University of BRISTOL

PSYC10009: Biological Psychology

Social Vision

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4D3

From Vision To Interaction In 3 Lessons

- Lecture 1: Early Vision
  - Retinal processing and spatial receptive fields
  - Early cortical visual processing
- Lecture 2: Higher-Level Vision
  - Beyond V1: colour, motion, form, objects
  - Feature binding
- Lecture 3: Social Vision
  - Perceiving People
  - Perceiving Minds

Relevant Reading

- Haxby, J. V., & Gobbini, M. I. (2011). Distributed neural systems for face perception. In G. Rhodes, A. Calder, M. Johnson, and J. V. Haxby, (Eds.) *Oxford Handbook of Face Perception*. Oxford University Press.

- available electronically from Ida Gobbini's webpage:

  http://haxbylab.dartmouth.edu/ppl/ida.html

What Is 'Social Vision'?

- visible person cues are used to draw conclusions about invisible person qualities
- underlying assumption: compared to objects, people are agents with feelings, beliefs and intentions

The Susan Boyle Moment

- http://www.youtube.com/watch?v=RxPZh4AnWyk

Common Visual Cues

- eye gaze
- facial morphology & expression
- hair style
- body shape & posture
- facial and bodily movement
- personal attire (clothing, accessories, objects)
- actions (opening a door for someone, jumping a line…)

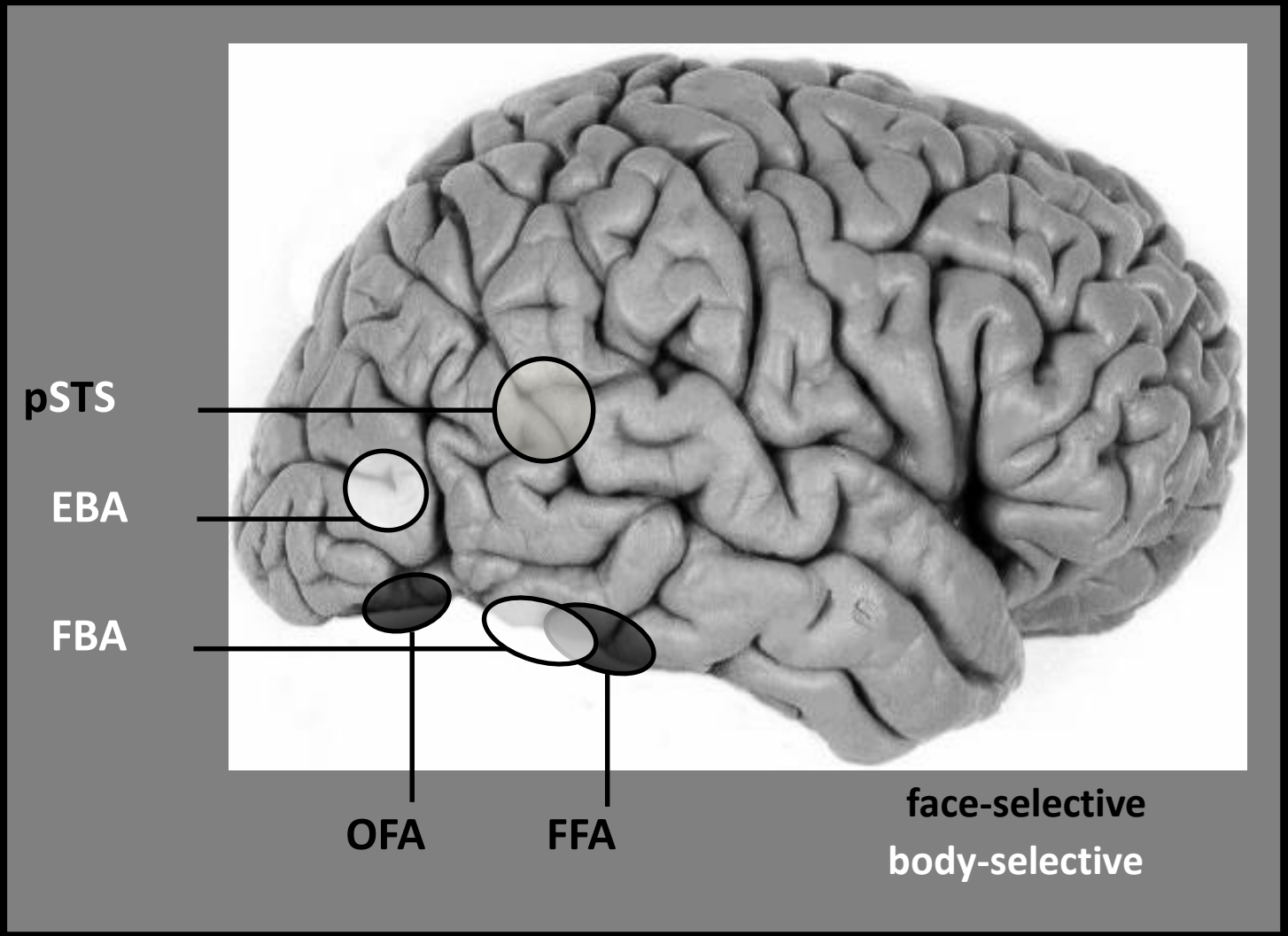
Common Social Inferences

- Social Category (age, sex, race, religion, profession…)
- Emotional State (happy, angry, sad…)
- Attractiveness/Health
- Social Attention (whom/what are they looking at)
- Personality (trustworthy, friendly, intelligent…)
- Familiarity/Identity

