

Exploring Aesthetic Principles of Spatial Composition Through Stock Photography

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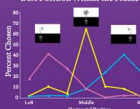
Background

Previous aesthetics research has shown two biases that affect people's aesthetic judgments of spatial compositions (Palmer, Gardner & Wickens, in press):

Center bias: pictures are preferred when their focal object is placed near the horizontal center of the frame

Inward bias: pictures are preferred when their focal object is facing into rather than out of the frame.

Best Position Within the Frame



Participants used a mouse to drag objects horizontally across a rectangular frame, and clicked when the object was at the most aesthetically pleasing position.

Other 2AFC designs with similar displays replicate these findings as well.

Research Questions

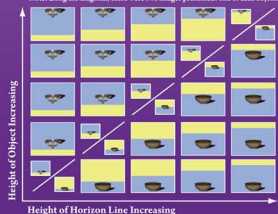
- 1) Do the center and inward biases exist in the vertical dimension?
- 2) Do these biases also exist in naturalistic images (e.g., stock photography)?

Vertical Dimension: Experimental Design

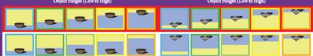
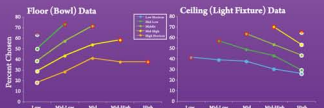
Vertical positions of the object and the horizon line were systematically varied (object depended on the plane of attachment).

2AFC comparisons were made between two pictures of the same object (both on the floor or both on the ceiling).

Notes: along the diagonal, there were two images presented: one of each object.



Vertical Dimension: Results



- 1) Most preferred pictures depict the object and horizon at the same height.
- 2) Objects on the floor are most preferred somewhat below the center of the frame.
- 3) Objects on the ceiling are preferred somewhat above the center of the frame.

Findings 2 and 3 replicate the center and inward biases in the vertical dimension that were previously found in the horizontal dimension.

Stock Photography: Experimental Design

Dataset: 325 natural images in the Corel image database (a large collection of stock photography and clip art images).

Each image had previously been segmented into discrete regions by 5 people (Martin, Fowlkes, Tal & Malik, 2001).



Procedure

- 1) For each photograph, participants were asked to state the number of *focal objects* (an object "without which the photograph would not be worth taking").
- 2) One- and two-object images were later presented again, and participants clicked on the "center of the visible portion of each focal object."
- 3) Objects were determined from participants' center judgments and the discrete regions comprising those objects were utilized for further analyses.



Original Image



Utilized images (green outlines are discrete regions and shading denotes unutilized regions)

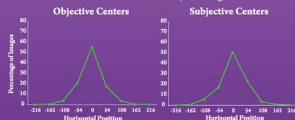
Object Centers: Three Kinds



Note: the distributions of bounding box centers and geometric centers were analyzed with a two-tailed Kolmogorov-Smirnov test and found not to differ significantly from each other. Thus, in subsequent analyses and graphs, only data from the bounding box center is presented.

Stock Photography: Results

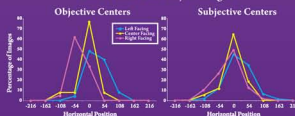
Center Bias: One-Object Images



Note: Images were normalized for orientation, such that every image was 480x320.

Center bias has a very strong presence in the distributions of both objective and subjective centers.

Inward Bias: One-Object Images



Note: Every image was normalized to be 480 x 320 pixels

Inward bias is present in both distributions, and is stronger for objective than for subjective centers.

Conclusions

Center and inward biases appear in the vertical dimension of spatial composition.

The center bias and the inward bias appear robustly in images that are more naturalistic than those previously studied.

Perhaps the inward bias reflects a center bias, but for subjective centers of objects.

Future Directions

Increase the number of stock photography images analyzed
 Analyze two-object photos and biases in the vertical dimension
 Analyze fine-art photography
 Explore the centrality of subjective center judgments

References

Martin, D., Fowlkes, C., Tal, D., Malik, J. (2001). A Database of Human Segmented Natural Images and its Application to Evaluating Segmentation Algorithms and Measuring Ecological Statistics. International Conference on Computer Vision, Vancouver.
 Palmer, S.E., Gardner, J.S., Wickens, T.D. (in press). Aesthetic Issues in Spatial Composition: Effects of Position and Direction on Framing Single Objects. *Spatial Vision*.

Acknowledgements

All 2AFC displays were created in Adobe Photoshop CS3, and experiments were run in Presentation. For photography experiments, participants' responses were collected in Presentation, and data were analyzed in Matlab. Thanks to Joseph Astorwell for assistance with Matlab coding.