Learned social values modulate neural representations of faces
Ariana M. Familiar, Alice Xia & Sharon L. Thompson-Schill
Department of Psychology, University of Pennsylvania

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, such as social values of different people? Given distinct areas of the brain that process face and social value information, how are these pieces of information associated?

The present study tests whether learned social values modulate the similarity of neural responses in face-selective brain areas, as well as across the brain, and how such re-structuring is related to behavior.

Methods

Value learning (modified from Hackel et al. 2015)
• 4 days of training
• Task: choose 1 of 2 players, receive feedback about that players’ point allocation. Noise added to average values on each trial
• Goal: maximize points received by players for monetary bonus
• Social value (generosity) and reward value (points) were orthogonally

Behavioral similarity
• Free sorting task: organize faces such that spatial organization reflects their similarity
• Performed once before (pre-) and once after (post-) value learning

Post-learning measures
• Social preference ratings
• Social value similarity ranking
• Reward value similarity ranking

fMRI Methods
• Two scan sessions: one before & one after value learning (analyzed separately)
• Task: one-back repeat detection
• Face images presented one at a time (2 s), at the center of the screen
• Order of stimuli determined by a De Brujin sequence
• GLM to estimate voxel responses to each face (beta weights used as input in multi-voxel pattern analyses)
• Face-selective ROIs defined by data from independent localizer runs

Neural similarity: face-selective ROIs

Left FFA
Perceptual 0.22 0.02 Preference 0.04 0.14 Social Value 0.06 0.17 Reward Value 0.19 0.15 Behavioral -0.15 -0.16

Right FFA
Perceptual 0.24 0.06 Preference 0.00 0.17 Social Value 0.08 0.19 Reward Value -0.44 -0.55 Behavioral 0.02 -0.14

Neural responses in FFA related to perceptual similarity prior to value learning, while after value learning responses are related to social value similarity and social preferences.

These trends were not found in left or right OFA

Classification of face identity was at chance performance in FFA.

Results

Behavioral similarity

Social Value
N = 15

Neural similarity: whole-brain searchlight

Social Value
Left ATL
Reward Value
Left vmPFC & OFC

Conclusions

• After value information is learned, organization of faces in similarity space is driven by social values and relates to future social preferences.
• Social value information is encoded in neural response patterns of areas within the face and value processing systems, when merely viewing faces and performing a repeat detection task.
• Responses in FFA are related to expectations of future social behavior, however do not encode face identity information.
• Whether specific areas contain integrated representations of social value and face identity, or whether network-level interactions underlie such associations, remains to be established.

References

• Original face images from PICS database: pics.stir.ac.uk

Work supported by NIH R01DC015359

https://web.sas.upenn.edu/schi

Reprints