From Visual Cues To Social Inferences

TERMINOLOGY	PROCESS	CONTENTS
Person Perception	Identifying complex visual stimuli as human beings.	Faces Bodies Human Motion
Person Classification	Organizing people based on salient visual markers.	Social Categories (Race, Sex, Age…) Archetypes (Beauty, Traits, States) Individuals (Ahmed, Susan, Dar, Sibu) Similarity (With Self or Others)
Person Inference	Judging people on the basis of existing social knowledge.	Stereotypes (Social Categories) Schemas (Archetypes) Lay Theories (Individuals) Transference (Similarity To Others) Simulation (Similarity To Self)

The Core Person Perception Brain Network



Studying Face Perception

- Typical Task: 1-Back Detection Task
- Faces > Objects (e.g., cars):
- OFA: occipital face area
- FFA: fusiform face area
- pSTS: posterior superior temporal sulcus
- face-specific neural activity typically stronger in right hemisphere

What Makes Faces Special?

- face perception requires specialized visual processing
- faces as a category highly homogenous: 2 eyes over a nose over a mouth inside an ellipse
- face discrimination requires processing of very subtle differences => humans can easily distinguish between 1000s of faces

The Face Inversion Effect (Yin, 1969)

- face perception system highly specialized to the processing of upright faces
- humans have a difficulty in processing the relation between facial features when faces are inverted:

- => when faces are inverted, we have a harder time to recognize them (performance suffers more than for objects)
- => when faces are inverted, we have a harder time to notice odd configurations

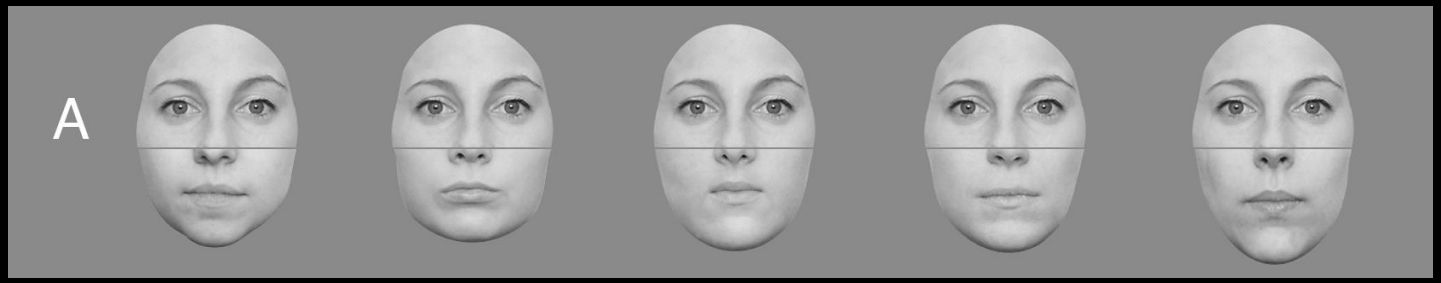
Example: The Thatcher Illusion I (Bartlett & Searcy, 1993)

Example: The Thatcher Illusion II (Bartlett & Searcy, 1993)

The Face Composite Effect (Hole, 1994)

- when the top and bottom halves of a face comprise different people (e.g., top half your mother; bottom half your aunt), participants experience difficulty reporting identity of the person portrayed in the top
- effect demonstrates that we habitually fuse upper and lower part of a face to form a holistic impression, at the cost of our ability to recognize the constituting parts
- impairment is removed by misaligning the top and bottom halve of a face (Young, Hellawell, & Hay, 1987)

Illustration of The Face Composite Effect (Rossion, 2013)



