

A network of occipito-temporal face-sensitive areas besides the  
right middle fusiform gyrus is necessary for normal face  
processing

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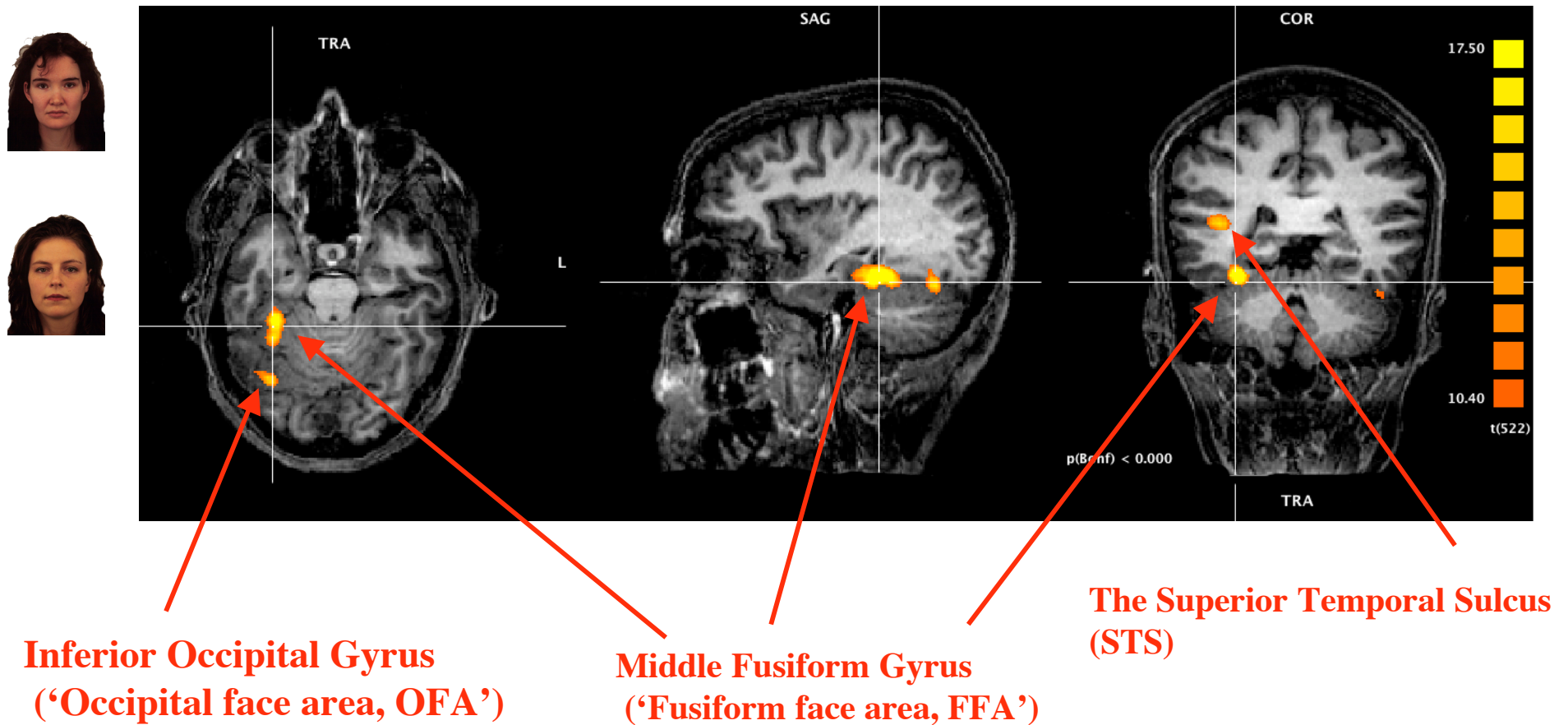
*Brain*, 2003, 126 , 2381-2395.

