



# Dissociable neural responses for Caucasian and Asian faces using a pattern-classification approach

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## BACKGROUND

- other-race effect for face recognition (e.g. Mapp & Kivlatz, 1999)
  - own-race recognition more accurate than other-race face recognition
  - perceptual component - other-race faces "all look alike to me!"
- neural correlates of own- vs. other-race face perception
- fMRI studies
  - socio-cognitive neural perspective
    - amygdala (Hart et al., 2000; Phelps et al., 2000; Cunningham et al., 2004; Lieberman et al., 2005)
    - results are inconsistent
  - visual perspective (e.g. Golby et al., 2001)
    - fusiform 'face' area (own-race response > other-race response)
    - left fusiform gyrus
    - parahippocampal gyrus, hippocampal areas
  - visual cues underlying face ethnicity, gender, identity (Ng et al., 2007)
    - fusiform gyrus, inferior occipital cortex

## GOAL

- understand neural activation patterns for own- vs. other-race faces
  - focus on spatial and temporal aspects of the brain patterns
  - consider broader range of high-level visual areas, including face-selective areas in ventral temporal (VT) cortex

## APPROACH

- pattern-based classifier to discriminate neural responses for:
  - Caucasian and Asian faces in the brains of Caucasian and Asian participants
- examine time-course of neural activation for own- vs. other-race faces in Caucasians and Asians

## STIMULI

- face stimuli
  - 4 Asian and 4 Caucasian facial identities
  - 4 different images per face



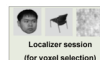
## LOCALIZER

• Localizer scan was used to isolate high-level visual and face-selective regions of interest in the occipital and VT areas of the cortex.



### Caucasian Localizer

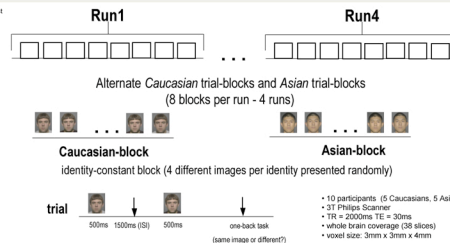
- ANOVA used to select voxels showing significant variation ( $p < 0.00001$ ) across three categories (Caucasian faces, objects, and scrambled images).
- Localized VT mask
- Approximate number of voxels/subject: 300-1000



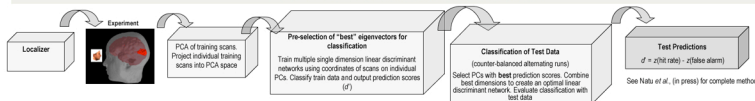
### Asian Localizer

- ANOVA used to select voxels showing significant variation ( $p < 0.00001$ ) across three categories (Asian faces, objects, and scrambled images).
- Localized VT mask
- Approximate number of voxels/subject: 300-1000

## EXPERIMENTAL DESIGN

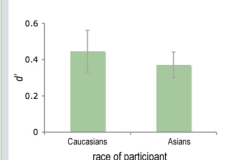


## PATTERN-BASED CLASSIFICATION



## RESULTS

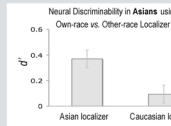
Discriminability of Neural Response to Caucasian & Asian Faces



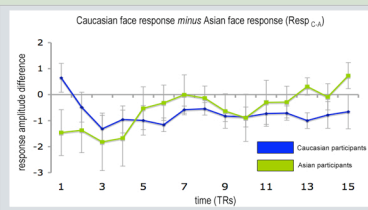
- above chance discrimination in brains of both Caucasians and Asians
- data from first 4 TRs of block most useful for classification

Importance of own-race localizer:

- to select high-level visual and face-selective areas
- data from a subset of Asian participants

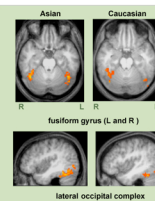


## TIME-COURSE of NEURAL RESPONSE to OWN- vs. OTHER-RACE FACES



- neural response time-course
  - faster and stronger average neural response to own-race faces
  - own-race > other-race
    - result consistent with Golby et al. (2001)
  - slow progressive increase in amplitude of neural response to other-race faces
  - own-race > other-race
- interpretation
  - neural adaptation of own-race response, continuously active other-race response
  - fast, automatic processing of own-race faces
  - dedication of additional neural resources for other-race faces

## IMPORTANCE MAPS



- regions important for dissociating own- vs. other-race faces in Caucasian and Asian participants
  - fusiform gyrus
  - lateral occipital complex

Summary of importance map construction:

1. individual subject classifier:
  - importance map = weighted sum of the dimensions (PCs) useful for discriminating neural response to Asian and Caucasian faces
2. MNI normalization of each participant's importance map
3. average MNI normalized maps for Caucasian and Asian participants
4. project thresholded voxels onto MNI normalized anatomical brain

## RESULTS SUMMARY

- neural response to Asian and Caucasian faces in Asian and Caucasian participants
  - discriminable with pattern classification methods
  - high-level visual and face-selective areas in VT cortex
- importance of own-race face localizer
  - discrimination scores with own-race face localizer > other-race face localizer
  - time-course differences in neural activation for own-race vs. other-race
    - fast, automatic own-race face processing
    - dedication of additional neural resources for other-race face processing

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