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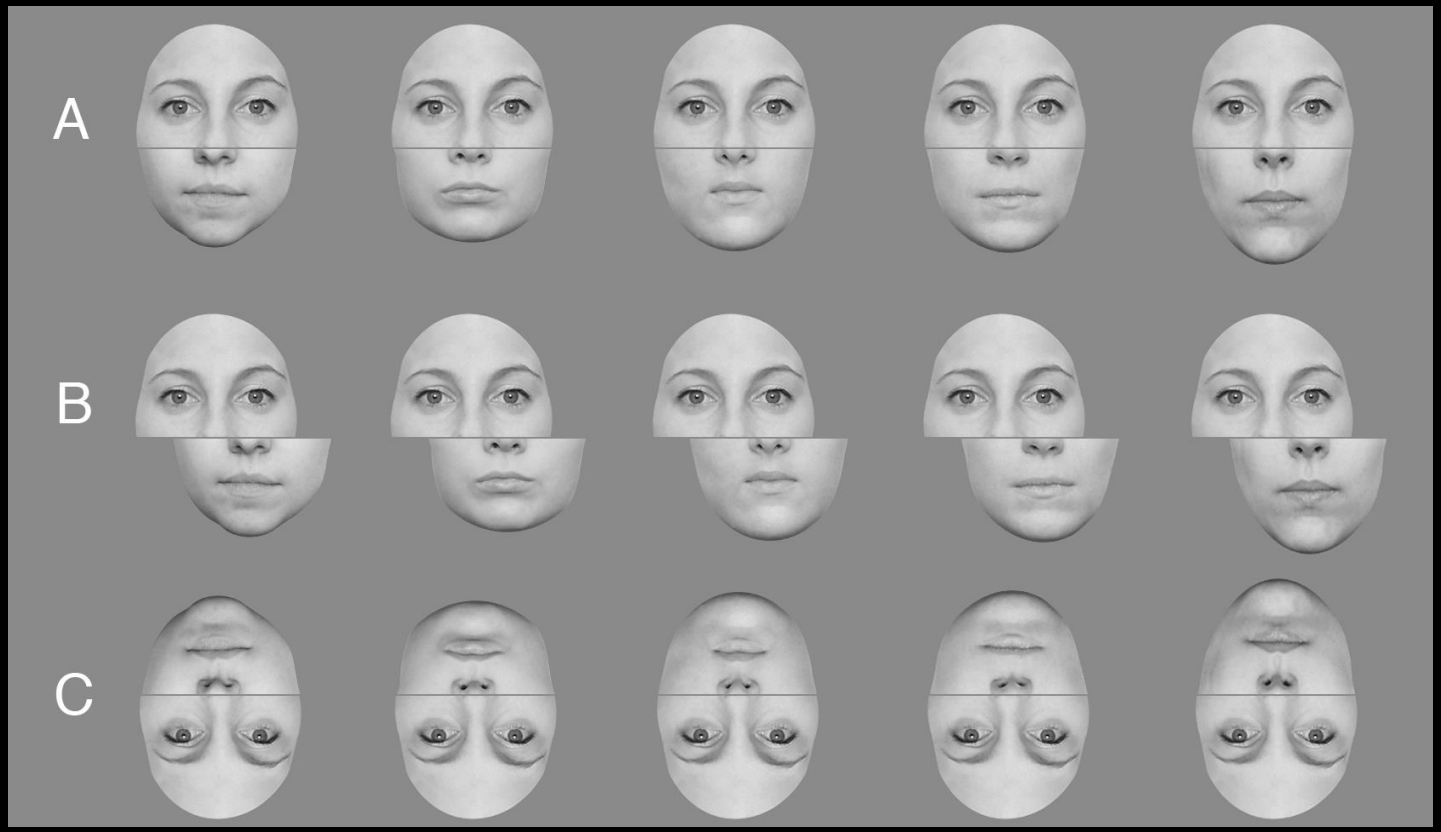
