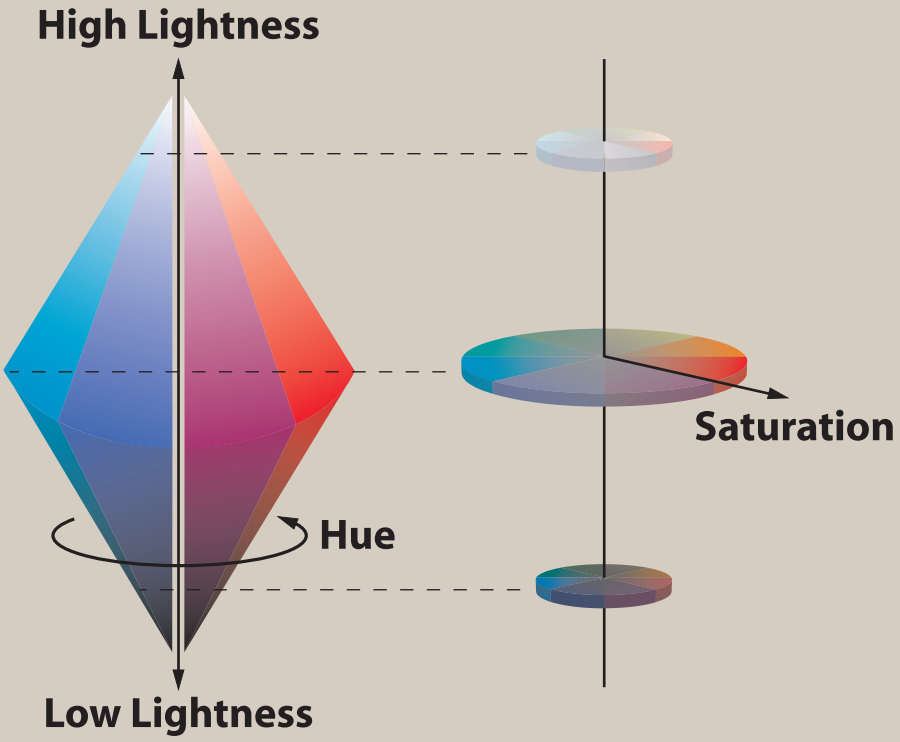


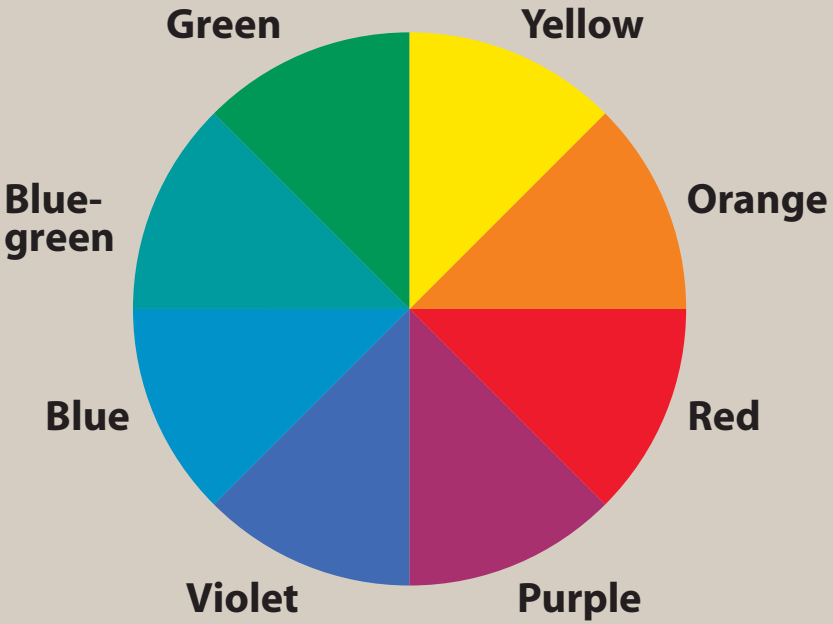
Not as effective

Color deficiencies associated with partial sight and congenital deficiencies make it difficult to discriminate between colors of similar hue.

Hue, lightness and saturation – the three perceptual attributes of color – can be envisioned as a solid.



