

Preference Asymmetries for Color Pairs: Image-based vs. Surface-based Area

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Background

General Question:

Does the spatial organization of colors influence preference for color pairs? If so, what are the relevant color and spatial factors?

Itten (1973) theorized that colors should be combined such that the ratio of their areas is inversely proportional to the ratio of their "intensities" (Goethe, 1810):

Color	Intensity	Red and green equally intense	Orange more intense than blue	Yellow much more intense than violet
Yellow	9			
Orange	8			
Red	6			
Green	6			
Blue	4			
Violet	3			

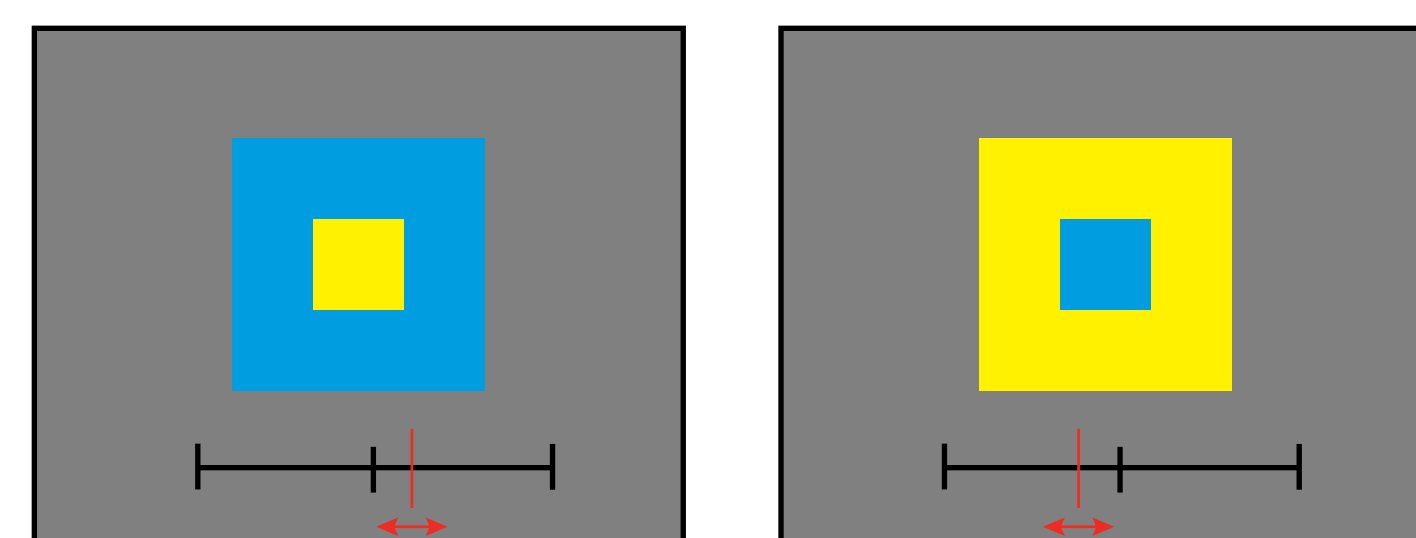
"Intensities" correspond more to yellowness/blueness ($r = .88$) than to lightness/darkness ($r = .52$).

"Intensity:" $6 \quad 6$ $4 \quad 8$ $3 \quad 9$
Spatial Ratio: $1 \quad 1$ $1 \quad 2$ $1 \quad 3$

Schloss and Palmer (2011) provided (weak) evidence for preference asymmetries:

Preference asymmetry:

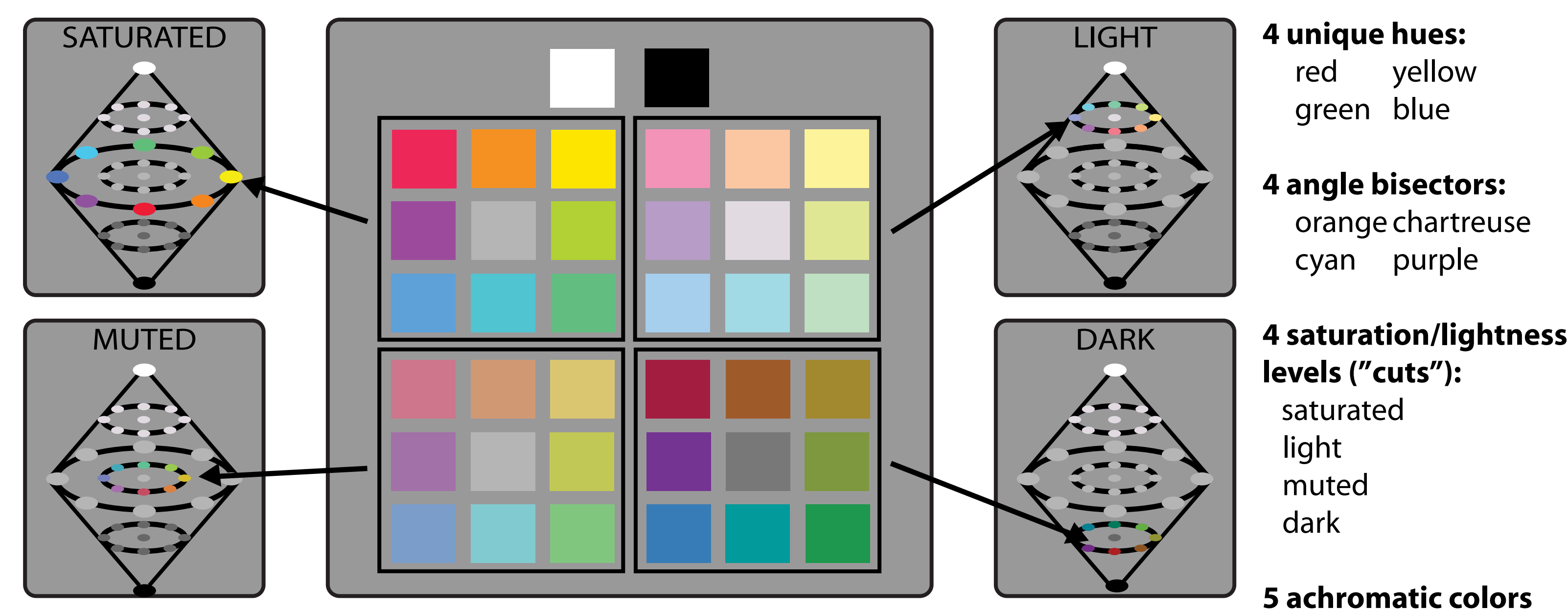
Greater preference for one color pair over another pair, when the two pairs only differ in the spatial assignment of the colors.



People prefer warmer, lighter figures on cooler, darker grounds, but only 4% of the variance in pair preferences was explained by these two factors.

Are these robust differences? What factors influence them?