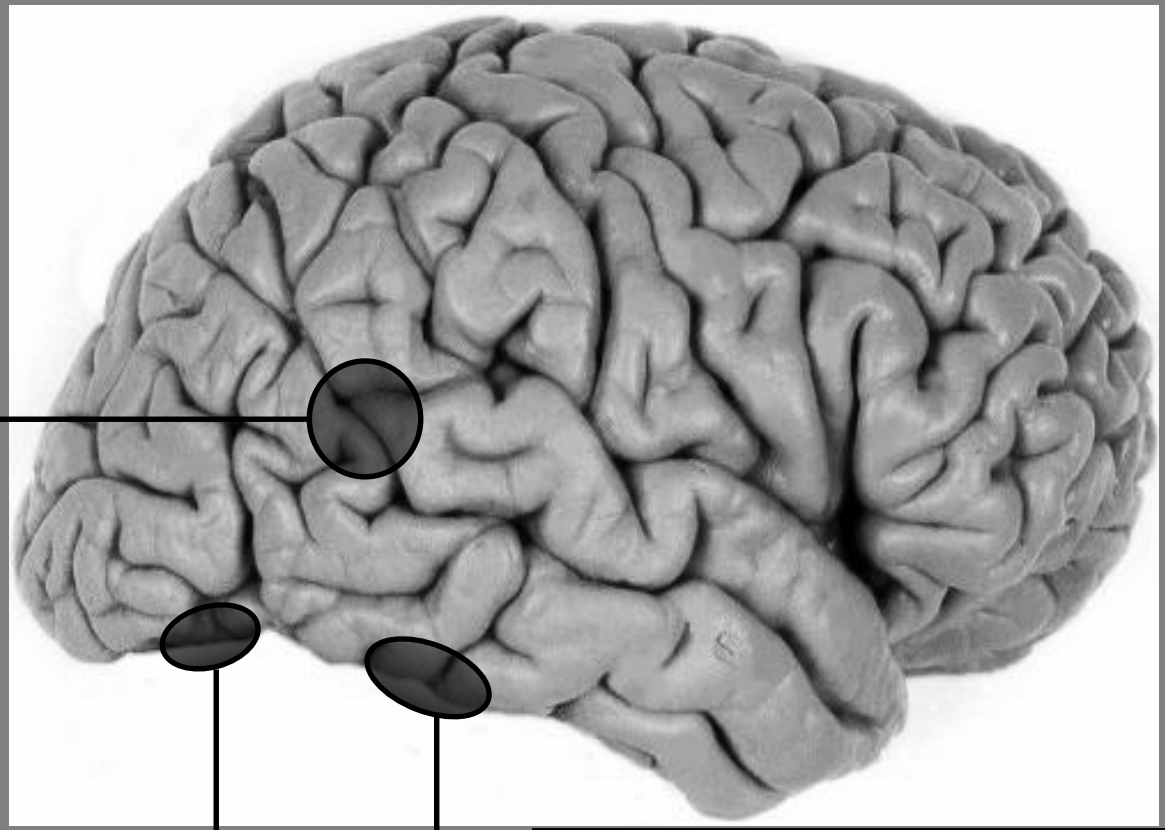
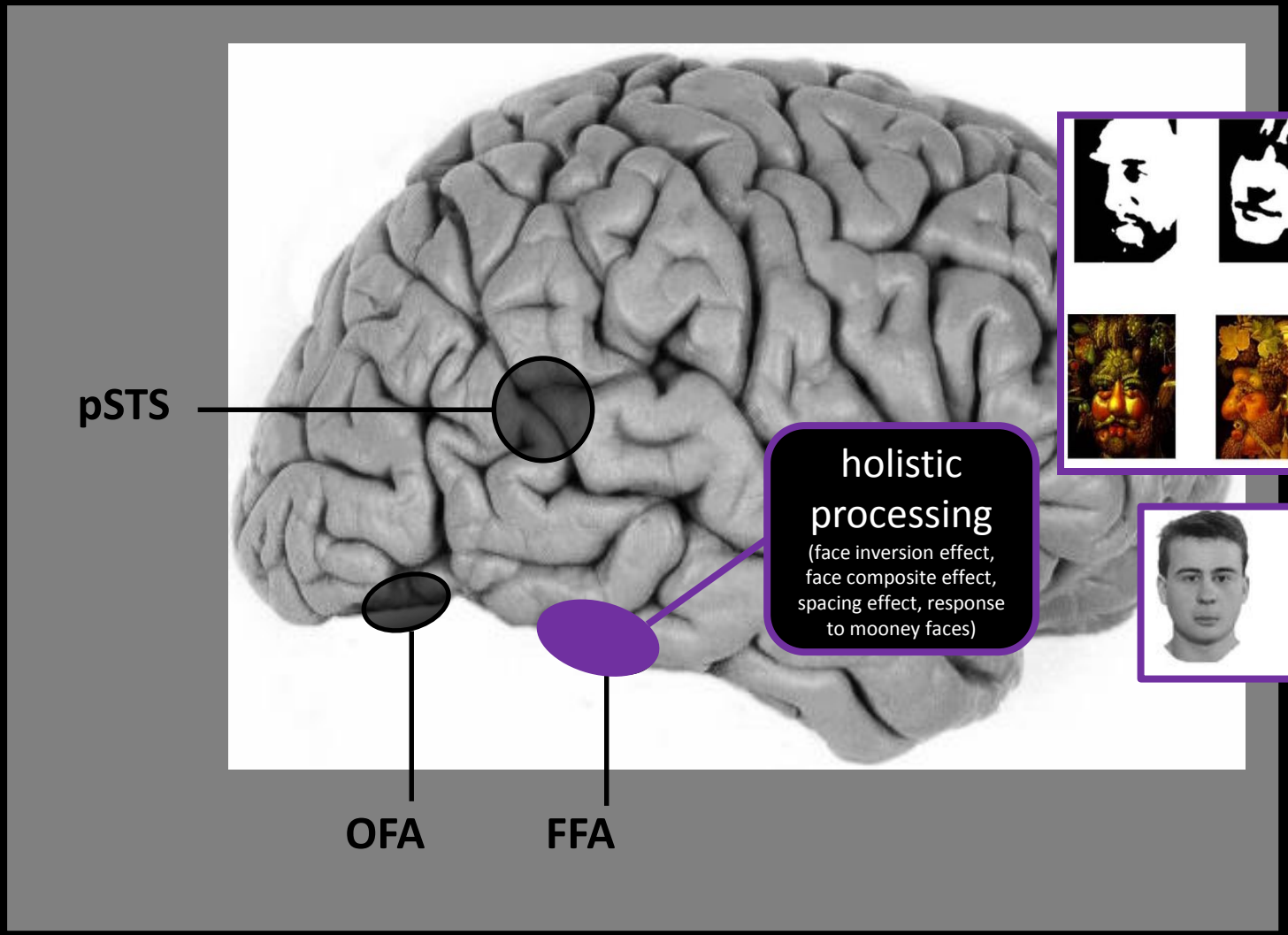


