

# DATA-DRIVEN APPROACH REVEALS UNIVERSAL PATTERNS IN COLOUR-EMOTION ASSOCIATIONS ACROSS 30 NATIONS

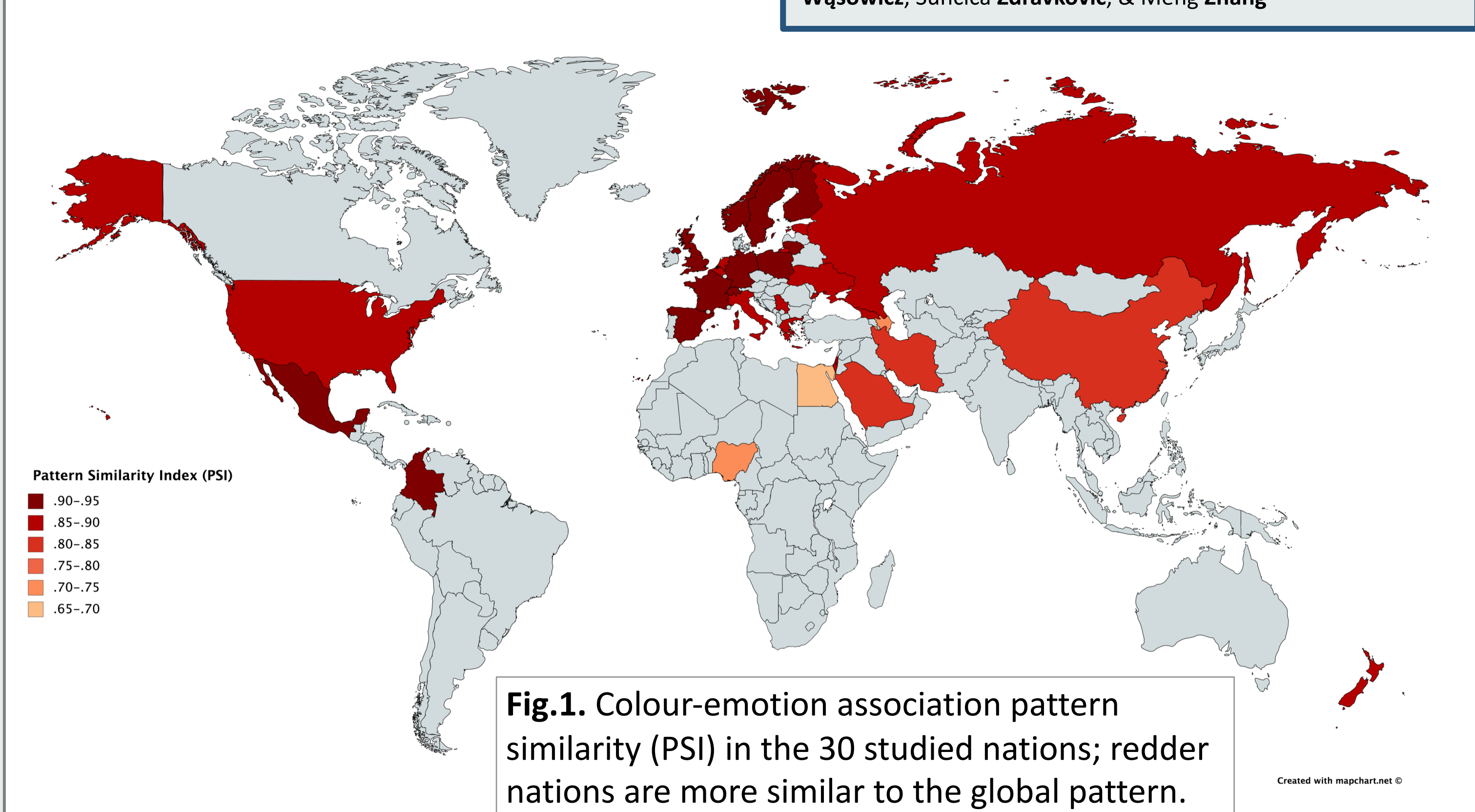