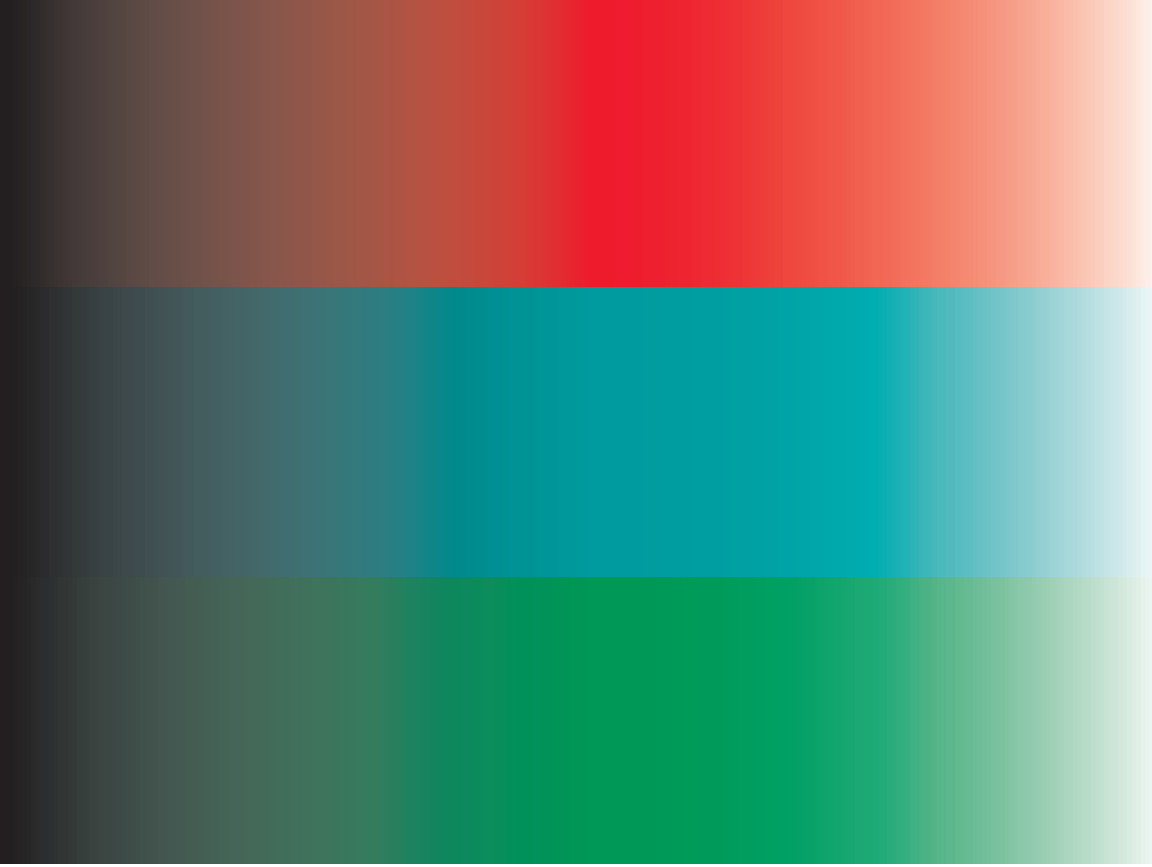
Hue varies around the solid; lightness varies from top to bottom and saturation is the distance from the center.



Hue is the perceptual attribute associated with elementary color names.

Hue enables us to identify basic colors, such as blue, green, yellow, red and purple. People with normal color vision report that hues follow a natural sequence based on their similarity to one another.

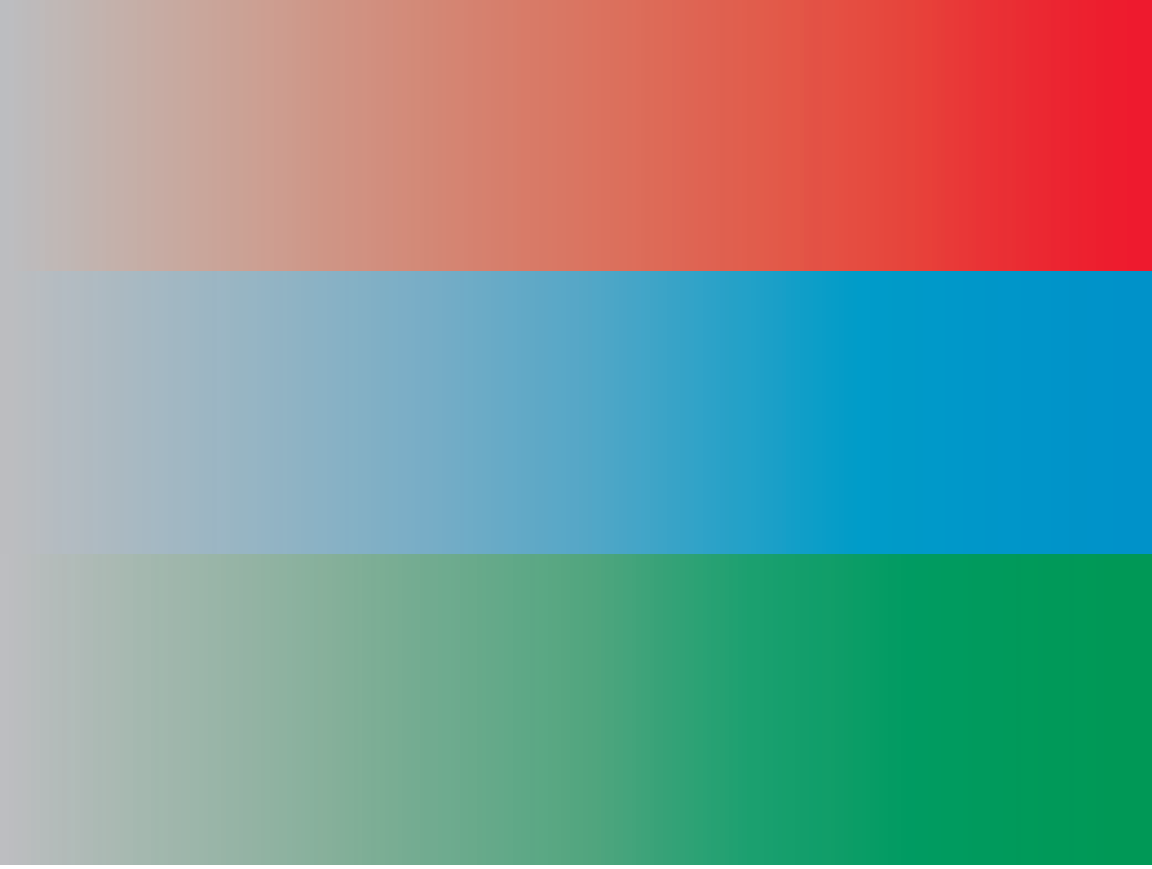
With most color deficits, the ability to discriminate between colors on the basis of hue is diminished.