The Core Face Perception Network



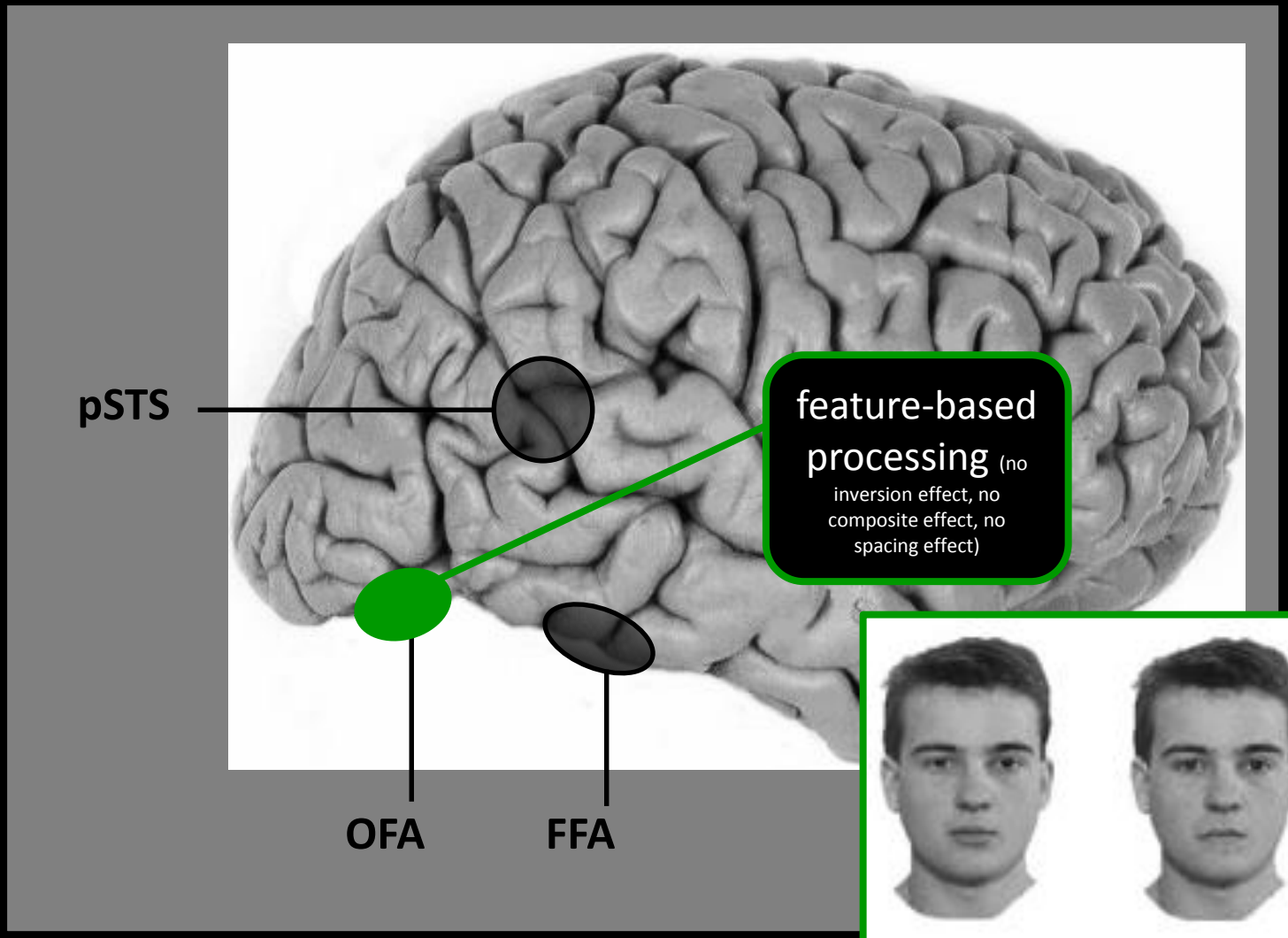
network encodes an individual's facial appearance

