Social value learning shifts conceptual representations of faces

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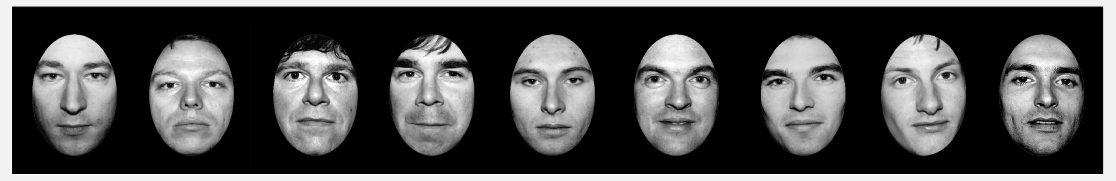
Introduction

Values drive behavioral choices. Ample research has examined the cognitive and neural underpinnings of monetary value-based computations (for review, see Kable & Glimcher, 2009). However, values attributed to biological stimuli are typically not monetary. How are more abstract values associated with naturalistic stimuli? For instance, how are social values integrated with representations of different people?

The present study tests whether learned social values modulate the organization of faces in conceptual space, and how such re-structuring is related to behavior.

Methods



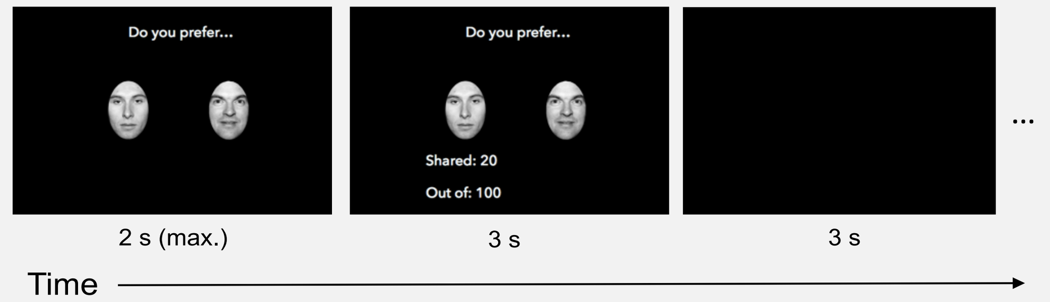
Value learning

(modified from Hackel et al. 2015)

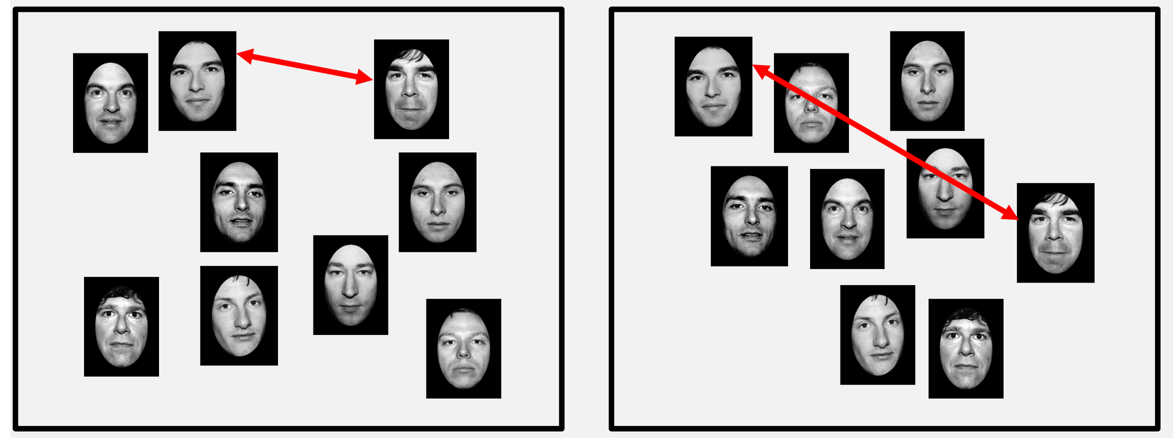
Generosity	20	20	20	50	50	50	80	80	80
Points	15	45	75	15	45	75	15	45	75
Point Pool	75	225	375	30	90	150	19	56	94

