



# Exploring Cultural Differences in Spatial Frequency and Orientation Tunings for Face Perception

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## Introduction

Face processing differs across Western and East-Asian individuals, with East-Asians relying on lower spatial frequencies (SF) compared to Westerners<sup>1-2</sup>. However, heavy reliance on WEIRD (Western, Industrialized, Educated, Industrial, Rich) samples have made it hard to pinpoint the mechanistic causes of these differences. Here, we examine SF and, for the first time, spatial orientation (SO) tuning across 8 distinct cultural sub-samples.

## Method

- 587 participants recruited via Prolific, divided across 8 cultural regions<sup>3</sup>;
  - African countries (n = 70)
  - East Asia (n = 68)
  - Eastern Europe (n = 83)
  - English speaking countries (n = 63)
  - Latin America (n = 89)
  - Middle East (n=64)
  - Southern Asia (n=72)
  - Western Europe (n=78)
- Same/Different face matching task.
- Stimuli filtered with SFO Bubbles<sup>4</sup>
- Study run online using Vpixx Pack & Go<sup>5</sup>.

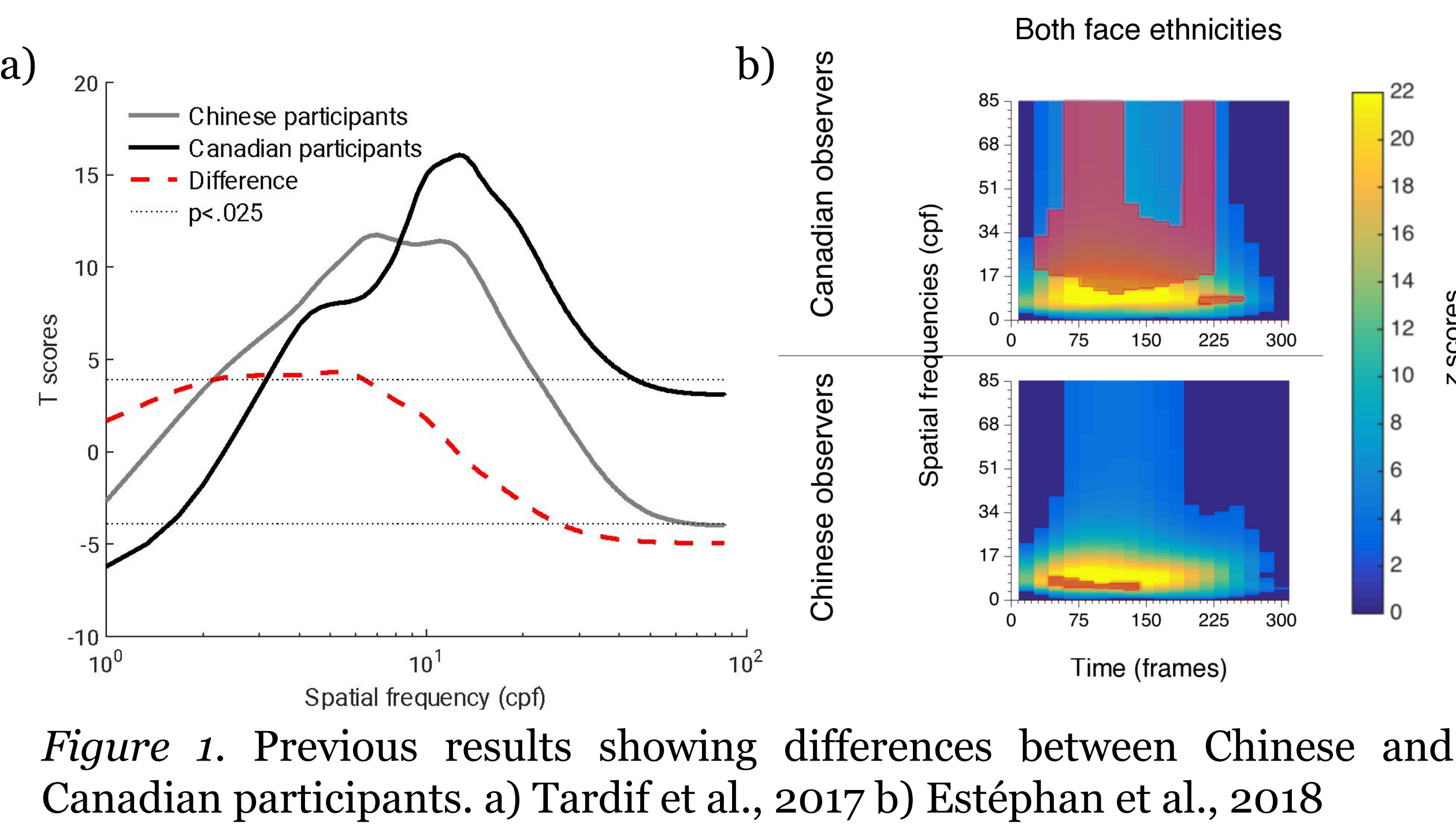


Figure 1. Previous results showing differences between Chinese and Canadian participants. a) Tardif et al., 2017 b) Estéphan et al., 2018