Functional Contribution of the FFA



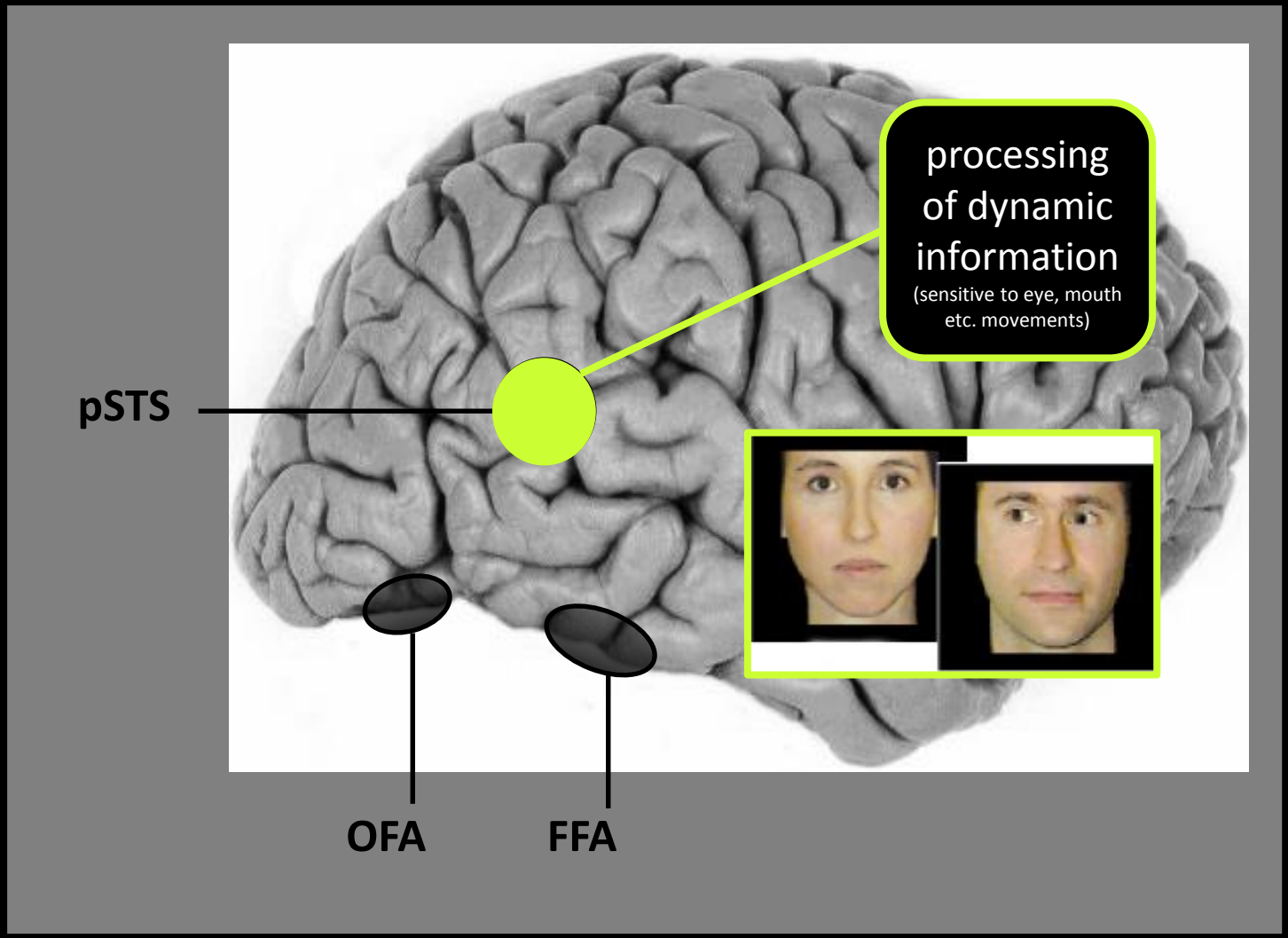
Andrews & Schluppeck, 2004; Kanwisher & Yovel, 2006;

Functional Contribution of the OFA



Pitcher et al., 2007,2011

Functional Contribution of the pSTS



Hoffmann & Haxby, 2000

What Happens When the Network Gets Damaged?

"People who are 'tone deaf' are not deaf to tones. They can hear tones, they just can't tell them apart. People who are 'color blind' can see things that are in color. They just can't tell colors apart. Similarly, I can see faces. I just can't tell them apart."

-- Bill Choisser, *Face Blind!*
www.choisser.com/faceblind/

Face Blindness (Prosopagnosia)

- impairment in the recognition of faces (even highly familiar faces)
- often completely distinct from agnosia
- informal reports of prosopagnosia date back to antiquity
- in 1947 first official scientific report of two individuals (Bodamer, 1947) => since then > 100 cases reported
- people with prosopagnosia often use alternative routes to recognition (a person's movement, bodily appearance etc.)

What Happens When The Network Gets Disturbed?

- we begin to understand how to induce temporarily changes in face perception
- long term hope: if we understand how to disturb the system, we can maybe also learn how to fix it
- http://www.jneurosci.org/content/32/43/14915.full

  (go to video file => sham vs. real)

Studying Body Perception

- Typical Task: 1-Back Detection Task
- Headless Bodies > Objects (e.g., cars, chairs etc.):

- EBA: extrastriate body area
- FBA: fusiform body area
- pSTS: posterior superior temporal sulcus
- less researched than face perception but first evidence of similar functional divergence (Taylor, Wiggett, & Downing, 2007; Thompson et al., 2007)