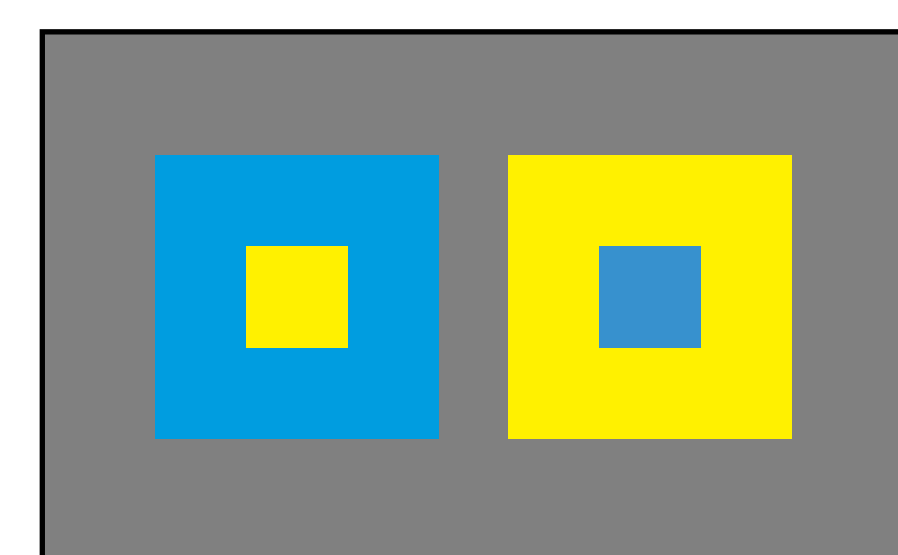
Berkeley Color Project (BCP) 37



Preference Asymmetries in Figure-Ground Pairs

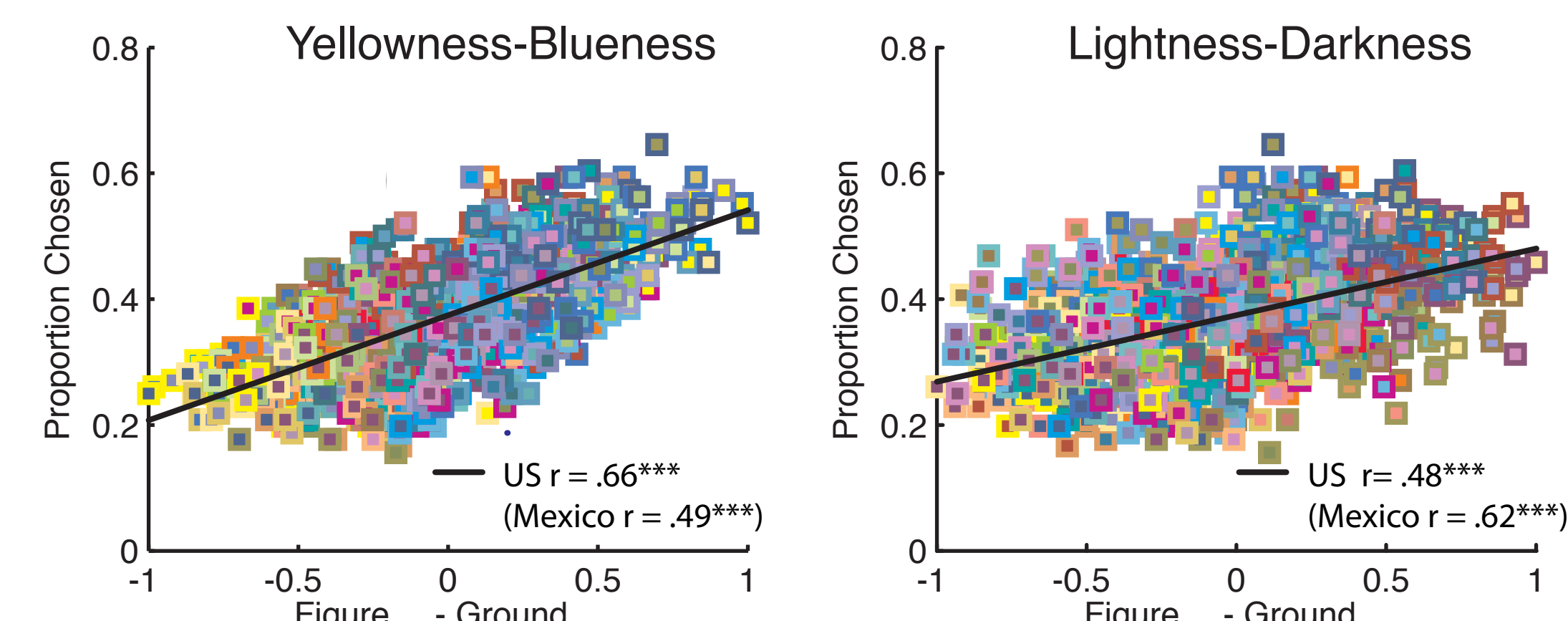
Are preference asymmetries robust? Preference for yellower, lighter figures on bluer, darker grounds:

Displays:
Two pairs containing the same colors in opposite figure-ground arrangements.



Task: Which pair do you prefer?

