The recognition of static versus dynamic faces in prosopagnosia

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OBJECTIVE

- compare static versus dynamic face recognition
  - prosopagnosics and neurologically intact controls

BACKGROUND

- Two-stream hypothesis (Haxby *et al.*, 2000)
  - invariant information (identity)
    - fusiform gyrus (FFA)
    - inferior occipital gyrus (OFA)
  - changeable information (social communication)
    - superior temporal sulcus (STS)
  - pSTS - a "back-up" face recognition system?
    - (O'Toole, Roark & Abdi, 2002; Roark et al., 2003)
    - dynamic identity signatures
    - structure-from motion

RATIONALE

- Can prosopagnosics recognize moving faces?
  - with sparing of the pSTS "back-up system"
  - possible that pSTS can support recognition
  - detectable when faces are learned *in motion*
- Previous work
  - "CS" developmental prosopagnosic
  - could discriminate identity in moving faces
    - (Steede *et al.*, 2007)
- What about prosopagnosia from a lesion?
  - (cf. also Lander *et al.*, 2004; Humphreys & Riddoch, 1987)

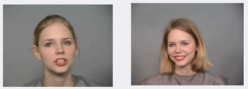
PARTICIPANTS

- 19 neurologically intact controls
- 2 prosopagnosics with intact STS (Barton, et al., 2009)
  - MR and BP

	FFA		OFA		STS		Anterior temporal areas	
	L	R	L	R	L	R	L	R
MR	√	x	√	x	√	√	√	√
BP	√	√	√	√	√	√	√	x

STIMULI

- **dynamic** face stimuli (5 s video clips)
  - person speaking or expressing (smile, laugh)
- **static** face stimuli
  - 5 frames from video presented in random order



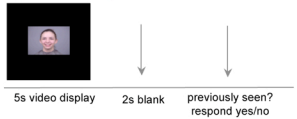
facial speech expressions

EXPERIMENTAL SETUP

- **Face Recognition Task**
  - learn - 20 faces
    - from static or dynamic face presentations
    - within-subjects
  - test 80 faces
    - 20 images/videos identical to learned stimuli
    - 20 images/videos "changed" (hair style, etc.)
    - 40 images/videos from 20 novel identities
- response - Old? or New?
- *d'* - face recognition accuracy
- measured on first occurrence of identity in test

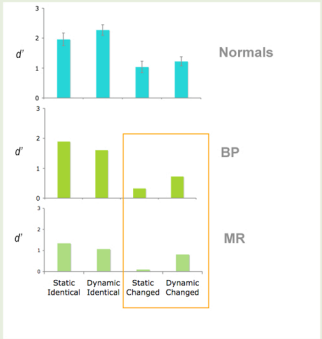
static face presentations

dynamic face presentations



RESULTS - Does Motion Affect Recognition?

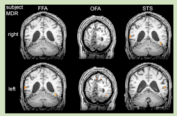
Recognition Scores for Static and Dynamic Face Stimuli



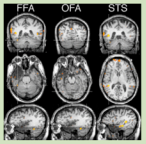
- **normals**
  - no effect of motion, $F(1,18)=3.2$, ns. (cf., O'Toole et al., 2002)
  - identical > changed, $F(1,18)=46.8$, $p < .001$
- **prosopagnosics MR and BP**
  - for **changed** stimuli
    - motion affects recognition
    - **dynamic faces > static faces**
  - for **identical** stimuli
    - both MR and BP performed marginally better on static faces than on dynamic faces
  - **static faces > dynamic faces**

PATIENT BRAIN SCANS

MR (70 yr. old male)



BP (30 yr. old female)



- **lesions**
  - **r fusiform**
  - **r occipital temporal**
- **lesion**
  - **r anterior temporal**
- **impaired (BP and MR)**
  - Warrington face test
  - Cambridge face memory test
  - famous face recognition
- **normal (BP and MR)**
  - Benton face matching

Barton et al. (2009)

CONCLUSION

- **motion advantage for MR and BP in the challenging *changed* stimulus condition**
  - propospagnosics with pSTS may be able to use this system to recognize moving faces
- **no motion advantage for MR and BP for the identical stimulus condition**
  - matching on external features (e.g., hair) ?
- **no motion effect for neurologically intact controls**
  - for either identical or changed stimulus conditions
    - consistent with previous work (cf. O'Toole et al. 2002)

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