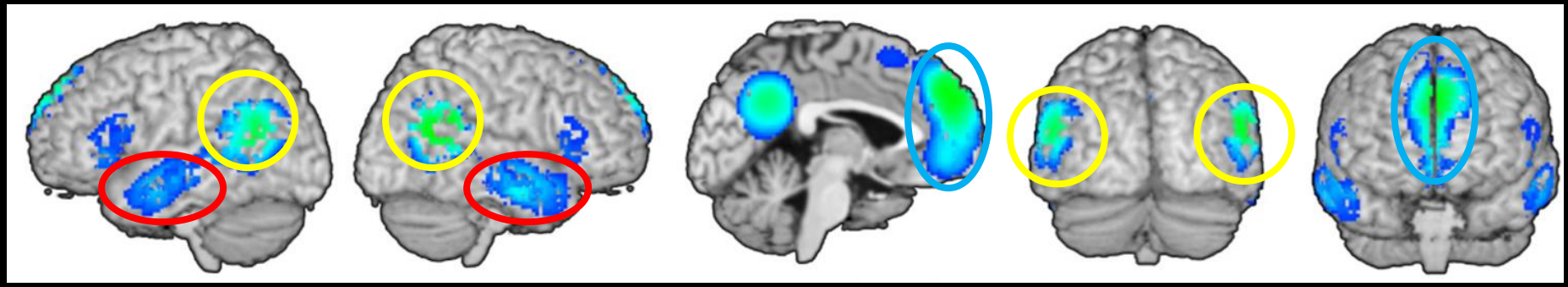
Interim Summary I

- other people are visual input of particular evolutionary relevance
- their perception tends to be rapid (< 300 ms), yet detailed
- their perception occurs in the so-called core person perception network
- network comprises regions dedicated towards face processing and body processing
- if the network's normal processing is interrupted, person perception problems arise (e.g., prosopagnosia)

The Extended Network

- brain regions of the extended network are recruited in concert with the core network depending on the task at hand

Example: The Mentalizing Network (Schurz et al., 2014)

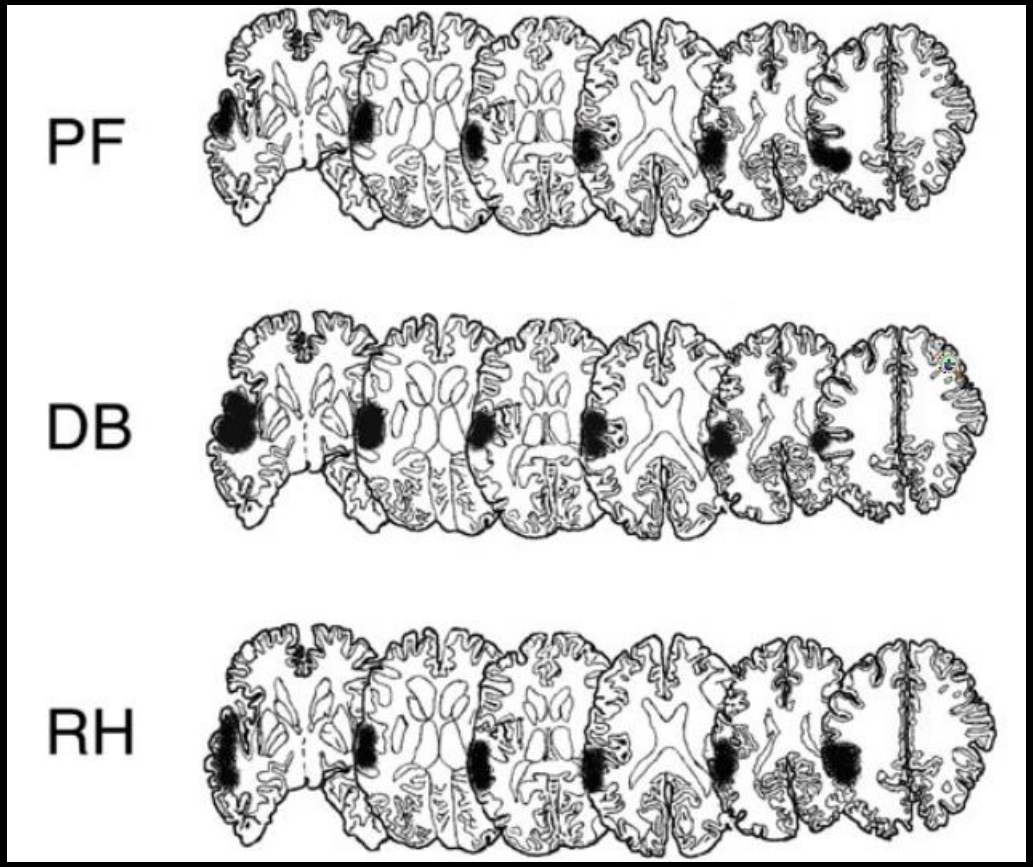


- three key regions – the medial prefrontal cortex (MPFC), the anterior temporal lobes (aTL), and the temporoparietal junction (TPJ)
- linked to inferring the mental states (beliefs, intentions) and/or personalities of others (Schurz et al., 2014)

What Happens When Damaged? (Samson et al., 2004)

Testing false belief reasoning:

A video showed a woman watching as a man placed a green object in one of two boxes. The woman then left the room and while she was away, the man swapped the two boxes. The woman then returned and pointed to one of the boxes. Healthy participants infer that the woman has a false belief and that the green object is therefore located in the box other than the one indicated.



After damage to the left temporo-parietal junction false belief reasoning is at chance-level.

