

# Testing an adaptive explanation for sex differences in color preference using online photo collections

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## Background

Are there sex differences in color preferences, and, if so, where do those sex differences come from – enculturation or evolution? Past studies have worked with small samples of participants asked to make explicit decisions with limited stimuli consisting of blocks of single colors.

- Palmer and Schloss (2010) argued that color preferences can be explained in terms of object preferences and associations between objects and colors, which can be influenced by evolution, culture, and individual experience. This though leaves open the question of sex differences.

- Hurlbert and Ling (2007) found a cross-cultural female preference for reddish hues. They give an evolutionary explanation related to the proposed ancestral sexual division of labor for this sex difference, arguing that a cross-cultural female preference for red arises from the adaptive benefit to foraging females of seeking out a red object on a green background (e.g., fruit against leaves).

## Our approach

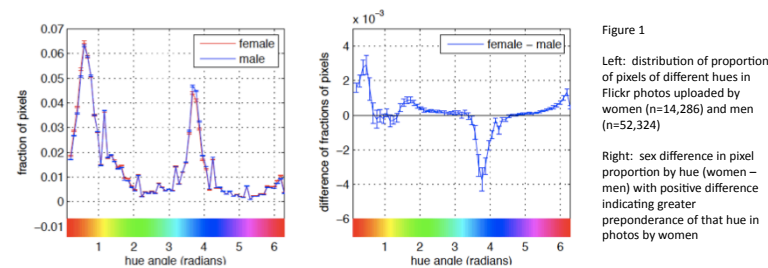
We propose a novel approach for studying color preference using the online photo-sharing network Flickr. By analyzing the color spectra of photos that users choose to upload, we can assess color preferences in an implicit (behavior-based) rather than explicit (ratings-based) manner and on a much larger scale than can be done in a lab experiment.

## Method

Sample: 91,000+ users; 23 million+ photographs

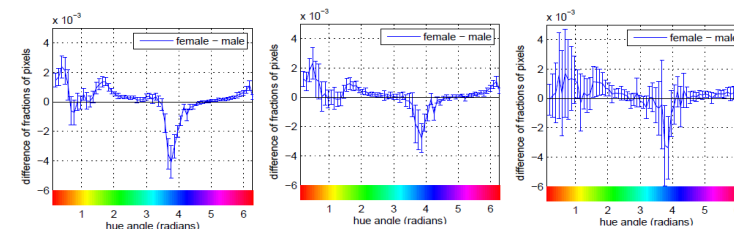
- Each photo is first converted into an individual histogram of the distribution of pixels over hue angle.
- Using a large number of photos from a given user, we compute a combined histogram.
- We then take the histograms for many users from a particular population of interest (e.g., male users) and combine them into a single aggregated histogram which can be compared with the histograms of other populations of interest (e.g., female users).

## Sex differences

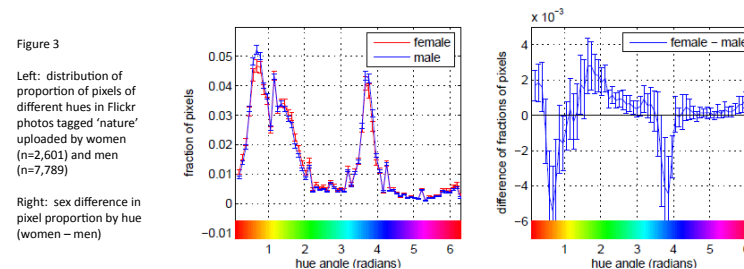


Our preliminary results indicate strong overall sex differences for the predominant reddish and blueish hues, with women uploading more photos with more reddish pixels and men uploading more photos with more blueish pixels (Figure 1).

This same sex difference in hue distribution occurs in several geographical subsets (e.g., US/Canada, Europe, Asia) (Figure 2) indicating its cross-cultural relevance.



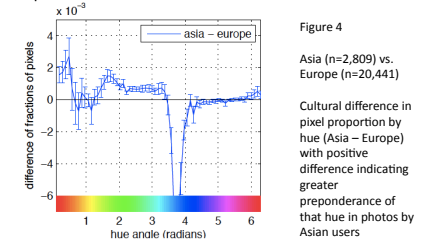
In certain content categories, such as ‘nature’ photographs, additional reliable sex differences in hue distribution occur. Specifically, women upload more photos with more greenish pixels (as well as reddish), while men upload more photos with more yellowish pixels (as well as blueish) (Figure 3).



## Cultural differences

A regular pattern emerges across comparisons: reddish preponderance is found with (lesser) greenish pixel preponderance, and blueish and yellowish pixel preponderance similarly go together.

The difference in hue distribution found between Asia and Europe mimics the sex differences.



- The same pattern of differences shows up between other pairs of regions as well, such as Europe and US/Canada, even controlling male/female numbers. This pattern may be attributable to background-contrast effects.

- This pattern is not seen in hue distribution differences between content tags, such as ‘winter’ and ‘sunset’, or when users are put into artificially created groups for comparison.

## Final thoughts

- Preliminary sex difference results seem to provide further evidence for a cross-cultural female preference for red (i.e., women upload more photos with more reddish and sometimes greenish pixels). Such a cross-cultural preference could have some adaptive benefit for foraging females seeking out reddish fruits among greenery.

- Men upload more photos with more blueish and sometimes yellowish pixels.

- Cultural variation also tended to follow a similar pattern of reddish and greenish pixel preponderance vs. yellowish and blueish pixel preponderance.

- Next steps include comparing photo hue distributions to background hue distributions captured via “life logging” cameras, and assessing sex differences in fractal dimension of photos.

Hurlbert, A.C., and Ling, Y. (2007). Biological components of sex differences in color preference. *Current Biology* 17 (16), 625-628.

Palmer, S.E., and Schloss, K.B. (2010). An ecological valence theory of human color preference. *PNAS* 107 (19), 8877-8882.