

Effects of selective blue-violet spectral subtractions on colour perception
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Our objective was to characterize the distortion of colour discrimination induced by selective blueviolet spectral subtraction in calibrated common light environments. We designed a custom-made colour classification test and used a range of unique holographic 20 nm bandstop filters covering the whole blue spectral range in 20 nm increments with two rejection rates (50% and 100%).

The discrimination test was designed to reveal low discrimination efficiency in any region of the hue circle, including (i) constant ΔE^*_{ab} -unit intervals between adjacent caps in CIE 1976 L*a*b* colour space; (ii) a desaturated color panel. The number of colour caps (48) was chosen to limit test duration and eye fatigue. Trilinear correction procedure including rotation and translation was implemented on Matlab software. Both natural and artificial calibrated lights were modeled.

Colour vision distortions were maximal for selective blue filtering at $440 \text{ nm} \pm 10 \text{ nm}$, both for 50% and 100% rejection rates. At the contrary, blue subtraction at $480 \text{ nm} \pm 10 \text{ nm}$ with 100% rejection rate had almost no effect.

Models of colour vision based on the chromatic postreceptoral retinal treatment give quite precise predictions about these results. Colour discrimination under blue-violet spectral subtractions may be explained by Konyo pathway, carrying the difference S-LM between the short-wave cone signal and the long-wave and medium-wave cone signals.

The custom-made 48-hue colour classification test and holographic bandstop filters may be advantageously valued in characterizing more deeply chromatic mechanisms or assessing the quality of colour rendering of LED lighting.