

# **Design & color deficiency**

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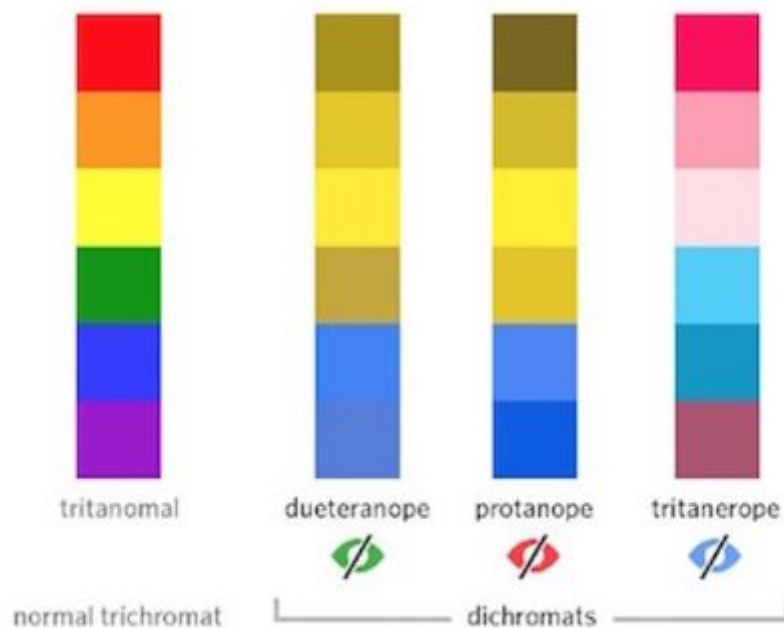
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# Overview

In order to bring our DBL web-application project to a successful end, we feel it is important to look at ways to improve the usability of our final product. One of the wishes present on our SCRUM product backlog is to take color deficiency in to consideration. Apparently around 1 in 12 men, and 1 in 200 women, worldwide, suffer from color deficiency.<sup>1</sup> With this in mind I set out to research the topic and hopefully propose a way of to move forward with our project, and make the tool better accessible to people who suffer from this.

## Forms of color blindness

The most common is red/green color blindness, where sufferers mix up all colors which have red or green as part of the whole color. Those affected by Protan color blindness are less sensitive to red light, whilst sufferers of Deuteranopia have the same problem with green. For example, a person with Protanopia will confuse blue and purple because they can't recognize the red element of the color purple. The third type of color deficiency, Tritanopia, is the least common and refers to sufferers who struggle to distinguish blue or yellow light. The image below shows what the rainbow may look like to individuals with each of these forms of color blindness.



<sup>1</sup> <http://blog.usabilla.com/how-to-design-for-color-blindness/> May 15, 2018

## Things that don't work

**The relative lighting** (bright, dim, daylight, incandescent, fluorescent), background (light, dark, front lit, and backlit) and size of the color sample all play a role. A color blind person can generally see all primary color hues (red, green, and blue) at full strength (saturation). But the mixture of the deficient hues with other colors makes some colors challenging to identify, or indistinguishable from another.

**Contrast** is a huge factor in accurately differentiating between color shades. Color gradients (color ramps) are tricky too. One end of the ramp can begin in a hue that is perceptible, and end in a hue that is not. If text appears on top of the color ramp, it is sometimes not readable if the contrast between the elements is not high enough.

## Color combinations to avoid

You need to be smart when picking out your color combinations. Since color blindness affects people in different ways, it's difficult to determine which colors are 'safe' to use in web design. That being said, here's a few color combinations to avoid<sup>2</sup> because they're a potential nightmare to color blind users:

- Green & Red
- Green & Brown
- Blue & Purple
- Green & Blue
- Light Green & Yellow
- Blue & Grey
- Green & Grey
- Green & Black

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<sup>2</sup> <http://wearecolorblind.com/article/a-quick-introduction-to-color-blindness/>

# **Color combinations that work**

Next up follows a short overview of things that actually do work. It is suggested that even though a palette might be created which adheres to the following guidelines, that it is still tested via the tool mentioned later in this document.

Complementary contrast

Cool and warm contrast

Make it look good in grayscale

## Patterns and shapes

An alternative approach is to include patterns and/or shapes into the mix as well. Thereby conveying meaning, if present, in more ways than only color. Here one could think of exclamation or question marks, information icons, etc.

## Tools

The following tool might be useful to us as a group. We can use this to design palettes and test whether they also work for people who are colorblind.

<https://www.canvasflip.com/color-blind.php>

## Example

## Conclusion

The concept of colorblindness is not a complex topic in and of itself. What does complicate matters is that there is not one single notion of colorblindness. It comes in quite a few variants, each with its own set of colors that become hard to distinguish from them.

In this document there is a brief, but I believe complete enough, outline of some of the forms of colorblindness, and what approaches could help in boosting the accessibility of our web-application. As clear examples are available, and I have even found a tool to guide us along the way, I believe it is very well possible to

create a few color palettes as `global settings` to alleviate any issues a user might experience. This way I believe the research is complete and we now have a set of guidelines to work with in the near future.

## Sources

1. <http://blog.usabilla.com/how-to-design-for-color-blindness/>
2. <https://uxplanet.org/108-million-web-users-are-color-blind-tips-for-designing-keeping-them-in-mind-7be71d0019a9>
3. <http://dux.typepad.com/dux/2013/04/my-entry.html>
4. <http://understandinggraphics.com/design/designing-for-color-blindness/>