The effect of scene complexity and local contrast on constancy measured in the blocks-copying task: supplementary results

Prior to conducting Experiment 3 we conducted a preliminary experiment in which we measured the degree of color constancy in the blocks-copying task as a function of scene complexity and local contrast.

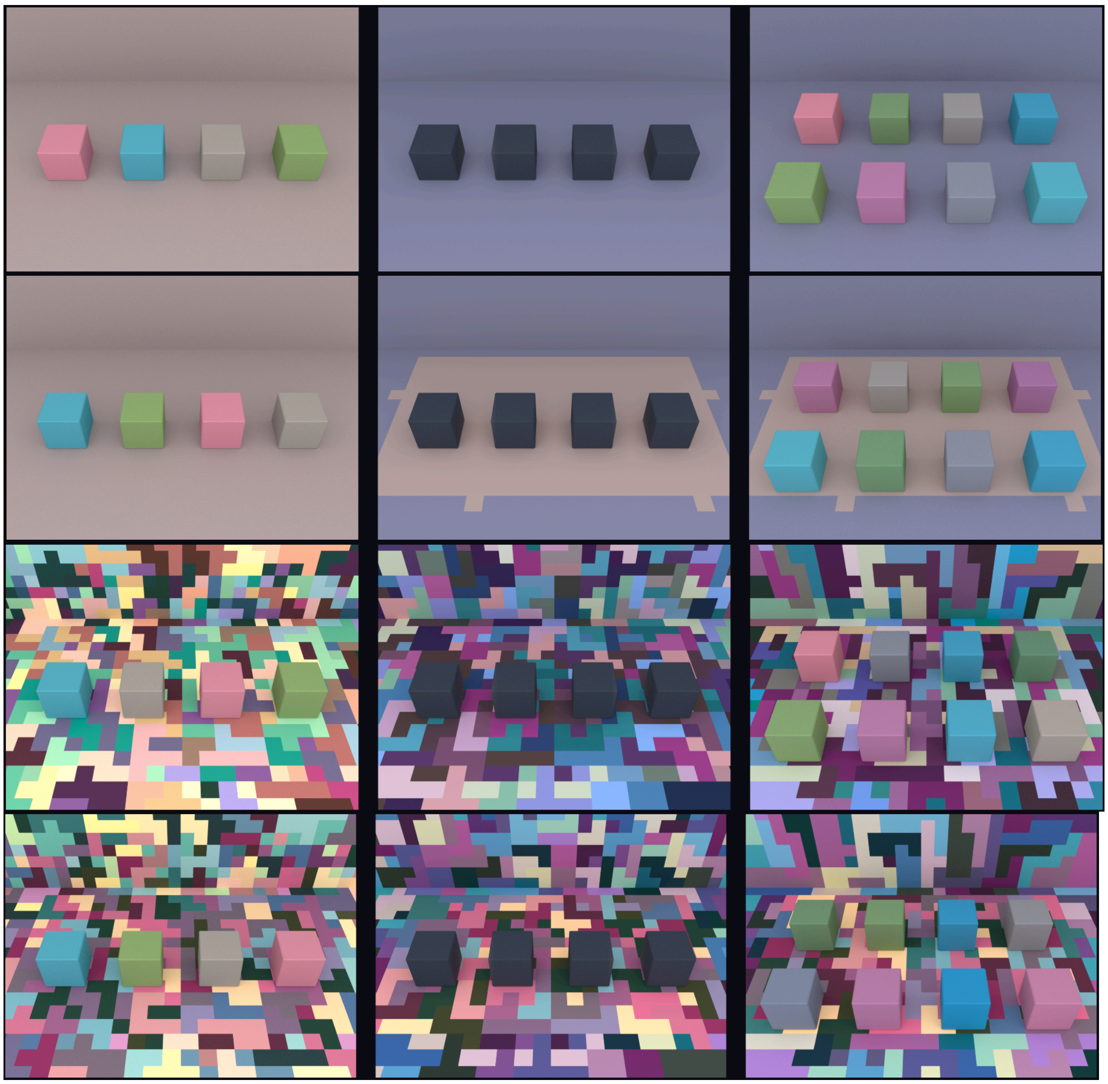

Figure S1. Stimuli in the preliminary experiment (illuminant-changed condition: simple (row 1-2) and complex (row 3-4) scenes. Examples of stimuli in which the local contrast is preserved when the illuminant in the workspace and the source changed to bluish are shown in the first and third row. Stimuli for which the local contrast was silenced (on average) across the illumination change are shown in the second and fourth row.

In the preliminary experiment we used the same target block reflectances as in Experiments 1 and 2 (Set A; see Figure S1); these differed from those used in Experiment 3. We used the same illuminant spectra as in Experiment 1, but set the front wall reflectance to white (MCC sample from column 1, row 4), which slightly changed the spectra impinging on the blocks. Illuminant xy chromaticity estimated from blocks modelled as perfectly reflective surfaces was [0.318 0.335] in the illuminant-constant and [0.273 0.286] in the illuminant-changed condition; luminanance values were 242.87 and 161.88 cd/m^2.

The competitors were designed in the same way as in Experiment 1, but did not include an overconstancy match for the illuminant-changed condition. Further, in the preliminary experiment, the structure of the complex scene was different than it was in Experiment 3 and employed a larger number of smaller individual patches. The surface reflectances of the background patches were chosen from a subset of 194 Munsell surfaces whose mean reflectance was roughly neutral, although no gray surfaces were included in the set. As in Experiment 3, the reflectance of the background in the simple scene condition was equal to the mean of the set of background surfaces used in the complex scenes.

Five naive subjects participated in the experiment. They were all female (age 18-24) and passed our initial vision screening tests. Each subject completed between 14 and 16 blocks of trials for each scene condition in 7-9 experimental sessions of approximately 1 hour each.