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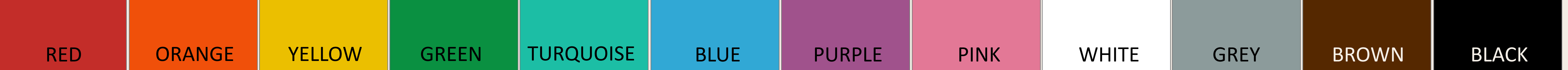
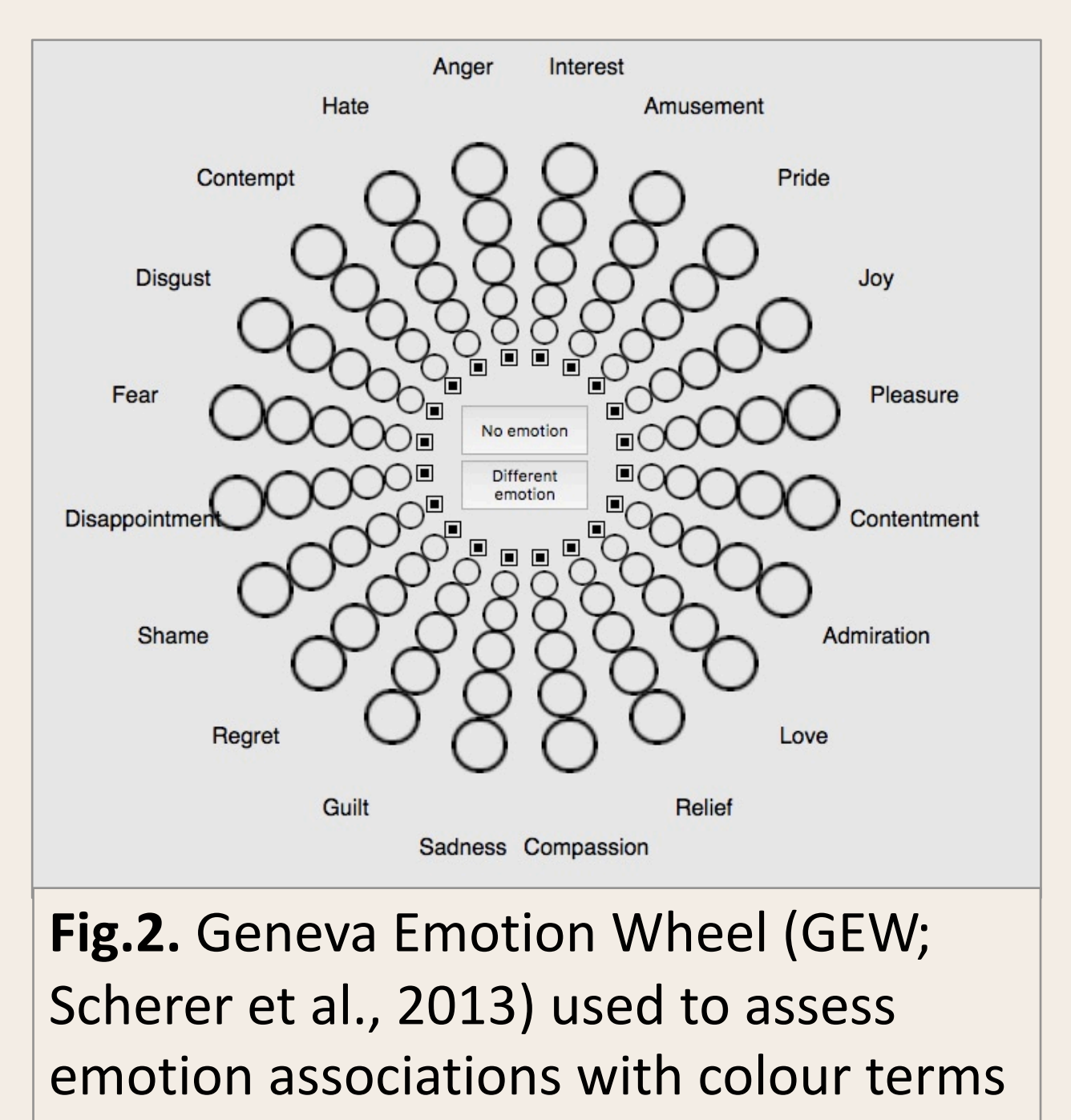
## INTRODUCTION

