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Differences between the perception and the recognition of cross-race faces

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FACE SPACE MODEL & CROSS-RACE EFFECT

Cross-Race Effect (CRE): More difficulty recognizing faces of a different race than one's own[1].
Face Space Model[2]: Faces are represented in a multidimensional psychological space, organized by similarity and typicality. Commonly encountered, same-race faces are diffused across the face space while rarer-encountered cross-race faces are clustered near race-typical dimensions. This explains higher perceptual similarity among cross-race faces and false alarms[1].

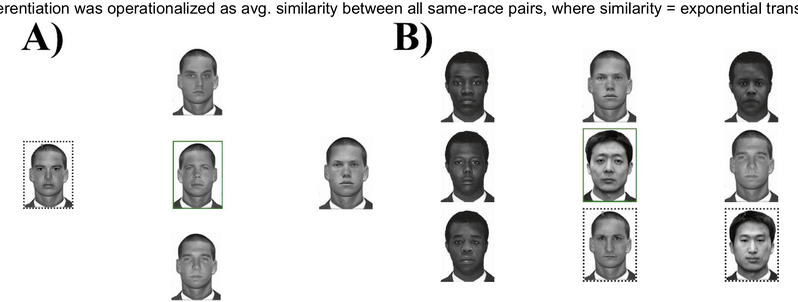
- Few studies directly measure both perceptual similarity and recognition[3, 4]
- Few studies directly test Face Space Model 's CRE predictions[5]
- No study yet tested Face Space Model 's CRE predictions using both perceptual similarity and recognition tests

Current Study: We collected human similarity judgments to generate multidimensional face spaces and tested recognition memory for same-race and cross-race faces.

GENERAL METHODOLOGY

Stimuli. Faces were extracted from online database[6] and superimposed on a single upper body for each race to eliminate the potential effects of external features.

1.) Perception Task: In PsiZ trials, participants are presented with arrays of images arranged in a grid and are tasked with selecting the *n* peripheral images that they considered to be most similar to the query image highlighted in green ("*n*-choose-*x*" trials). PsiZ algorithm outputs: a multidimensional scaling-like psychological embedding where distance reflects dissimilarity & a pairwise similarity matrix capturing all relationships among stimuli. PsiZ have been found to plot psychological embeddings reliably for training and expertise.[7,8] Differentiation was operationalized as avg. similarity between all same-race pairs, where similarity = exponential transformation of embedding Euclidean distance.



Panel A shows a "4-choose-1" PsiZ trial with only same-race faces, Panel B shows an "8-choose-2" PsiZ trial with a mix of same- and other-race faces.

2.) Recognition Task: A typical old/new face recognition task[1] : Participants studied 10 randomly selected faces of a given race (3000 ms each, with a 500 ms intertrial interval). Immediately after, all 20 faces from that race were shown for old/new recognition judgments.

DISCUSSION

Face perception and recognition may rely on distinct mechanisms in the context of CRE.

Consistent with prior research,[1] participants showed a clear CRE in recognition performance. However, they perceived same-race faces as more similar to each other than cross-race faces—contradicting the prediction that cross-race faces cluster more closely in face space. Thus, perceptual similarity may not fully account for race-based recognition differences.

The CRE may not stem solely from encoding—but may instead reflect memory-related processes such as encoding strength, retrieval efficiency, or cue usage. Future studies using PsiZ should vary memory load during perceptual similarity task to more reliably assess the CRE's impact on perception.

