

Introduction

The study of adaptation commonly requires **asymmetric matches**, where the test and comparison stimuli are viewed in obviously different contexts. This makes matching difficult.

To eliminate this subjective component, Whittle and others have use haploscopic displays in which the different backgrounds of the test and comparison stimuli are binocularly fused.

We have been exploring an alternative technique that can **eliminate the subjective component** to investigate the dynamics and quantitative properties of visual adaptation.

This technique can also be used to **estimate the effect of the subjective component** on matches.

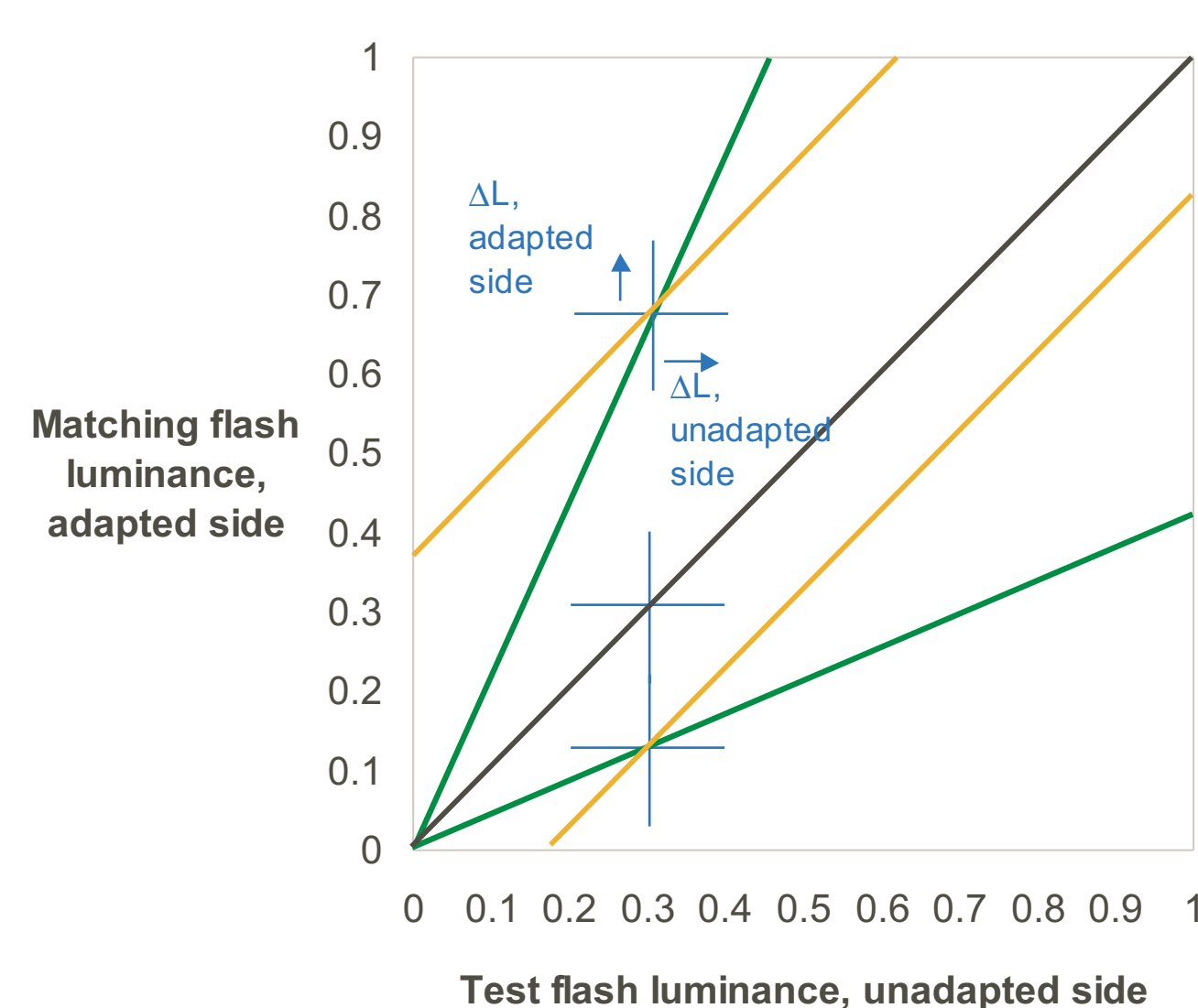
Methods

Our incremental or decremental adapting 'blob' has a broad **Gaussian spatial profile**, embedded in a uniform surround, left or right of the fixation point.