- Affective colour associations are ubiquitous (Palmer et al., 2013). If colour-emotion associations turn out to be universal, it would suggest that they are rooted in our shared environmental histories.
- Two views aim to explain colour-emotion associations:
  - Colour-emotion associations might arise through environmental experiences (e.g., angry red face) and be largely universal.
  - Colours and emotions may become arbitrarily associated in the language, history, religion, or folklore of one's culture and be culture-specific.
- Previous studies reported similarities (e.g., Adams & Osgood, 1973) and differences (e.g., Hupka et al., 1997) in colour-emotion associations.

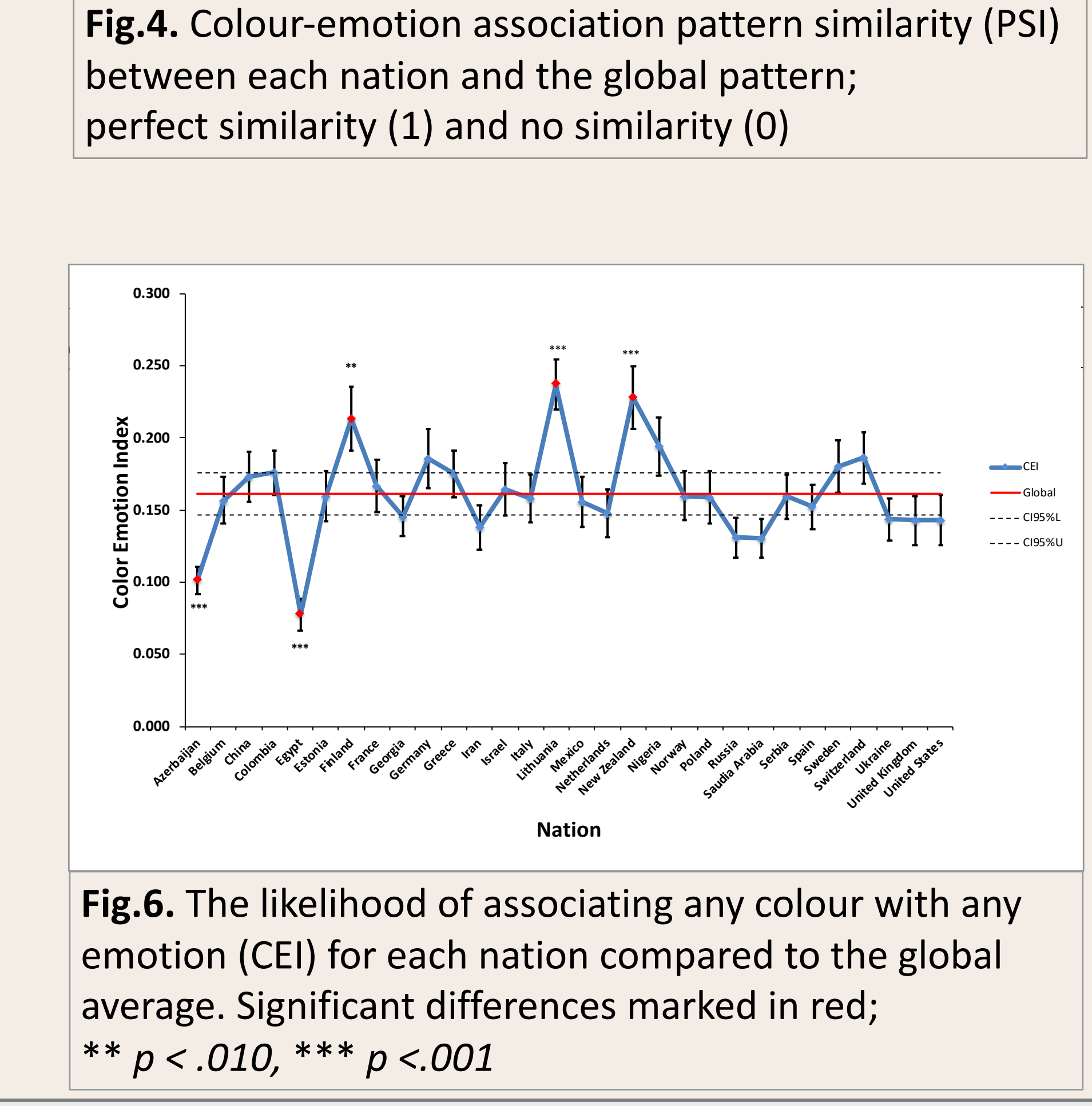
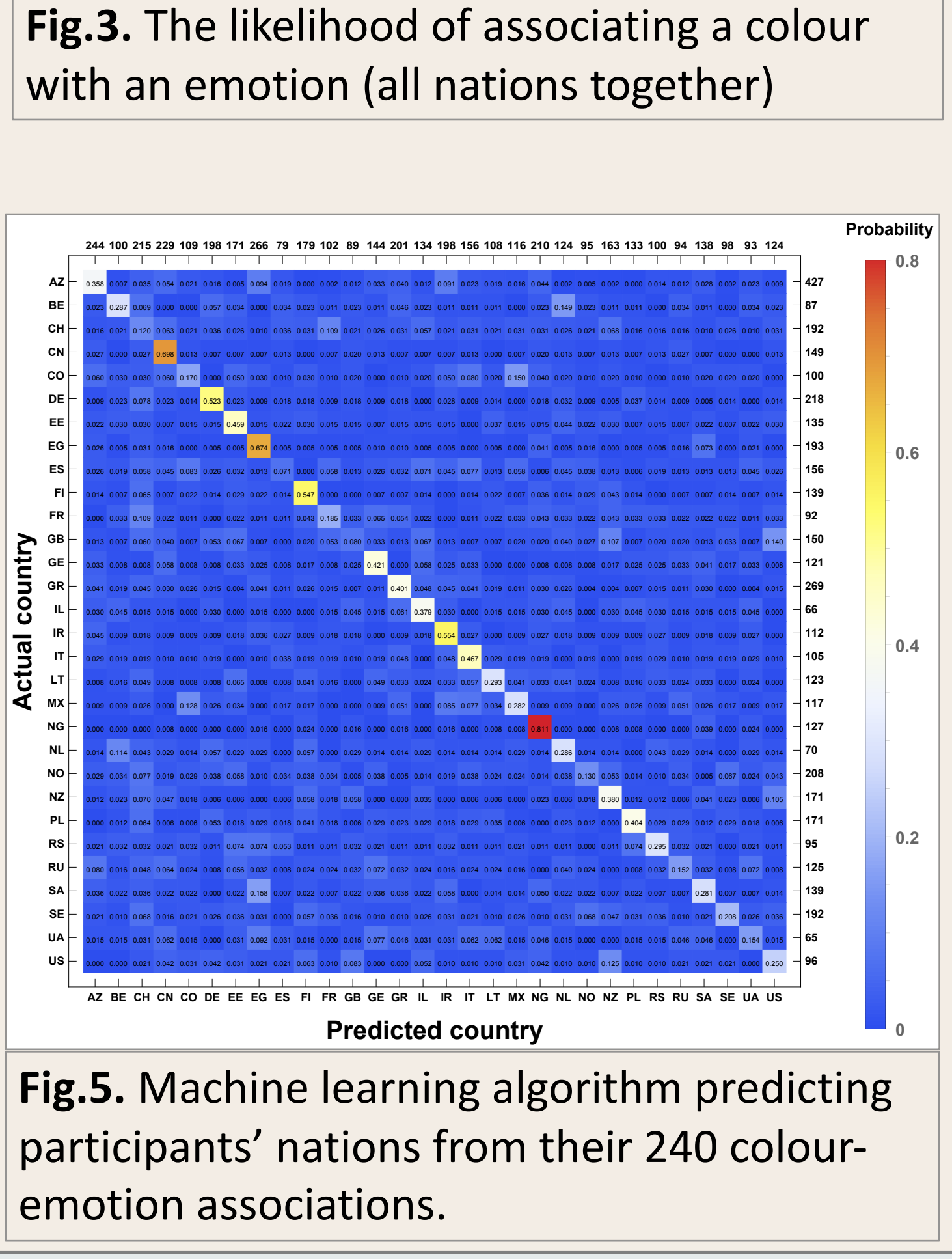
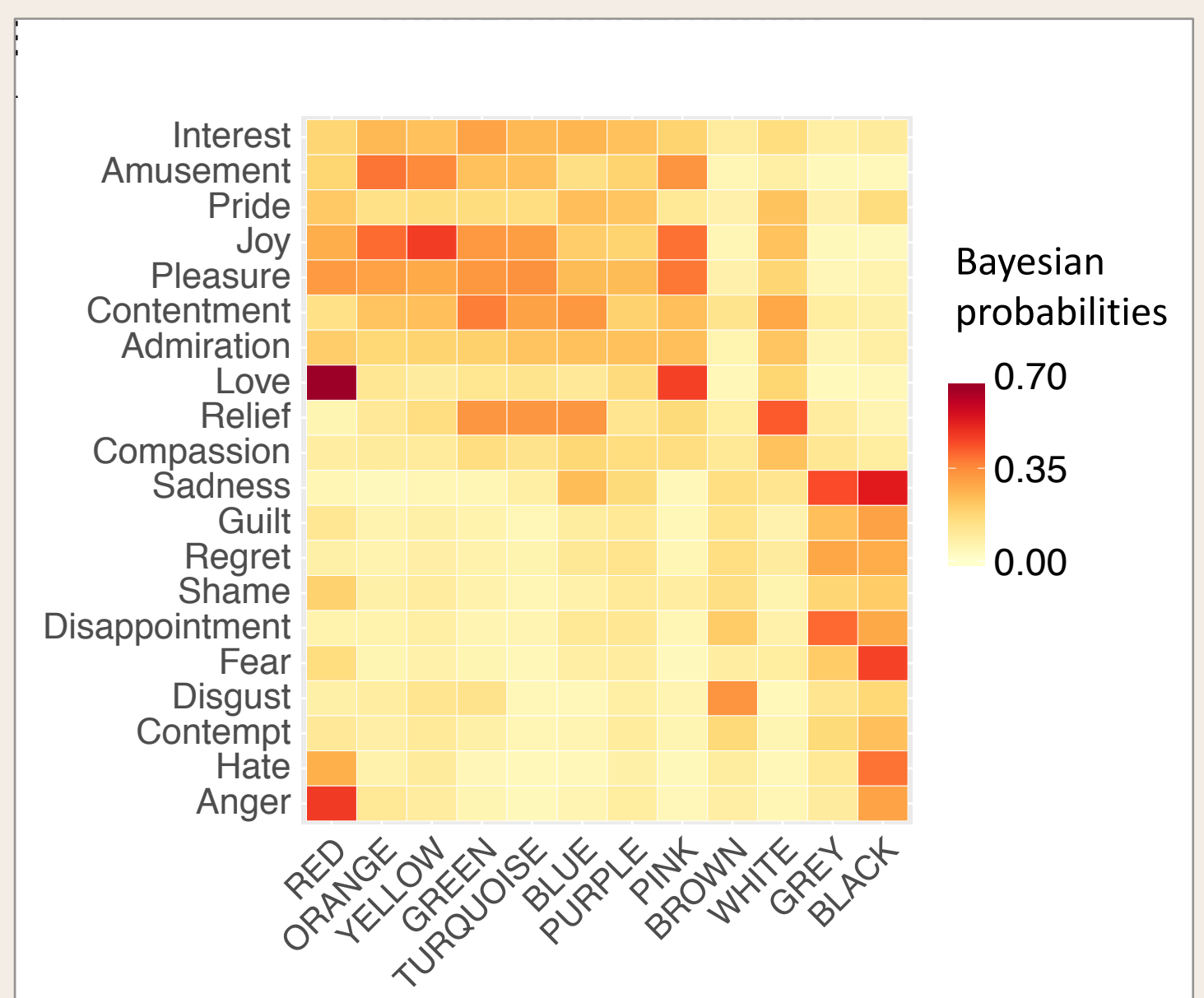