- 4 days of training, 288 trials per day
- Trial: choose 1 of 2 players, receive feedback about that players' point allocation. Random noise added to average values on each trial
- Goal: maximize points received by players for monetary bonus
- Generosity was average proportion of point pool shared (20%, 50%, or 80%)

Behavioral similarity



- Free sorting task: organize faces such that spatial organization reflects their similarity
- Performed once before and once after value learning



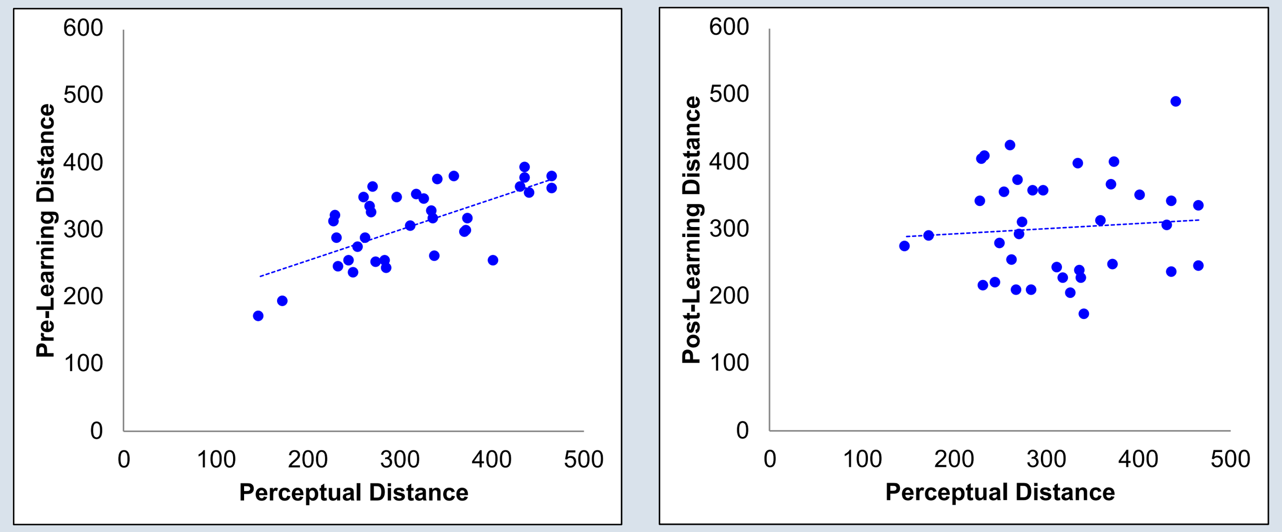
Post-learning measures

- Social preference ratings
- Generosity similarity ranking
- Point similarity ranking

Perceptual similarity

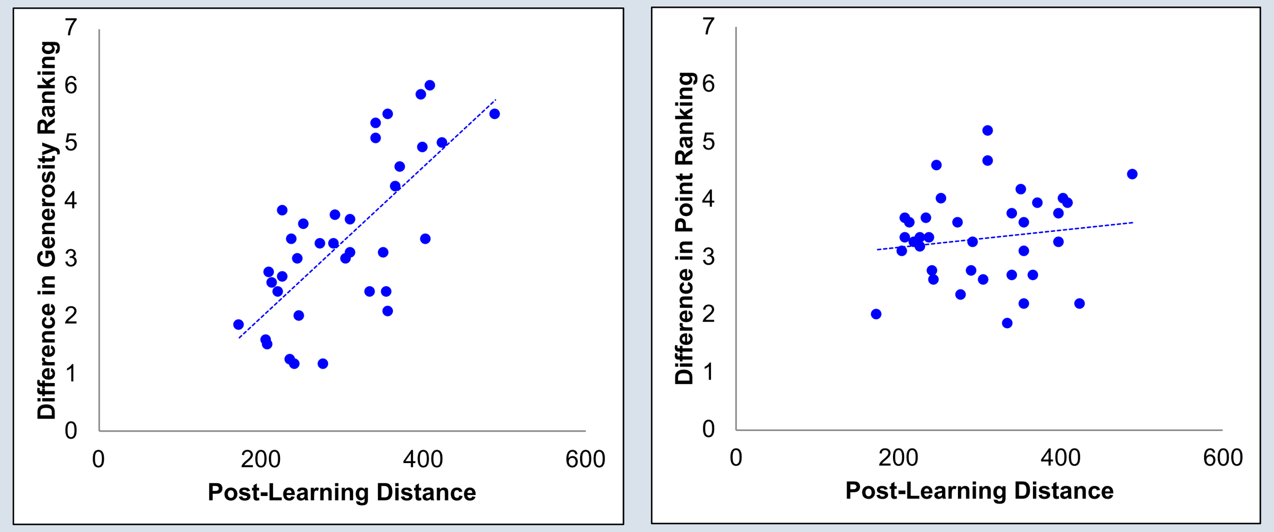
- Separate group (N = 20) organized faces in spatial manner that reflected their perceptual similarity