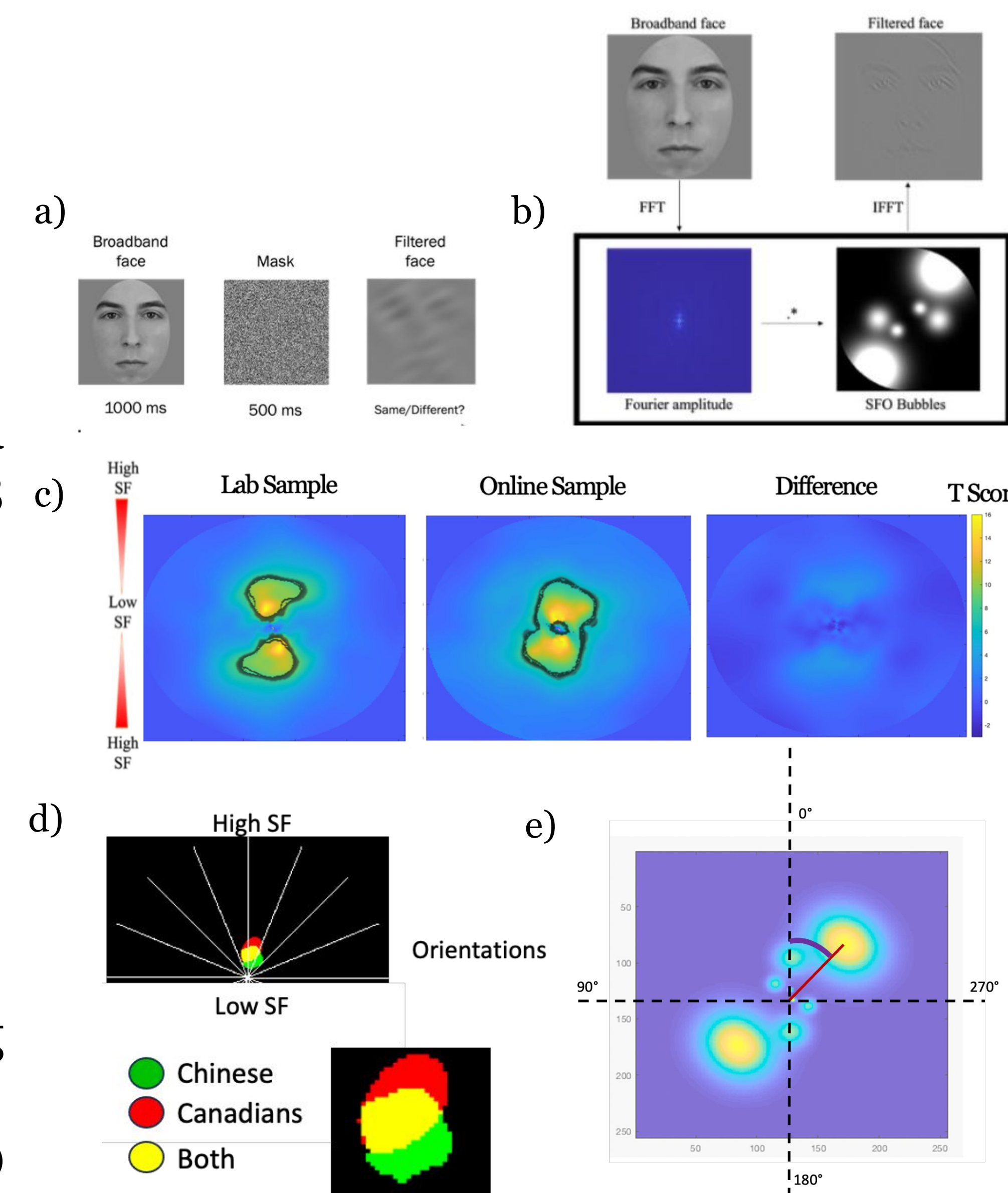


Figure 2. a) Experimental Task b) SFO bubbles method c) Comparing results between a lab and online sample, showing no differences. d) Comparison between a Chinese and a Canadian lab sample, replicating previous data. e) How to interpret SFO bubbles; the vector between the center and a specific pixel gives the frequency and orientation in Fourier space.

## Results

- Bayesian prevalence analyses<sup>6-7</sup> show that Latin Americans/Europeans tend to use higher SFs while Asians use lower SFs. English and African participants are tuned in between (Figure 3b).
- A significant difference is observed between Western and Eastern samples in regards to SO (Figure 3d).
- Middle-Eastern participants show two distinct profiles; some using higher SF and others using lower SF (Figure 3d).