## Main findings and conclusions

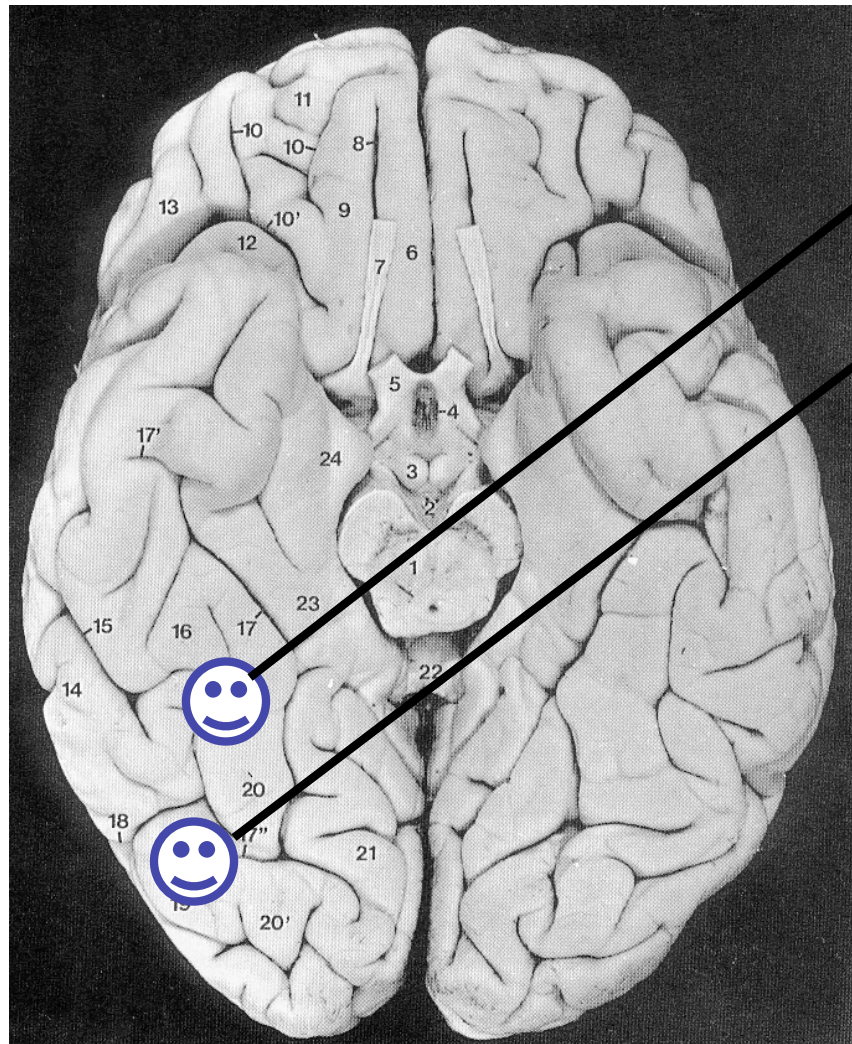
- \* Prosopagnosia can follow a right hemispheric lesion sparing the ‘fusiform face area’ (FFA)
- \* The integrity of face-preferential coding in the right inferior occipital cortex (‘occipital face area’, OFA) is **necessary** for normal face perception, and a lesion of this region may be the main cause of prosopagnosia.
- \* Activation of the ‘FFA’ may not be due to inputs from the ‘OFA’ in normal subjects, as in a feedforward face processing model
- \* We suggest that both the ‘FFA’ and ‘OFA’ in the right hemisphere and their reentrant integration are necessary for normal face processing

Note: these observations have been replicated in another case of prosopagnosia, DF, by Steeves et al. (2006, *Neuropsychologia*).

= Neuroimaging studies have disclosed three visual areas where a larger response to faces than other object categories is consistently observed in single subjects, with a *right hemispheric dominance*:



Two of these areas are located in the ventral visual stream



‘Fusiform face area’ (FFA)

‘Occipital face area’ (OFA)

## Two critical questions

- \* Are these areas (all) **necessary** for normal face perception?
- \* How do they **interact** with each other during face processing?