Results Behavioral similarity N = 13



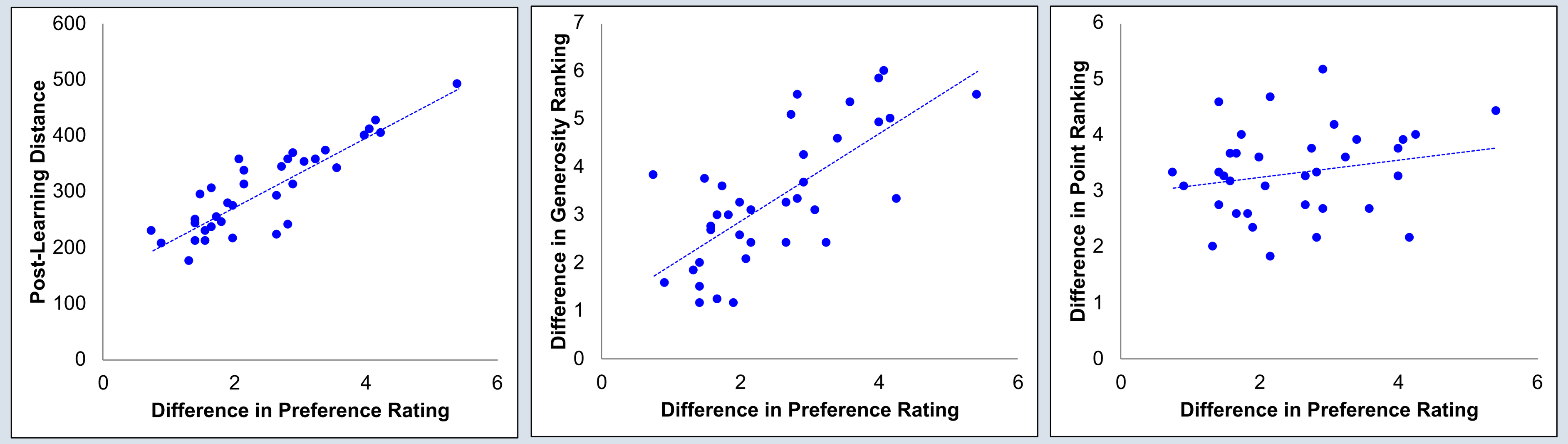
Percept sim Vs. Pre distance: **R = 0.66, p < 0.0005**
Percept sim Vs. Post distance: R = 0.08, p = 0.65
Difference between corr's: **Z = 2.9, p = 0.002**

Pairwise distances between faces correlated with perceptual similarity before, but not after, learning.



Gen ranking Vs. Pre distance: R = 0.12, p = 0.54
Gen ranking Vs. Post distance: **R = 0.72, p < 0.0005**
Difference between corr's: **Z = 3.2, p = 0.001**
Point ranking Vs. Pre distance: R = 0.15, p = 0.40
Point ranking Vs. Post distance: R = -0.13, p = 0.45

Post-learning distances correlated with generosity, but not point, rankings. Pre-learning distances did not correlate with either ranking (not shown).



Pref ratings Vs. Pre distance: R = 0.03, p = 0.86
Pref ratings Vs. Post distance: **R = 0.88, p < 0.0005**
Pref ratings Vs. Gen ranking: **R = 0.72, p < 0.0005**
Pref ratings Vs. Point ranking: R = 0.21, p = 0.21
Pref ratings Vs. Percept sim: R = -0.04, p = 0.82

Preferences for future social interaction only correlated with post-learning distances and generosity rankings.

