Supporting Information

Control Experiment 1: Photometric vs. Psychophysical Isoluminance

1. Methods
In Experiments 1-3 isoluminance was determined photometrically. It could be argued that this has led to luminance artefacts in the colour channels. Here we re-ran Experiment 1 with isoluminance determined psychophysically and with a deliberately introduced luminance artefact.

Participants
One participant with normal vision gave their informed consent and took part in the study.

Apparatus
The same apparatus was used as for Experiment 3.

Stimulus Generation
The participant’s psychophysical isoluminant point was measured for the L-M and S-cone channels separately using a minimum motion procedure (Anstis & Cavanagh, 1983; Ledgeway & Smith, 1994).

All Gabors were of size 2.0°, spatial frequency 2.0 cpd and were presented for 5 frames. The achromatic Gabors were presented at 0.1 contrast and the chromatic Gabors were presented at full contrast.

For half the trials an achromatic Gabor of phase 0.0 was followed by a chromatic Gabor of phase 0.25, then an achromatic Gabor of phase 0.5 and a chromatic Gabor of phase 0.75. For the remaining half the phases were reversed such that the initial achromatic grating had phase 0.75. Participants were required to indicate the direction the grating appeared to be drifting in. The elevation of the chromatic gratings was varied using a staircase procedure designed to find the 50% correct point i.e. the point where no consistent direction of motion was perceived.

The elevations generated using this procedure were then applied to the L-M and S-cone components of the experimental stimuli such that they were presented at psychophysical isoluminance.

Procedure
The same procedure was used as for Experiment 1. The experiment was run twice; once with the elevation values determined by the motion nulling procedure and once with a luminance artefact of 5.0° of elevation.

Data Analysis
The same data analysis was used as for Experiment 1. Data previously collected for Experiment 1 were used for the photometrically determined isoluminant condition. One staircase was excluded from the sharp luminance information combined with blurred chromatic information condition in the photometric isoluminance data and one was excluded from the same condition in the luminance artefact data because they did not converge.
In addition, due to the small sample size, 5000 within-subject bootstrap resamples were taken for each condition to produce a new set of psychometric curves. These data were then used to calculate the standard error for each condition.

2. Results – Experiment 4
The motion nulling procedure revealed small differences between photometric and psychophysical isoluminance for the participant. Psychophysical isoluminance was at -0.185° of elevation for the LM channel and -2.767° of elevation for the S channel.

Repeating the experiment with psychophysically determined isoluminance slightly increased the thresholds for the chromatic blur conditions. Introducing a luminance artefact had a similar effect in the isoluminant condition, however in the chromatic blur with sharp luminance condition the threshold decreased (from 9.542° in the photometric isoluminant condition to 8.175° in the luminance artefact condition, see Figure S1).

This demonstrates that any luminance artefacts that may have been present in the stimuli would only serve to decrease the luminance masking effect.

Supplementary Figure Legends
Figure S1. The mean blur detection thresholds for combined (hatched columns) and single channel (un-hatched columns) for the three elevations; photometric isoluminance or 0° of elevation (light grey columns), psychophysical isoluminance or -0.185° of LM elevation and -2.767° of S elevation (mid grey columns) and 5° of elevation (dark grey columns). 1 staircase was excluded from each of the chromatic blur combined with sharp luminance conditions due to a lack of convergence. Error bars represent ±1 standard error.

3. References