Tested all 992 pairs of BCP-32 chromatic colors



Do people prefer the larger ground to be the color they like better?
After accounting for component color preference (29% explained), people prefer lighter (+22% explained), yellower (+9% explained) figures on bluer, darker grounds.

Effects of Relative Area on Preference Asymmetries

What type of area is more important?

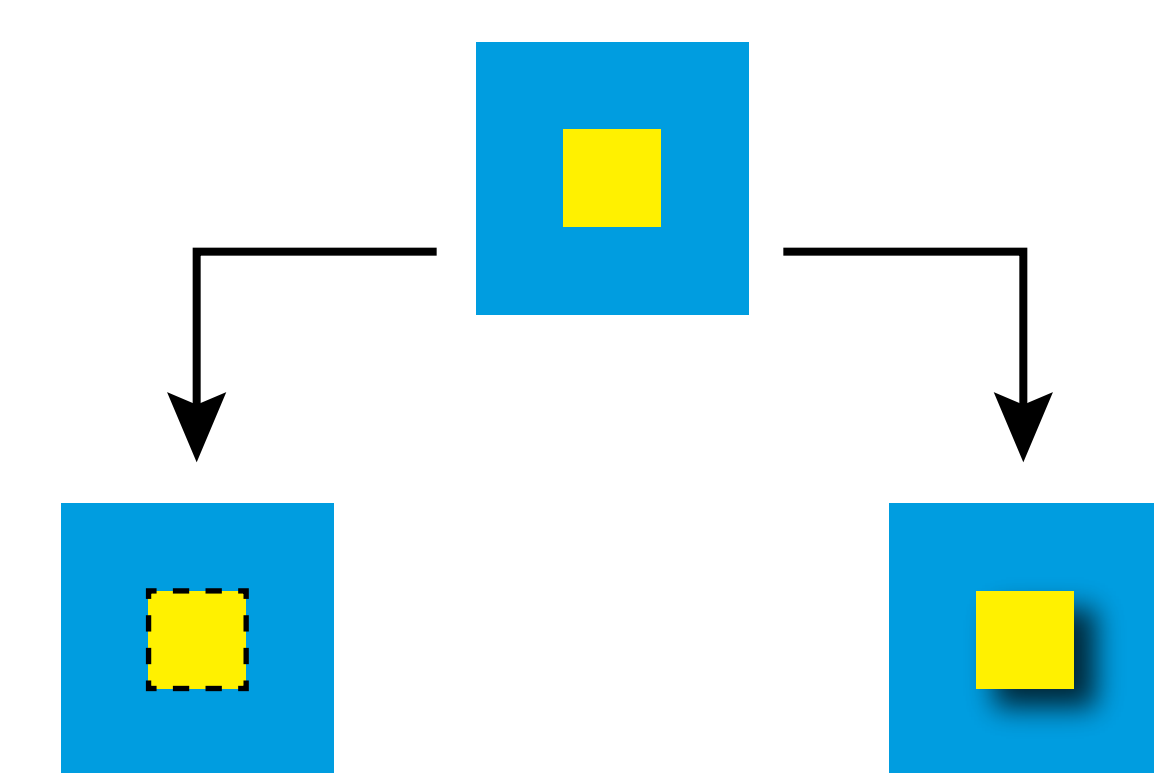
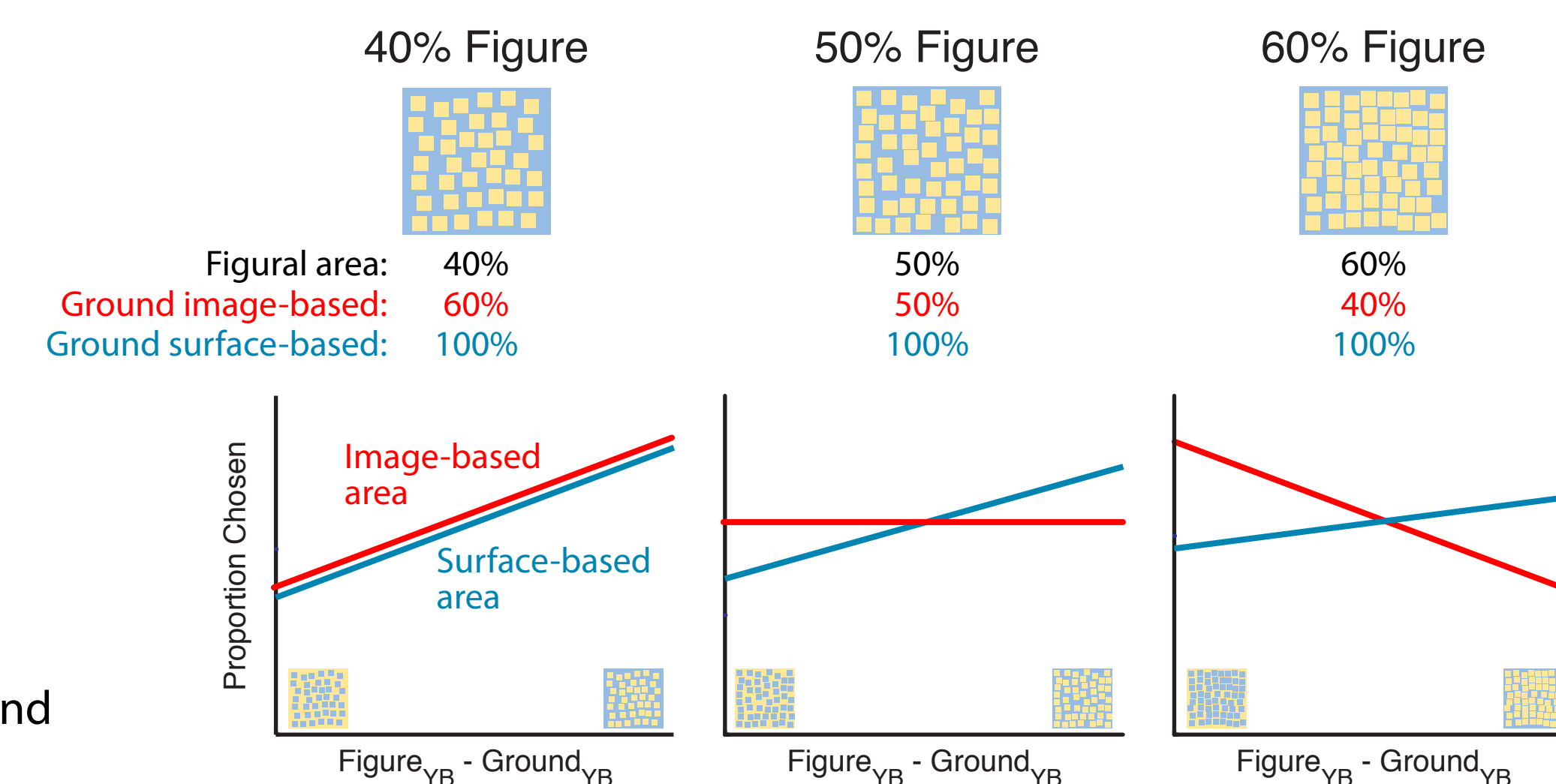
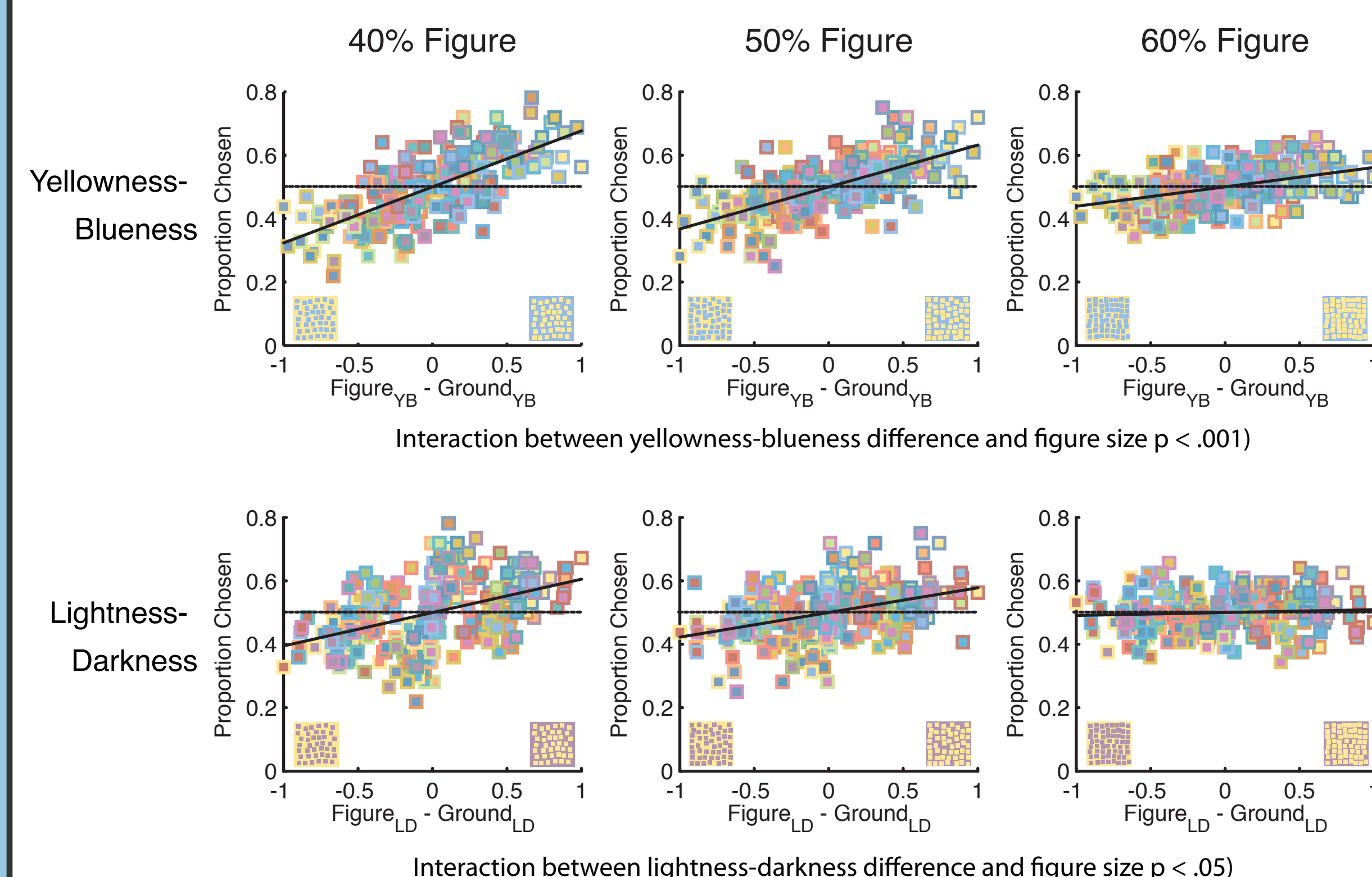