Under steady fixation, the blobs **fade completely** over several seconds, creating a subjectively uniform field in which we present two similarly profiled incremental or decremental flashes (< 50 ms): one flash superimposed on the adapting field, and the other superimposed on the uniform surround.

Phenomenally, test and comparison **flashes appear against the same surround**, despite their physically different adapting conditions. Unlike typical asymmetric matches, the matches are subjectively unambiguous.

Predictions:



- equal ratios match
 $L_{match}/L_{adapt} = L_{test}/L_0$
- equal luminances match
 $L_{adapted} = L_{unadapted}$
- equal steps match
 $\Delta L_{adapted} = \Delta L_{unadapted}$

Afterimage Appearance and Adaptation

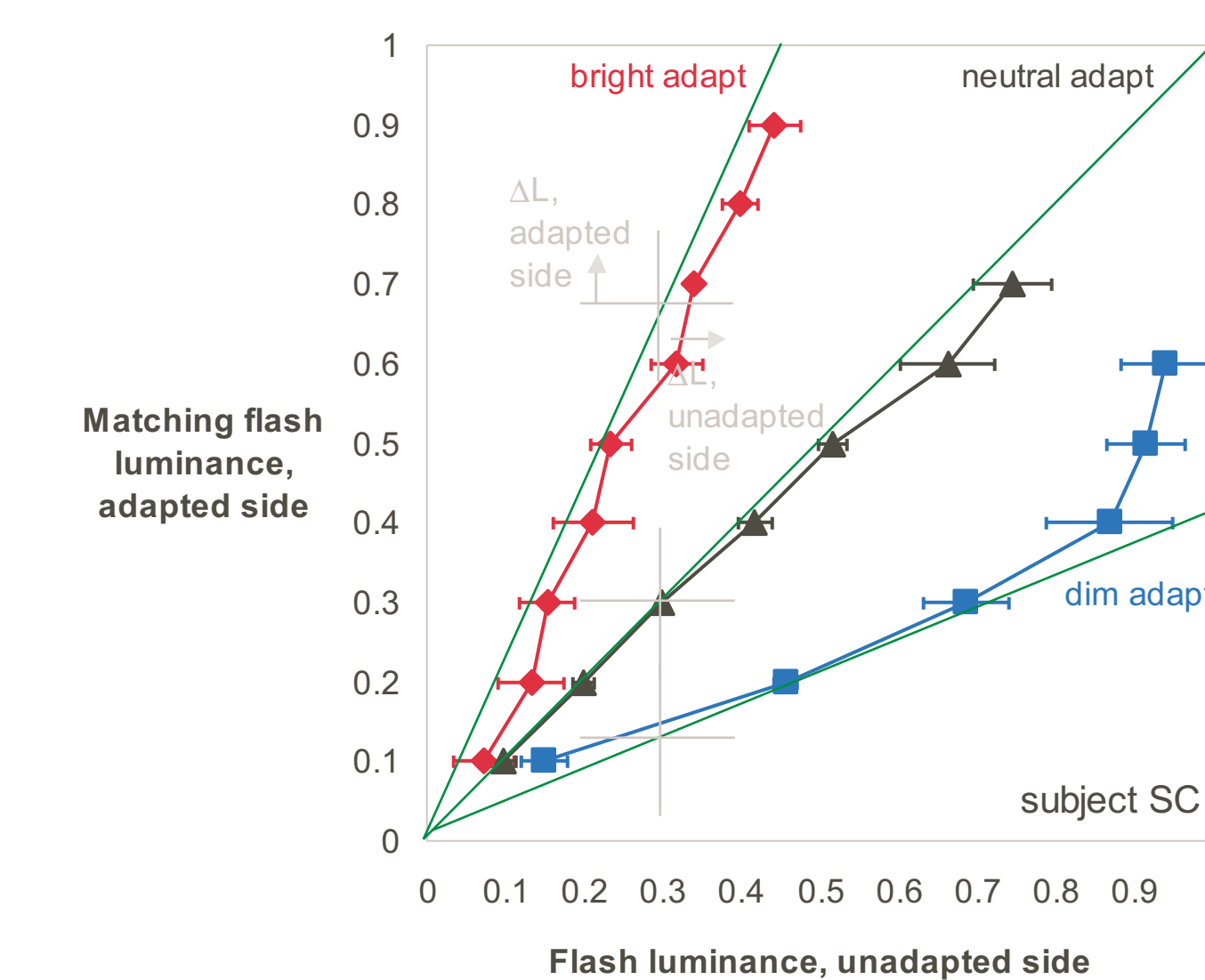
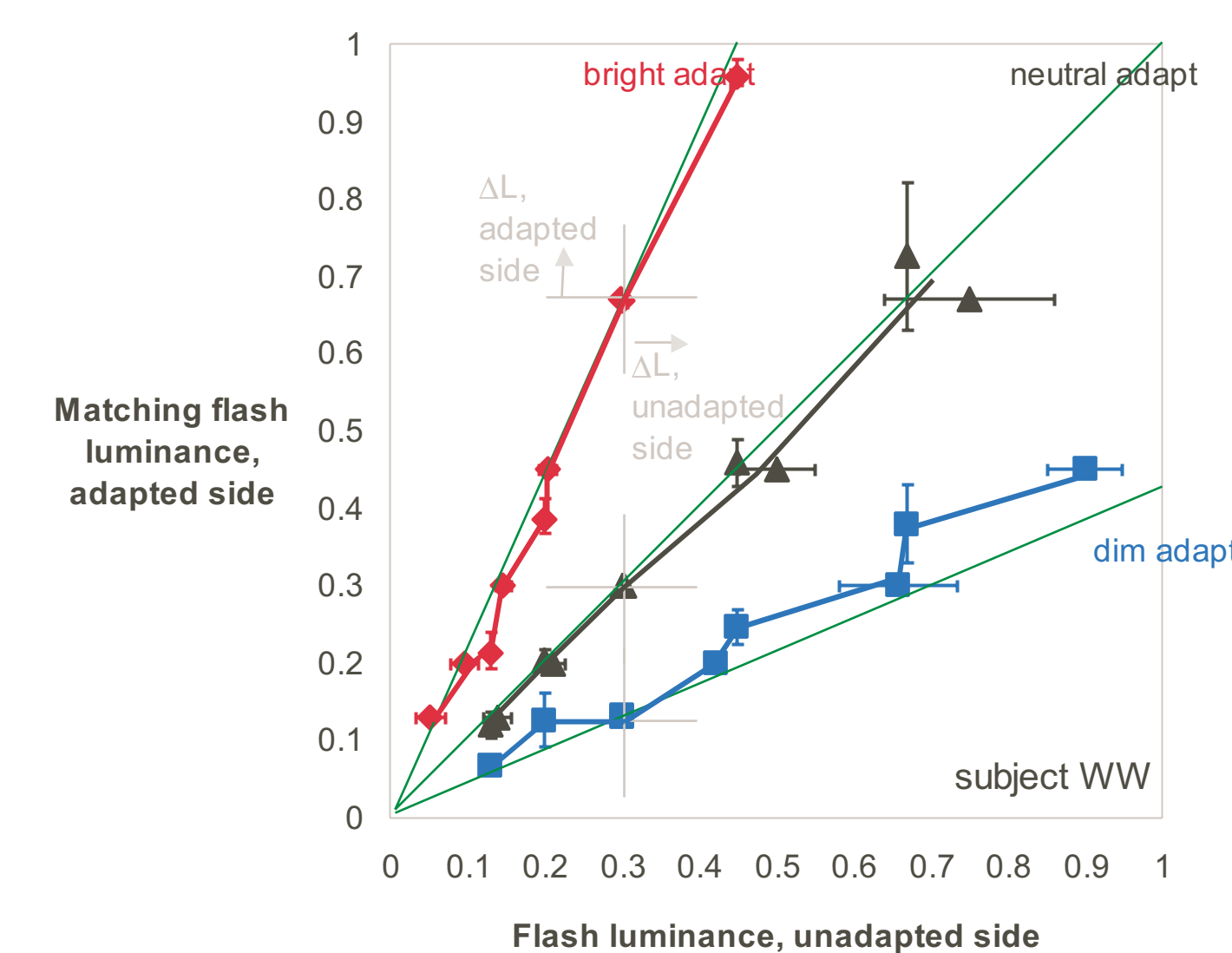
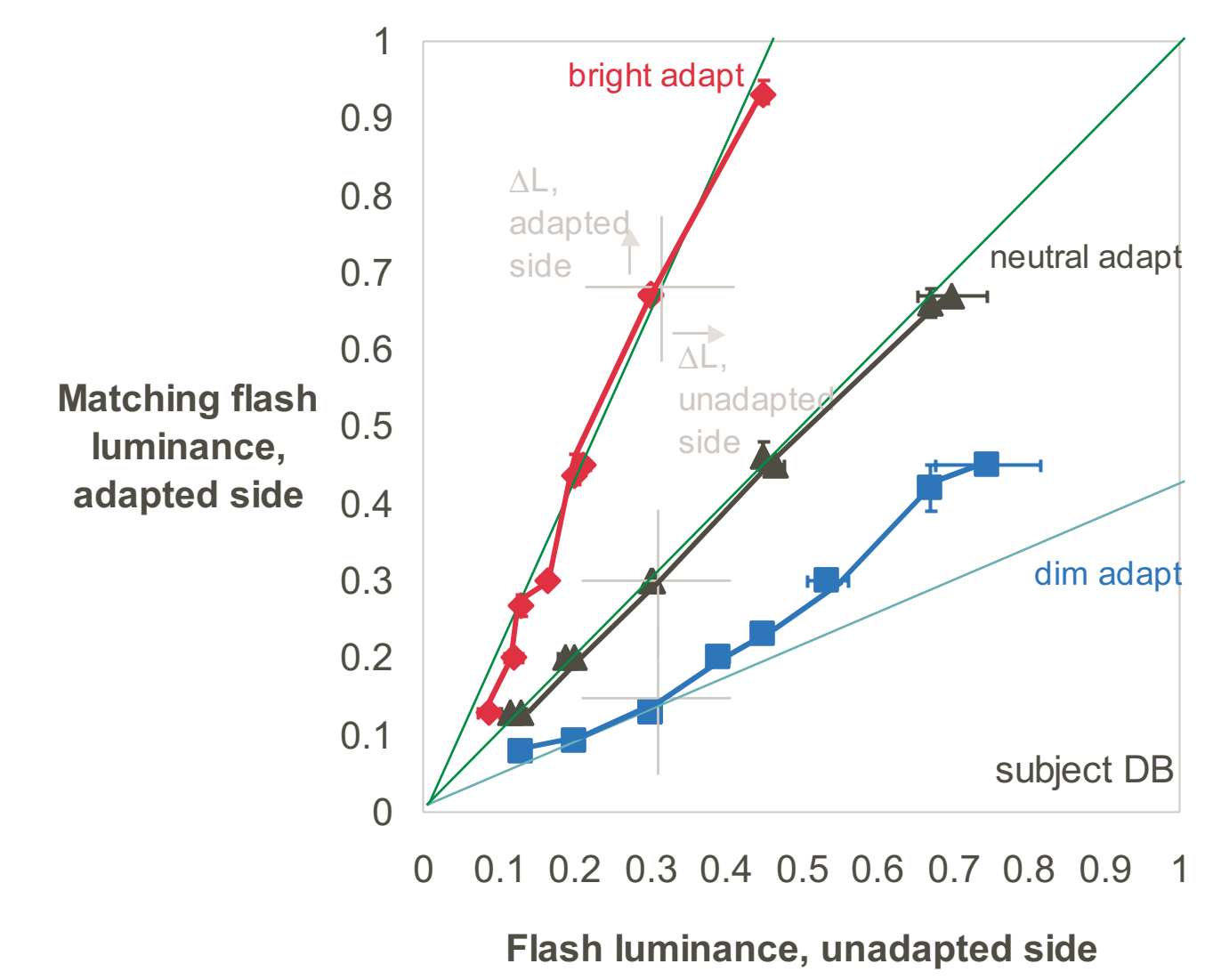
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Experiment 1:

Matches after complete fading

The flash increment (or decrement) needed to make a match is determined by the adapting blob's luminance, not its appearance (**the adapting blob is invisible**).

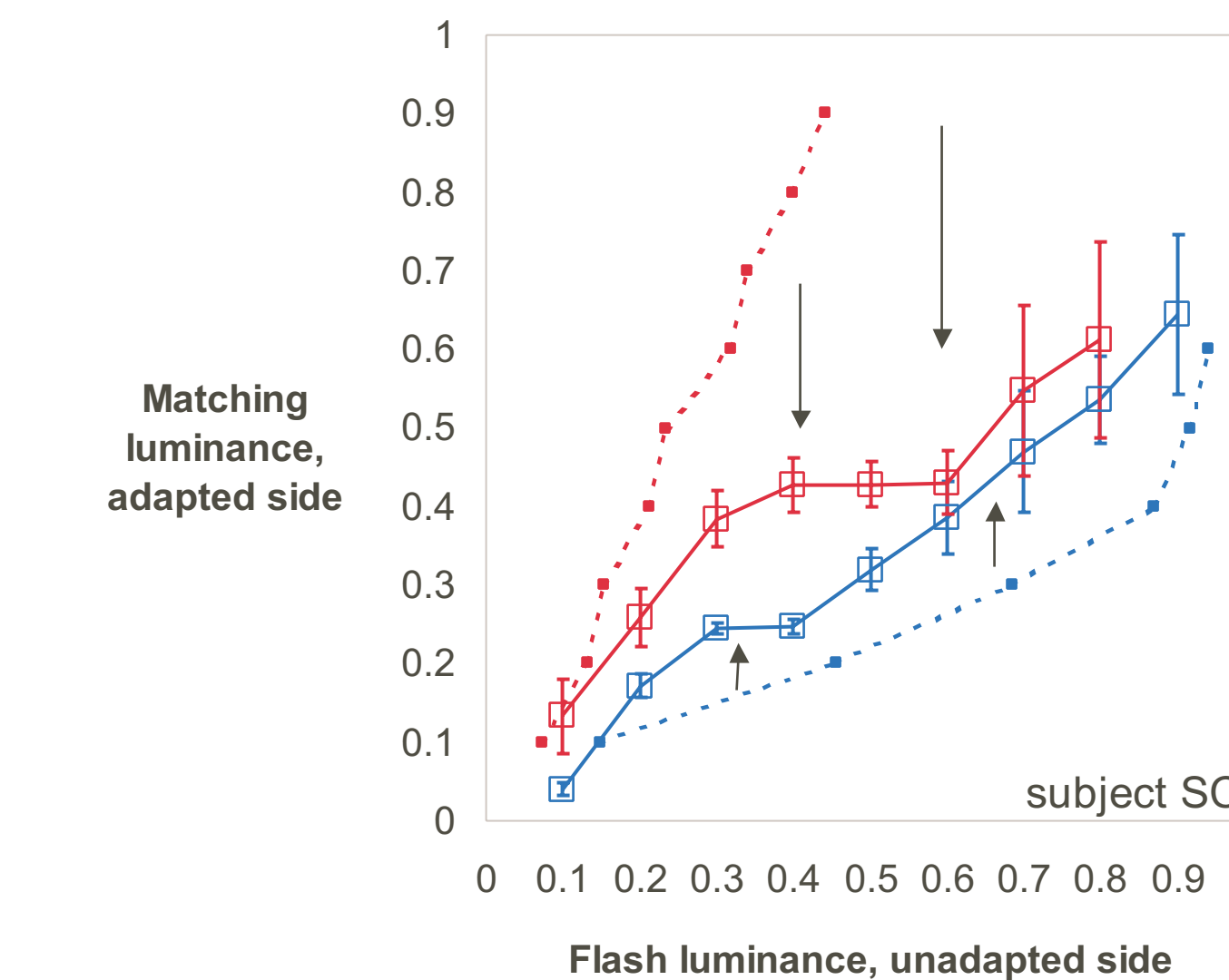
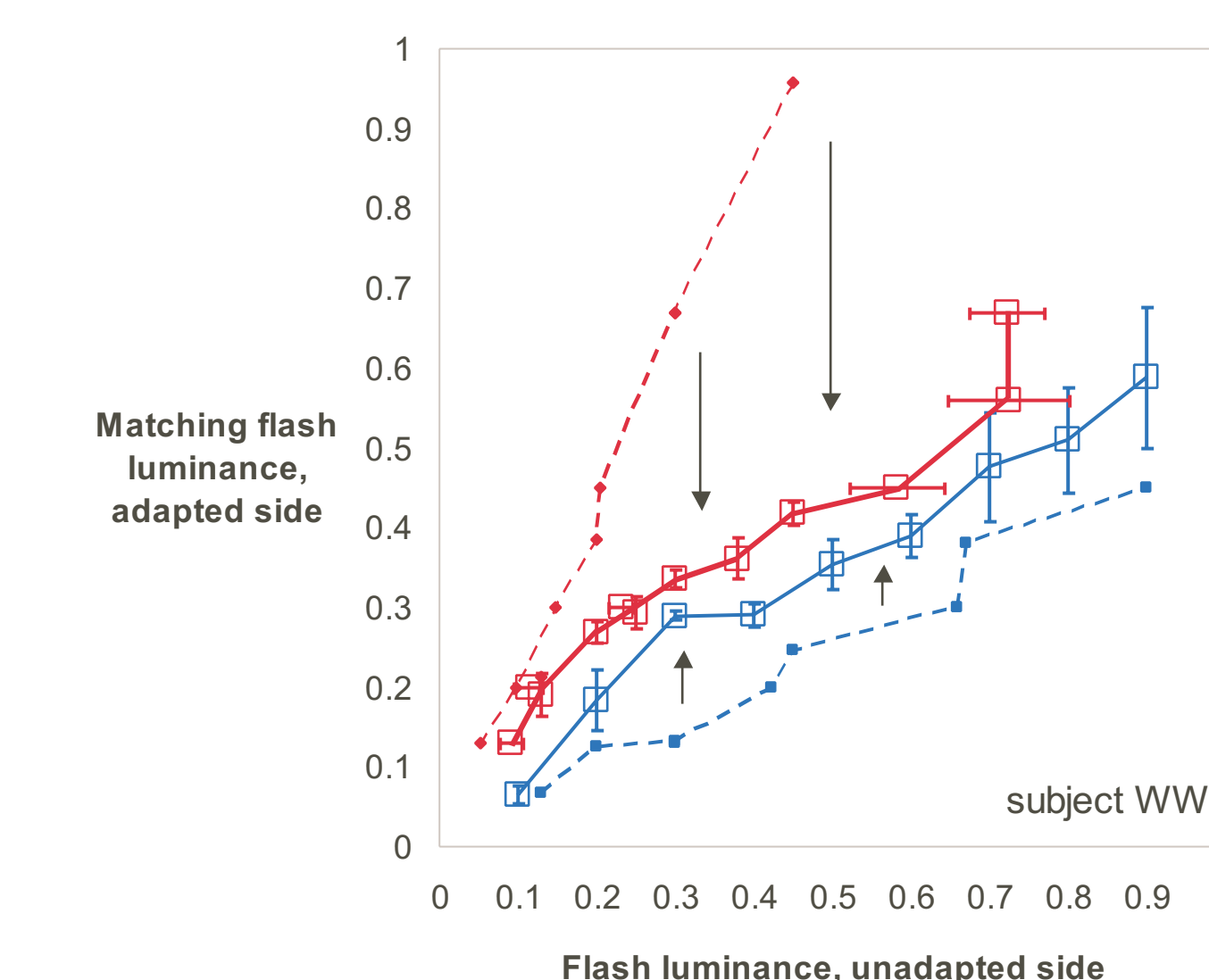
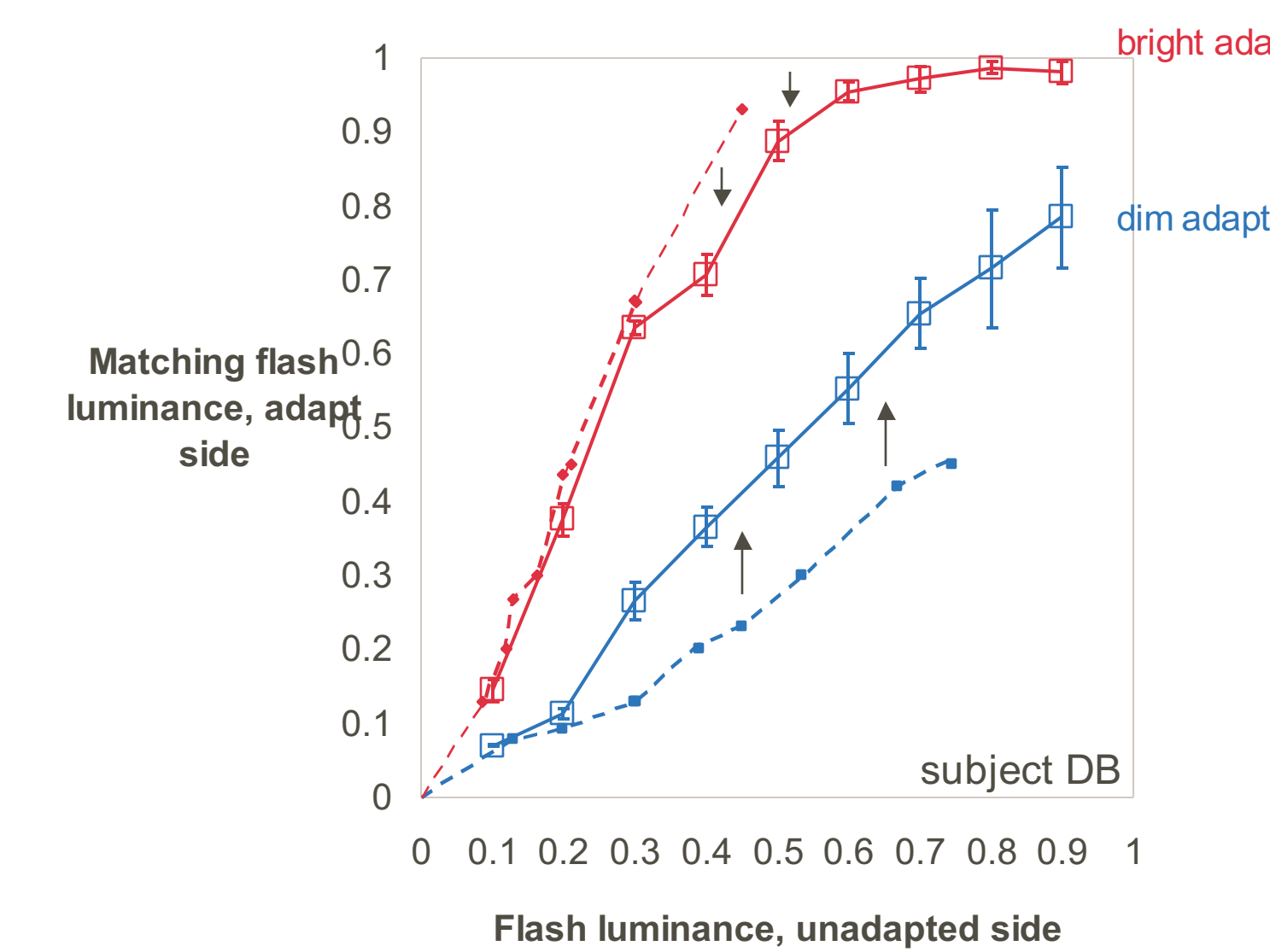
After complete fading, brief increment or decrement test flashes match in brightness when they are the **same multiple of their respective adapting luminances**:



Matches with a perceptible luminance pedestal

When matches are made **before the slow fading process is complete** (750ms after onset of adapting blob), the test stimuli assume a brightness that is not strictly determined by the incremental or decremental temporal transient.

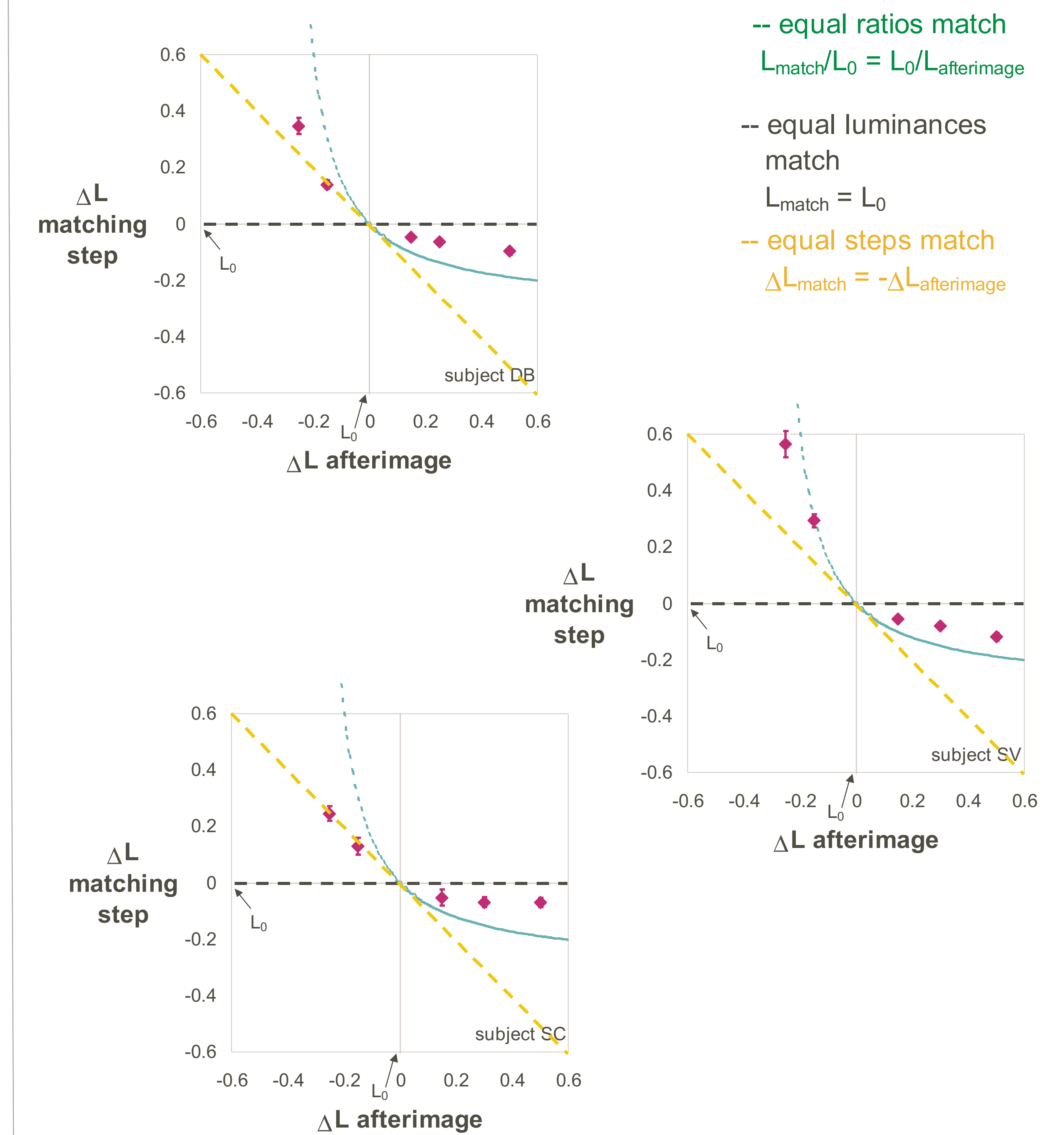
Matches are no longer on a subjectively uniform surround and are more variable -- they reflect a **contribution of the slowly fading subjective brightness** of the adapting blobs to flash brightness.



Experiment 2:

Matching full afterimages

We generated afterimages of increment or decrement blobs. Subjects **matched brightness of the full afterimages** with a physical luminance step presented simultaneously on the other side of fixation.



Conclusions

- * Appearance of short flashes on an invisible blob is determined by the ratio of $\Delta L/L$.
- * Brightness of short flashes on a visible blob is boosted (or diminished) by superposition on the bright (or dark) pedestal, but the effect varies from subject to subject.
- * Afterimages were not matched by what would be predicted by equal luminance ratios, but by something between equal ratio and equal luminance settings.