To answer these questions, we performed an fMRI study of the prosopagnosic patient PS, who is unable to recognize faces following a brain damage in 1992

PS has normal visual functions and **object recognition**

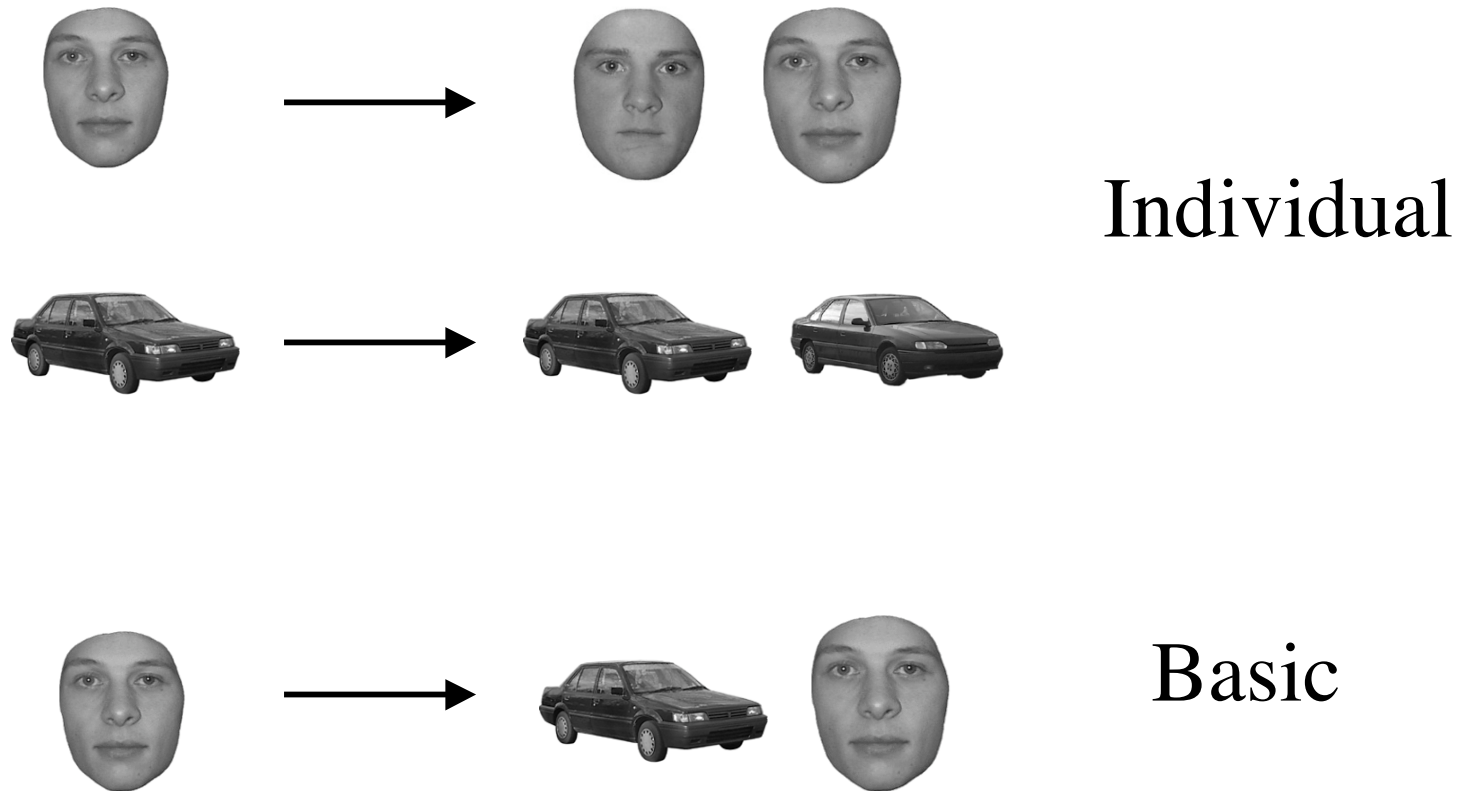
- Low-level: small left paracentral scotoma, acuity: 8/10 both eyes
- Reading OK
- 100% object recognition (Colorized Snodgrass and Vanderwart set by Rossion & Pourtois, 2004)