Image-based area: size of the 2D regions projected onto the retina
Surface-based area: region sizes after the ground is amodally completed

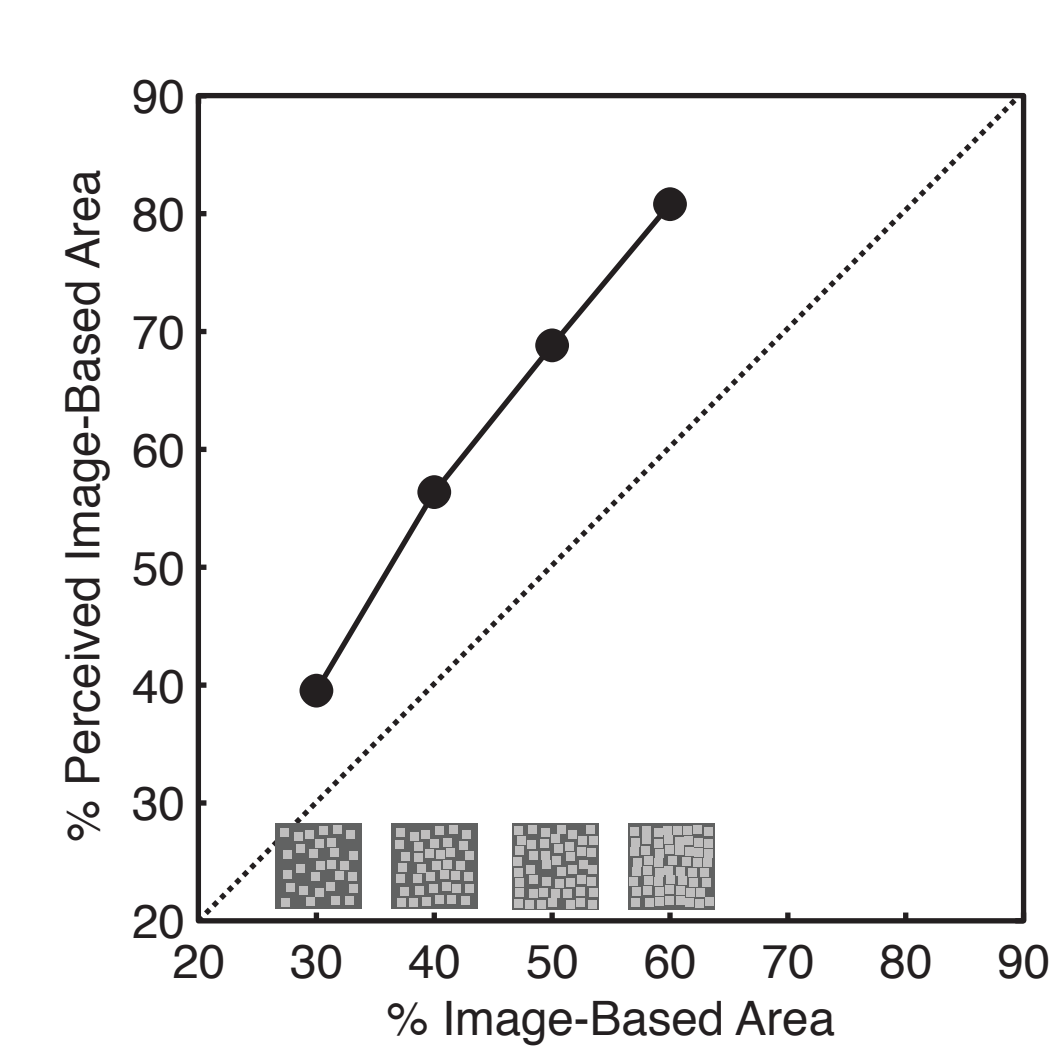
Predictions of Image-based vs. Surface-based area



Preference asymmetries depend on relative area after the ground is amodally completed behind the figure.



Do people underestimate the size of the figure?



Do people choose the pair in which the yellower figure appears to occupy less image-based area?

No, the figure size is overestimated ($p < .001$).