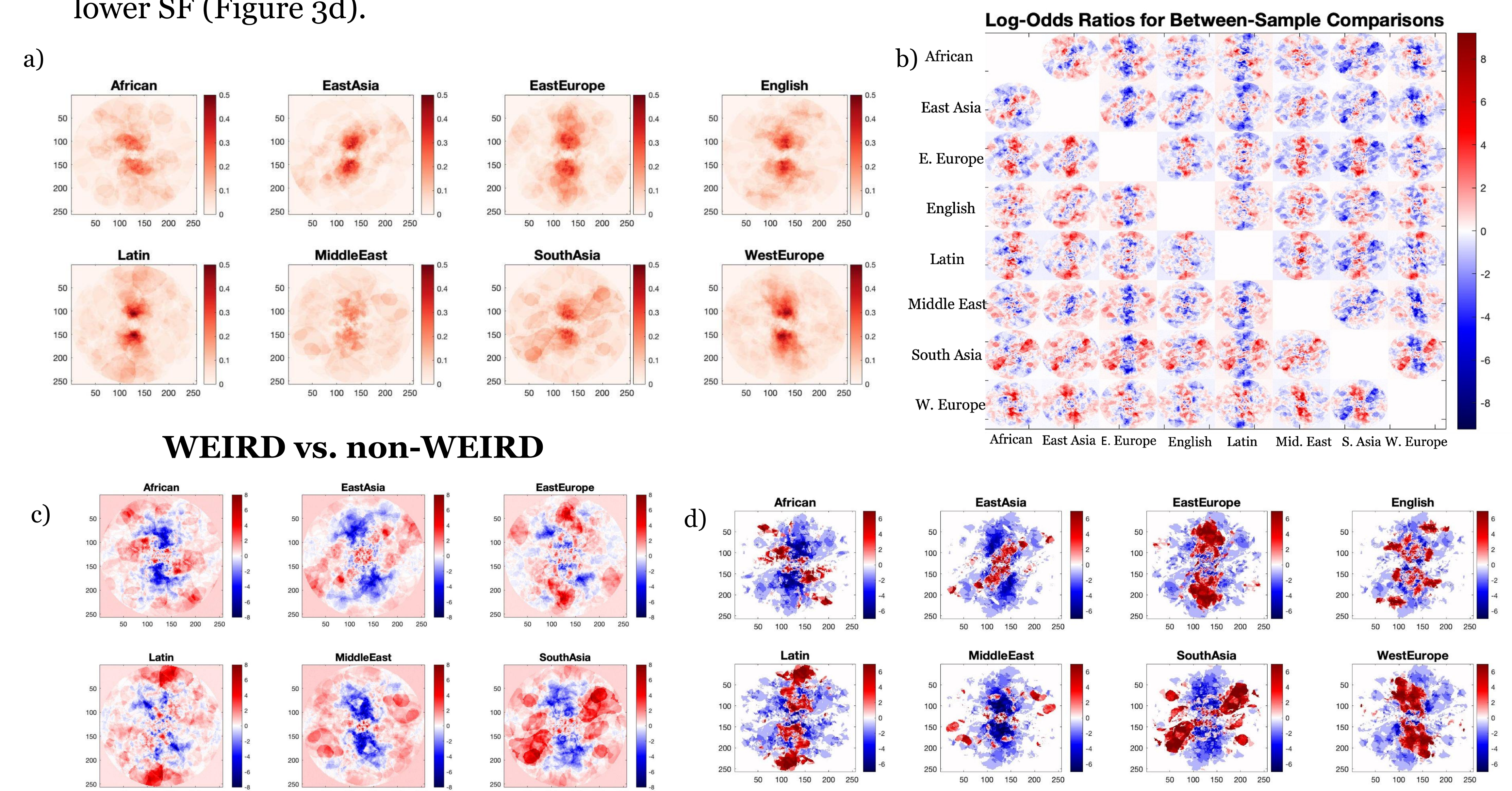


Figure 3. a) Bayesian prevalence; color bar shows the sample % using this frequency. b) Log-odds ratio of differences in prevalence for each pair of groups. c) Comparison between WEIRD/non-WEIRD samples. The WEIRD sample is a pool of English participants and Western Europeans d) Sum of significantly different prevalence across group comparisons. Red shows prevalence tends to be higher in the sample, blue shows prevalence tends to be lower.

## Conclusion

This study aimed to investigate SF and SO tunings across cultures to get a clearer picture of potential underlying mechanisms. While we find a common, seemingly universal pattern across all cultures (mid-range SF, horizontal SO), we found a preference for higher SF in Europe and Latin America, and lower SF in Asia. Our study is the first to show significant differences in SO tunings across cultures. For the next steps, we intend to explore specific cultural factors that could influence SFO tunings, as well as collect data in the Middle East to better understand the underlying mechanism behind these differences.

## References

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