## METHODS

- Participants (N = 4598, n<sub>men</sub> = 1114) originally coming from 30 nations (Fig.1) and of wide age range (15-87 years old) associated 12 colour terms (see below) with as many or as few of the 20 emotion concepts presented in a circular fashion on the Geneva Emotion Wheel (Fig.2).
- GEW assesses 20 discrete emotions (feeling component) and it is organized by valence and power.
- Survey was completed in participants' native language (40 available). The native language coincided with the national language of the country.
- We used a Bayesian approach to estimate the mean probabilities for the 240 colour-emotion associations for each nation and globally.
- We compared the patterns of colour-emotion associations (Pattern Similarity Index: PSI) between a nation and a global pattern with matrix-to-matrix Pearson correlations (Fig.3, Fig.4), the overall likelihood of associations (Colour-Emotion Index: CEI; Fig.5) between a nation and globally with t-tests, and created a machine learning model which predicted participants' nations from their responses (Fig.6).



## RESULTS



## CONCLUSIONS

- Colour terms are systematically associated with emotions in many-to-many fashion.
- The *pattern* of colour-emotion associations is largely universal, with similarities to the global pattern between 68.4% and 94.1%.
- The *degree* of colour-emotion associations varies more by nation.
- Nations that used the same language or were neighbours were even more similar to each other.
- Few gender or age differences were observed.
- Potential mechanisms for this universality may be found in shared evolutionary history, regularities in human language, and/or environment.
- Thus, colour-emotion associations have a universal basis, further modulated by language, environment, and culture.

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