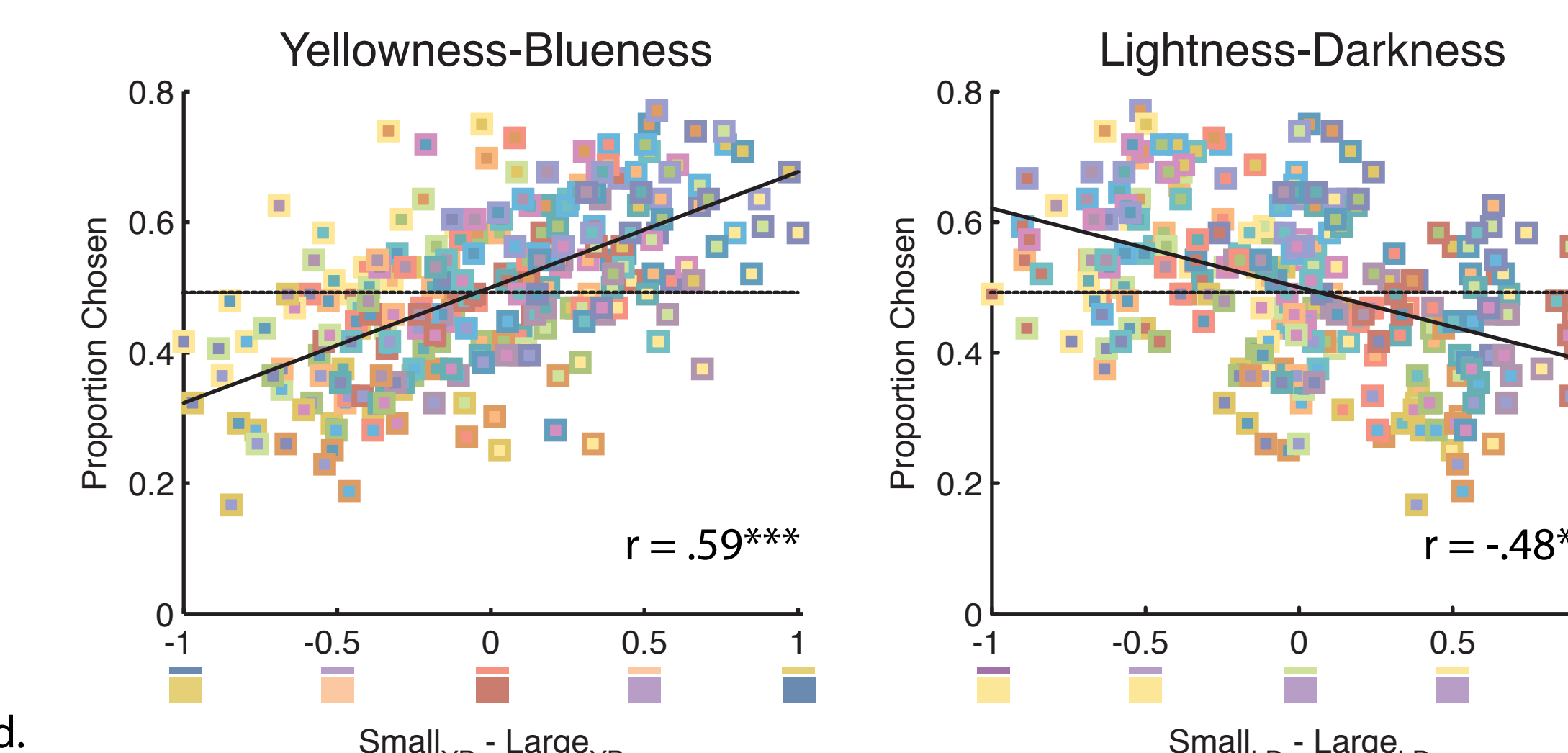
Effects of Area for Mosaic Configurations

Is surroundedness required for preference asymmetries?



Top-large/bottom-small vs. top-small/bottom-large had no effect so data are averaged.

Preference for yellower, darker small regions with bluer, lighter large regions:



Summary and Conclusions

Summary

Preference asymmetries exist: people prefer pairs with yellower, lighter figures on bluer, darker grounds.

Preference asymmetries operate on surface-based representations, after amodal completion.

Surroundedness does not influence the yellowness-blueness effect. However, it modulates the lightness-darkness effect:

Figure-ground: preference for lighter figures on darker grounds
Mosaic: preference for darker, smaller regions next to lighter, larger regions

Possible Explanations

Phenomenological: More "intense" regions need to be smaller for pairs to feel balanced, and yellower regions are more intense (Itten, 1973).

Ecological: Pairs that are associated with positive things in the world are more preferred (Ecological Valence Theory: Palmer & Schloss, 2010), and yellower, lighter figures on darker bluer grounds are reminiscent of the sun in the sky.

Current research testing how shape modulates preference asymmetries suggests that introducing "sun-like" imagery makes the previously irrelevant redness-greenness dimension become important.

References and Acknowledgments

Goethe, J.W. (1970). *Theory of Colors*. Translated by C. L. Eastlake (1840) from German edition "Farbenlehre" of 1810. Introduction by D. B. Judd. Cambridge: MIT Press.
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