



# Differential spatial and temporal neural response patterns for own- and other-race faces

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## BACKGROUND

- other-race effect for face recognition (e.g., Malpass & Kravitz, 1969)
  - own-race recognition more accurate than other-race face recognition
  - perceptual component - other-race faces "all look alike to me!"
  - speed of processing
    - other-race faces categorized faster than own-race faces (Levin, 2000)
    - own-race recognition faster than other-race (Macon et al., in press)
- neural correlates of own- vs. other-race face perception
- fMRI studies
  - socio-affective differences
    - amygdala (Hart et al., 2000; Phelps et al., 2000; Cunningham et al., 2004; Lieberman et al., 2005)
    - results are inconsistent
  - visual processing differences (e.g., Golby et al., 2001)
    - fusiform "face" area (own-race response > other-race response)
    - left fusiform gyrus, parahippocampal gyrus, hippocampal areas
  - visual codes underlying face ethnicity, gender, identity (Ng et al., 2007)
    - distributed representations
    - fusiform gyrus, inferior occipital cortex

## GOAL

- examine neural response patterns for own- vs. other-race faces
  - focus on spatio-temporal aspects
  - consider broader range of high-level visual and face-selective areas in ventral temporal (VT) cortex

## APPROACH

- apply pattern-based classification analysis to discriminate
  - 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.



• ANOVA used to select voxels showing significant variation ( $p < 0.0000001$ ) across three categories (Caucasian faces, objects, and scrambled images).

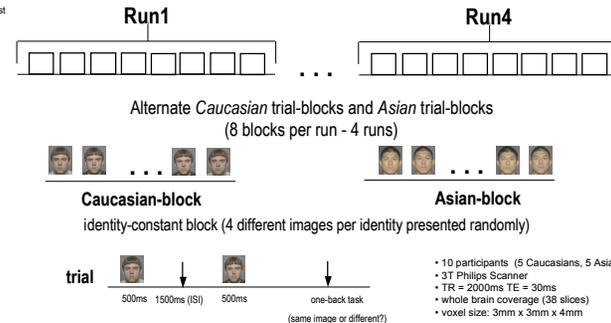
- Localized VT mask
- Approximate number of voxels/subject: 300-1000



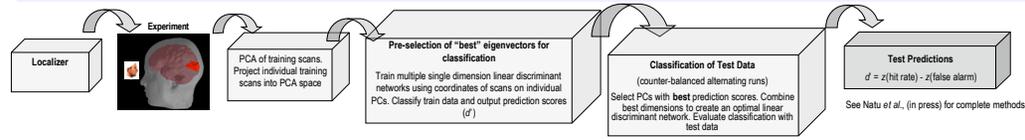
• ANOVA used to select voxels showing significant variation ( $p < 0.00001$ ) across three categories (Asian faces, objects, and scrambled images).

- Localized VT mask
- Approximate number of voxels/subject: 300-1000

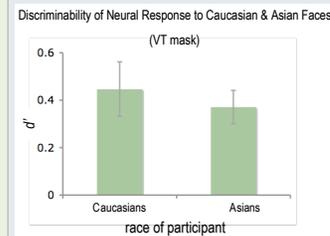
## EXPERIMENTAL DESIGN



## PATTERN-BASED CLASSIFICATION



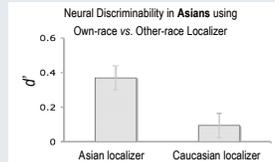
## RESULTS



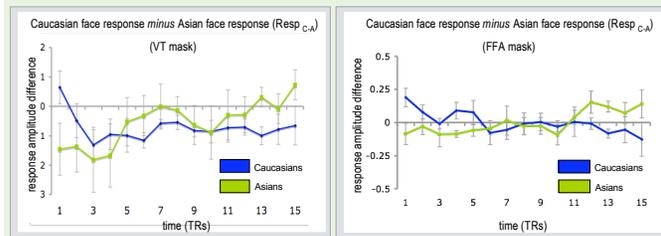
- VT mask
  - above chance discrimination in brains of both Caucasians and Asians
  - data from first 4 TRs of block most useful for classification
- FFA mask
  - no discrimination

### 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



### FFA and VT mask

- 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

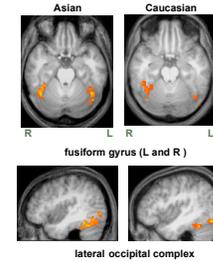
- other-race > own-race

- (cf., Henson et al. 2000 for analogous temporal response to unfamiliar faces in face-selective areas)

### interpretation

- neural adaptation of own-race response, continuously increasing 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:

- individual subject classifier:

importance map = weighted sum of the dimensions (PCs) useful for discriminating neural response to Asian and Caucasian faces

- MNI normalization of each participant's importance map
- average MNI normalized maps for Caucasian and Asian participants
- project thresholded voxels onto MNI normalized anatomical brain

## RESULTS SUMMARY

- neural response to Asian and Caucasian faces
  - discriminable with pattern classification methods
  - high-level visual and face-selective areas in VT cortex
- importance of own-race face localizer
  - time-course differences in neural activation for own-race vs. other-race
  - efficient own-race face processing
  - dedication of additional resources for other-race face processing
- use of areas beyond the FFA for categorization of faces by race

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