Each point represents one pair of faces

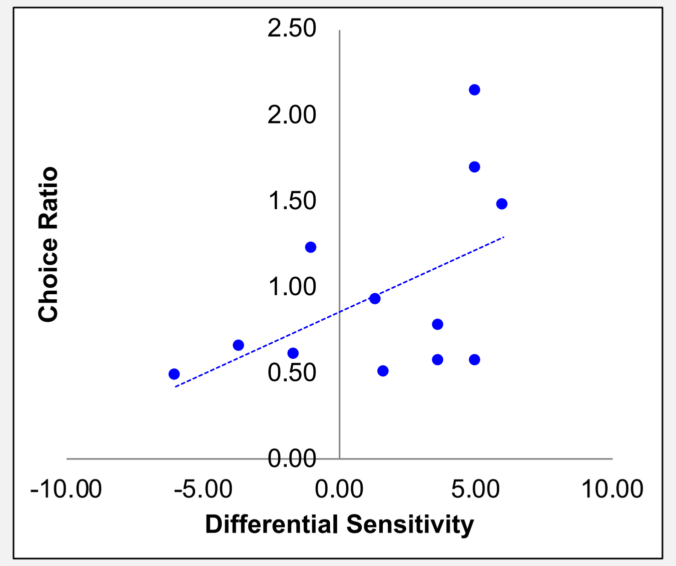
Results N = 13

Individual sensitivity

Differential sensitivity based on pref ratings

= (Ave. high pt players – Ave. low pt players) – (Ave. high gen players – Ave low gen players)

Choice ratio proportion of trials during Session 4 participant chose higher point player vs. higher generosity player



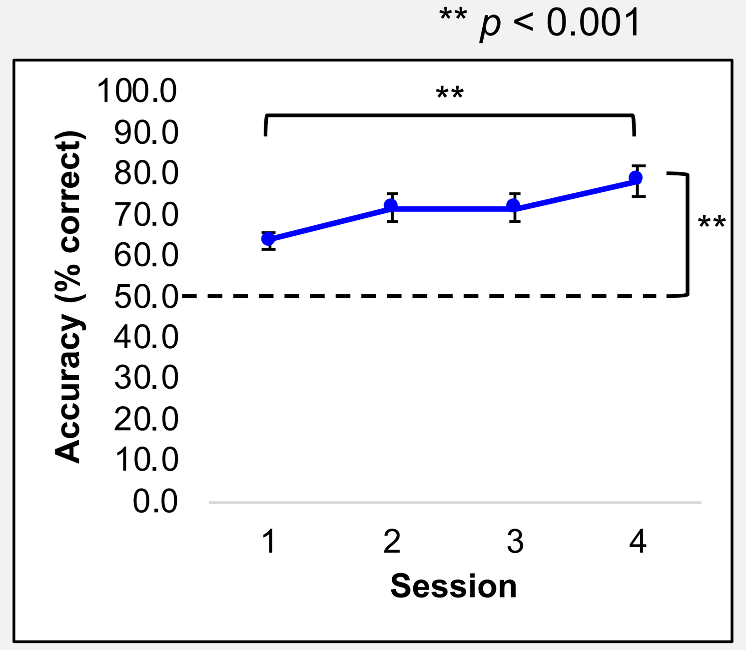
R = 0.51, p = 0.08

Each point represents one participant

Participants who chose higher generosity players more often than higher point players seem to prefer future interactions with high generosity, low reward players, compared to low generosity, high reward players.

Accuracy

** p < 0.001



RM ANOVA (accuracy x session)
effect of session
$F(3) = 18.48$, $p < 0.0005$

Value learning manipulation was successful.

Conclusions

- Perceptual similarity drives initial organization of facial identities in conceptual space.
- After value information is learned, organization is driven by social values, and not point values. Faces of more similar social values become closer together.
- After learning, organization is related to propensities in future social behaviors.

References

- pics.stir.ac.uk
- Hackel, Doll, & Amodio (2015) Instrumental learning of traits versus rewards: dissociable neural correlates and effects on choice. *Nature Neuro*, *18(9): 1233-1225.*
- Kable, J. W., & Glimcher, P. W. (2009). The neurobiology of decision: consensus and controversy. Neuron, 63(6), 733-745.

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