Results.

Figure S2 shows the results for the simple scene (top panels) and the complex scene condition (bottom panels).

Similarly to Experiment 3, preliminary experiment did not yield a clear answer regarding the effect of scene complexity on constancy. While we found that constancy decreased with increase in complexity when constancy indices were computed with respect to the physical tristimulus match for each target ($F(1,12) < 12.34$, $p < 0.05$), we failed to replicate that finding when the analysis was repeated using indices computed with respect to the inferred matches from the illuminant-constant condition, $F(1,12) < 2$, *ns*.

Consistent with the results from Experiment 3, we found that silencing local contrast information across the change of illumination significantly reduced constancy, $F(1,12) = 14.47$, $p < 0.05$. This effect held for both complex and simple stimuli and the overall size of the effect (-16 % in simple vs. -20% in complex scenes) did not significantly differ across different levels of scene complexity. Although the degree of constancy for different targets varied across different levels of scene complexity (Scene Complexity x Target interaction $F(1,12) = 3.64$, $p < 0.05$), we found no significant Scene Complexity x Local Contrast or Scene Complexity x Local Contrast x Target interaction. Local Contrast x Target interaction was also not significant. As in Experiment 3, silencing local contrast did not fully abolish constancy. For both simple and complex conditions, t-tests conducted on the mean constancy indices (averaged across targets) for each subject indicate that constancy was significantly different than zero (simple $t(4) = 3.7$, $p < 0.05$; complex $t(4) = 3.15$, $p < 0.05$). These findings held with either method of computing color constancy indices.

Consistent with the findings of our previous experiments, we found that subject's inferred matches in the illuminant-constant condition showed a blue bias[1]. Out of all individual matches (taken across targets and subjects) only 4 out of 20 in the simple scene condition and only 3 out of 20 in the complex scene condition fell between T and C_{-1}, while all remaining matches were shifted in the bluish direction. Unlike in Experiment 3, here we found that precision of subjects' choices in illuminant-constant condition decreased with scene complexity (main effect of scene complexity on precision: $F(1,12) = 13.12$, $p < 0.05$; distance between the physical tristimulus match and the inferred match in the illuminant-constant condition: $M = 2.47$; $SEM = 0.55$ in simple vs. $M = 3.47$; $SEM = 0.50$ in complex scenes, averaged across subjects; see also Figure S2, right column).

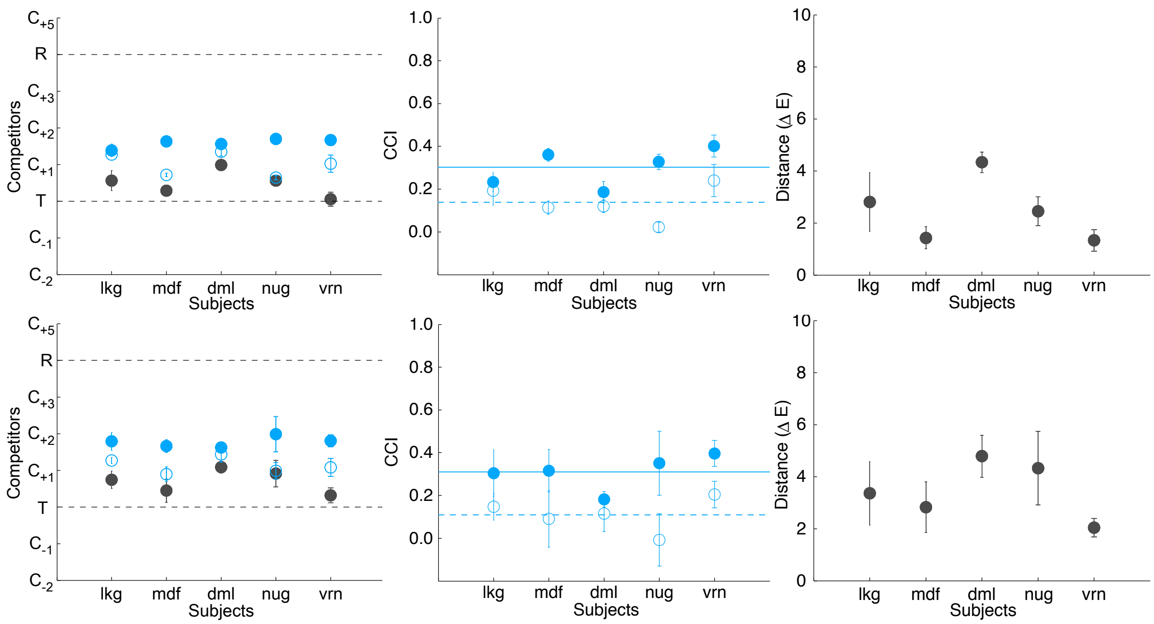

Figure S2. Results of the preliminary experiment. Simple scene condition is shown in the top; complex scene condition is shown in the bottom row. Illuminant-constant condition is plotted in gray, bluish illuminant-change conditions are plotted in blue (local contrast preserved) and cyan (local contrast silenced). The figure follows the same conventions as Figure 9 in the paper. **Left column**. Position of the inferred match across conditions. **Center column**. Color constancy indices, averaged across targets. Horizontal lines indicate average CCI across subjects (blue: local contrast preserved; cyan: local contrast silenced condition). **Right column**. Distance between the inferred match (illuminant-constant condition) and the target block in ΔE_{Lab} units averaged across targets.

[1]The spacing of competitors in the illuminant-constant condition in the pilot was the same as in the Experiment 1. Our attempt to correct for the blue bias in this condition by increasing the spacing between T and C_1 was only introduced in Experiment 3.