Lightness corresponds to how much light appears to be reflected from a surface in relation to nearby surfaces.

Lightness, like hue, is a perceptual attribute that cannot be computed from physical measurements alone. It is the most important attribute in making contrast more effective.

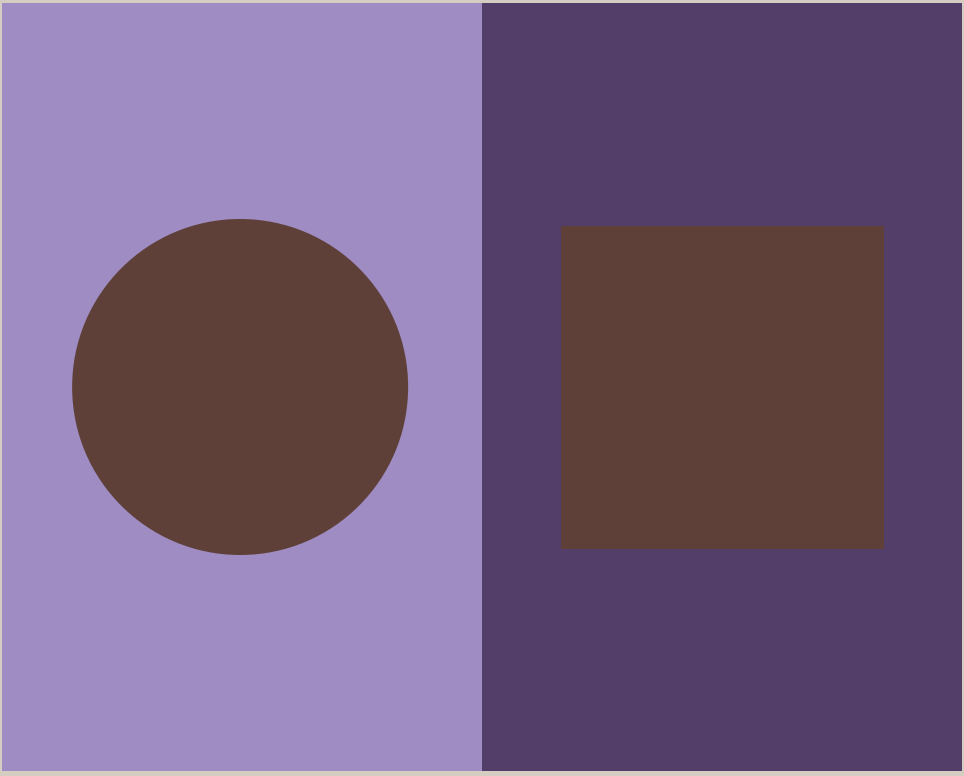
With color deficits, the ability to discriminate colors on the basis of lightness is reduced.



Saturation is the degree of color intensity associated with a color's perceptual difference from a white, black or gray of equal lightness.

Slate blue is an example of a desaturated color because it is similar to gray. A deep blue, even if it has the same lightness as slate blue, has greater saturation.

Congenital and acquired color deficits typically make it difficult to discriminate between colors on the basis of saturation.



To a person with color-deficient partial sight, the left-hand panel might appear like the right-hand panel appears to a person with normal color vision.

With color deficits, the ability to discriminate colors on the basis of all three attributes – hue, lightness and saturation – is reduced. Designers can help to compensate for these deficits by making colors differ more dramatically in all three attributes.

Lighthouse Guild is the leading not-for-profit vision + healthcare organization with a longstanding heritage of addressing the needs of people who are blind or visually impaired, including those with multiple disabilities or chronic medical conditions.

By integrating vision + healthcare services and expanding access through education and awareness, we help people lead productive, dignified and fulfilling lives.

This brochure was developed by Aries Arditi, PhD, Senior Fellow in Vision Science at Lighthouse International in 1995. It was based on his earlier work with Kenneth Knoblauch.

For additional copies of this brochure, its companion brochure entitled “Making Text Legible: Designing for People with Partial Sight” or other Lighthouse Guild publications:

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