Interim Summary II

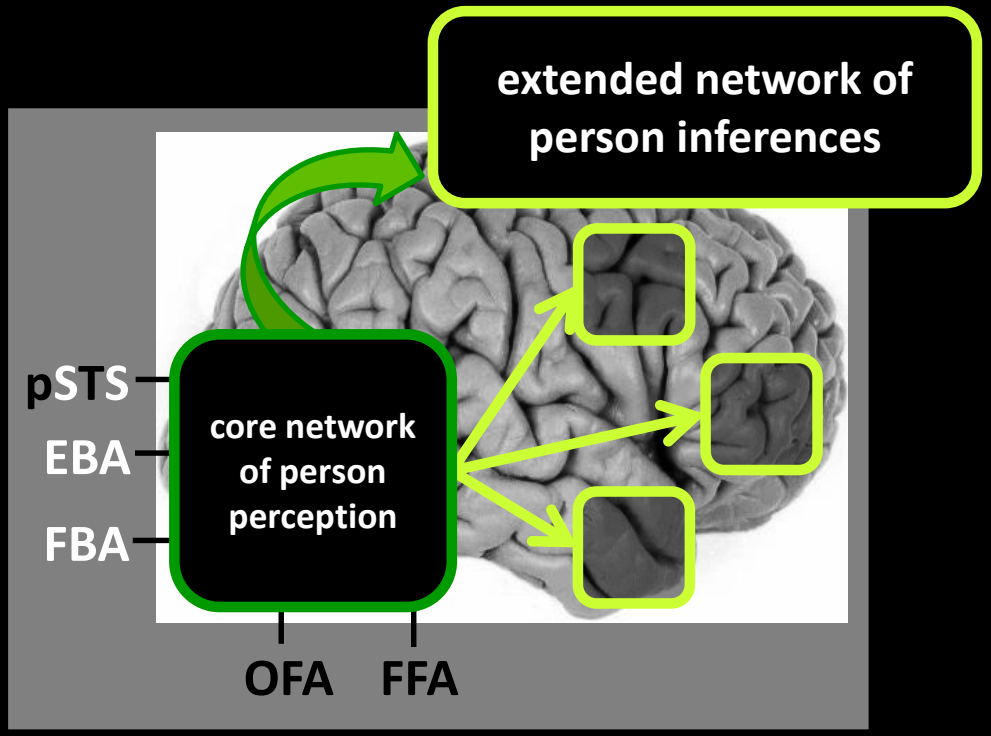
- upon perceiving people we tend to simultaneously 'perceive' invisible person qualities to predict their actions
- these rapid person inferences frequently require a cognitive leap and may not necessarily be accurate (=> social psychology)
- person inferences are implemented by the so-called extended person perception network (or 'person inference network')
- if the network's normal processing is interrupted, person inference problems arise (e.g., impaired false belief reasoning)

Open Question

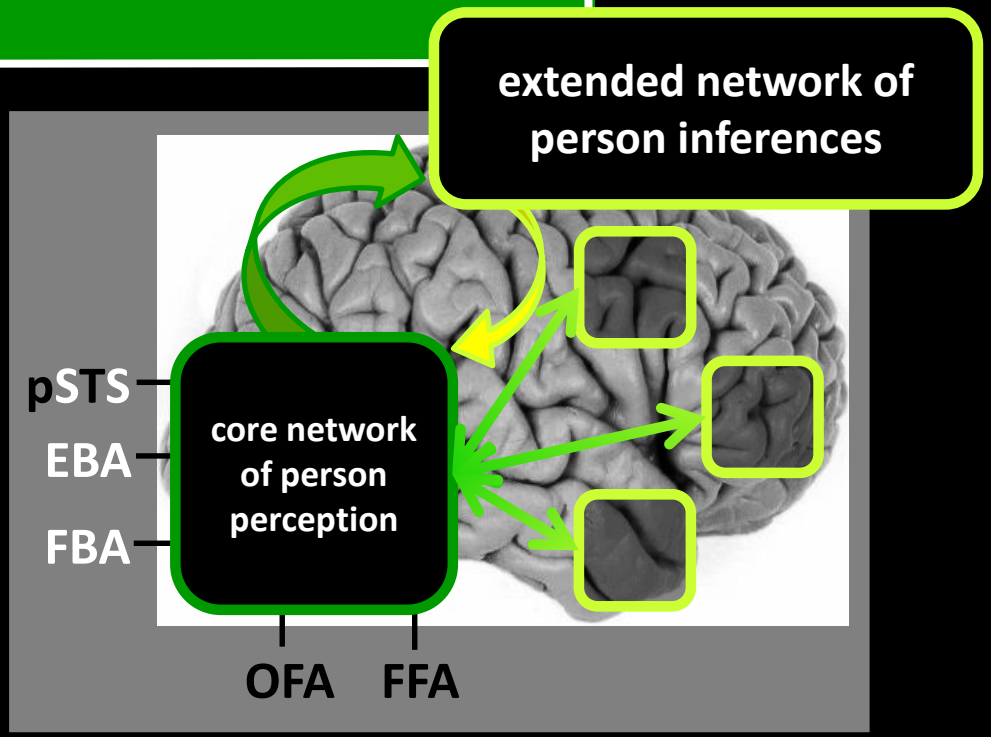
How do the core network of person perception and the extended network of person inferences interact?

The Classic View (Downing & Peelen, 2011)

- sequential processing of information (feed forward model)
- core network creates representation based on visual input
- created representation then used by extended network to exploit the socially relevant information



The Alternative View (e.g., Muckli, 2010)



- simultaneous exchange between both networks
- core network creates representation based on visual input and person's experience/expectations/ goals
- extended network generates predictions that support/guide processing in core network

Summary: The Haxby & Gobbini Model (2011)