Do basic colors influence chromatic adaptation?

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Color constancy (the ability to perceive colors relatively stable under different illuminants) is the result of several mechanisms spread across different neural levels and responding to several visual scene cues. It is usually measured by estimating the perceived color of a grey patch under an illuminant change. In this work, we hypothesize whether chromatic adaptation (without a reference white or grey) could be driven by certain colors, specifically those corresponding to the universal color terms proposed by Berlin and Kay (1969). To this end we have developed a new psychophysical paradigm in which subjects adjust the color of a test patch (in CIELab space) to match their memory of the best example of a given color chosen from the universal terms list (grey, red, green, blue, yellow, purple, pink, orange and brown). The test patch is embedded inside a Mondrian image and presented on a calibrated CRT screen inside a dark cabin. All subjects were trained to “recall” their most exemplary colors reliably from memory and asked to always produce the same basic colors when required under several adaptation conditions. These include achromatic and colored Mondrian backgrounds, under a simulated D65 illuminant and several colored illuminants. A set of basic colors were measured for each subject under neutral conditions (achromatic background and D65 illuminant) and used as “reference” for the rest of the experiment. The colors adjusted by the subjects in each adaptation condition were compared to the reference colors under the corresponding illuminant and a “constancy index” was obtained for each of them. Our results show that for some colors the constancy index was better than for grey. The set of best adapted colors in each condition were common to a majority of subjects and were dependent on the chromaticity of the illuminant and the chromatic background considered.