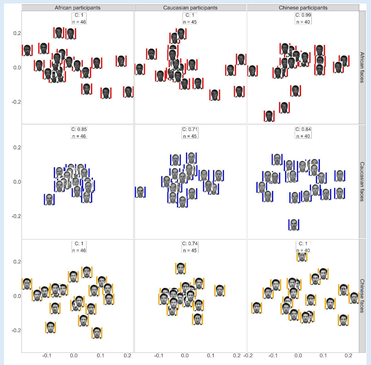
REFERENCES

[1] Lee, J., & Penrod, S. D. (2022). Three-level meta-analysis of the other-race bias in facial identification. *Applied Cognitive Psychology*, 36(5), 1106–1130.
[2] Valentine, T (1991). A unified account of the effects of distinctiveness, inversion and race in face recognition. *The Quarterly Journal of Experimental Psychology*, 43A, 161-204.
[3] Catz, O., Kampf, M., Nachson, I., & Babkoff, H. (2009). From theory to implementation: Building a multidimensional space for face recognition. Acta Psychologica, 131(2), 143–152.
[4] Schulz, C., Kaufmann, J. M., Walther, L., & Schweinberger, S. R. (2012). Effects of anticaricaturing vs. caricaturing and their neural correlates elucidate a role of shape for face learning. *Neuropsychologia*, 50(10), 2426-2434.
[5] Byatt, G. & Rhodes, G. (2004) Identification of own-race and other-race faces: Implications for the representation of race in face space. *Psychonomic Bulletin & Review* 11, 735–741
[6] Tanaka, J.W. & Pierce, L.J. (2009) The neural plasticity of other-race face recognition. *Cognitive, Affective, & Behavioral Neuroscience* 9, 122–131.
[7] Lawrence, A.K., Schultz-Coulon, J., Roads, B.D., & Tanaka, J.W. (2024). Shifting perceptions: The effects of subordinate level training on category restructuring. *Journal of Vision*, *24*(10).
[8] Mah, E.Y., Tanaka, J., & Roads, B.D. (2024). The influence of expertise and individual differences on psychological embeddings. *Journal of Vision*, *24*(10).

EXPERIMENT 1

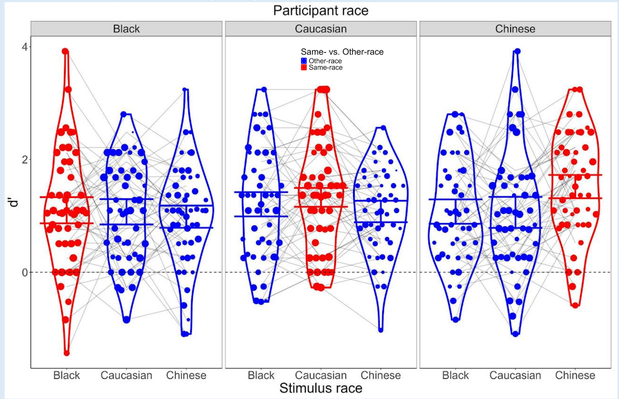
Perception Task

- 3 (Participant Race: Chinese, Black, Caucasian) X 3 (Face Race: Chinese, Black, Caucasian) MD
- Participants (46 Black, 45 Caucasian, 40 Chinese) via Prolific Academic
- 40 "4-choose-1" PsiZ trials per Face Race



Recognition Task

- 3 (Participant Race: Black, Chinese, Caucasian) X 2 (Face Race: Black, Chinese, Caucasian) MD
- 48 Black, 47 Caucasian, 47 Chinese participants

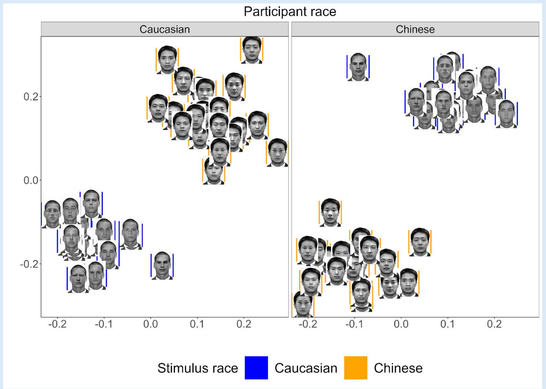


No CRE in the face space, t (1231.3) = 1.88, p = .06, d = .09. An overall CRE in recognition, F(1, 141) = 15.67, p < .001—driven by Chinese participant's CRE (p = .009), not Caucasian or Black participants (p > .18)

EXPERIMENT 2

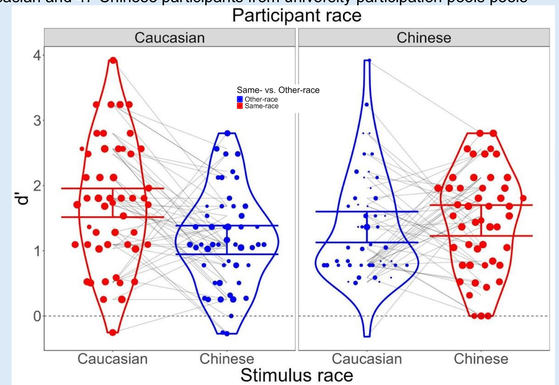
Perception Task

- 2 (Participant Race: Chinese, Caucasian) X 2 (Face Race: Chinese, Caucasian) MD
- 28 Caucasian and 28 Chinese participants via university study participation pools
- 20 "8-choose-2" PsiZ trials for each Face Race



Recognition Task

- 2 (Participant Race: Chinese, Caucasian) X 2 (Face Race: Chinese, Caucasian) MD
- 49 Caucasian and 47 Chinese participants from university participation pools pools



No CRE in the face space, χ^2(1) = 1.93, p = .17. Caucasian participants showed a CRE in recognition (p = .003), but viewed same-race faces as less differentiated. Chinese participants did not show a CRE in recognition (p = .93), but viewed same-race faces as more differentiated.