- **No deficit at subordinate object recognition**, even when RTs are considered

# 2AFC: Matching at basic and individual level

(data from Schiltz et al., 2006, *Cerebral Cortex*)



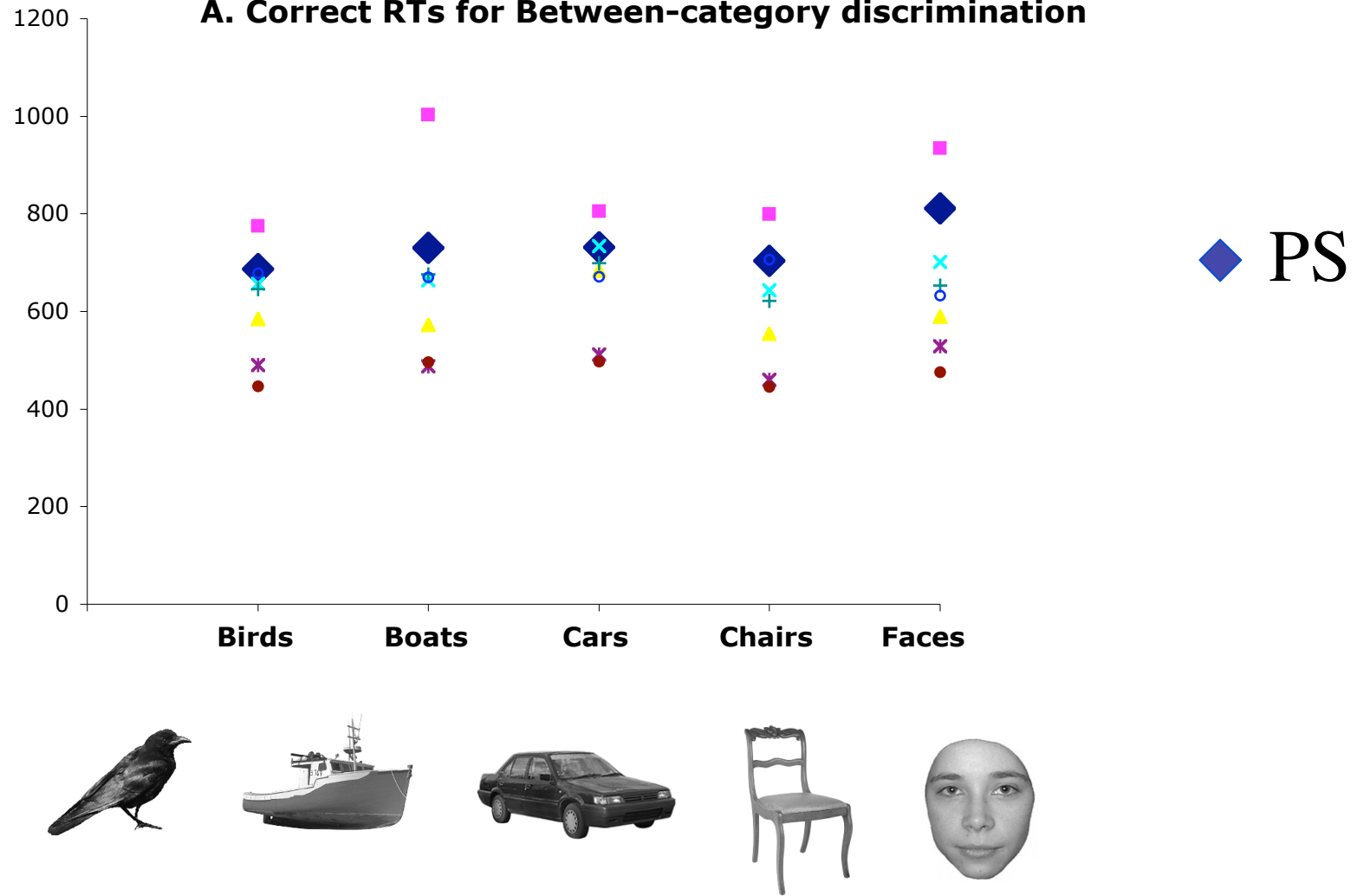
First stimulus 2000 ms; pair until response

*Case description*

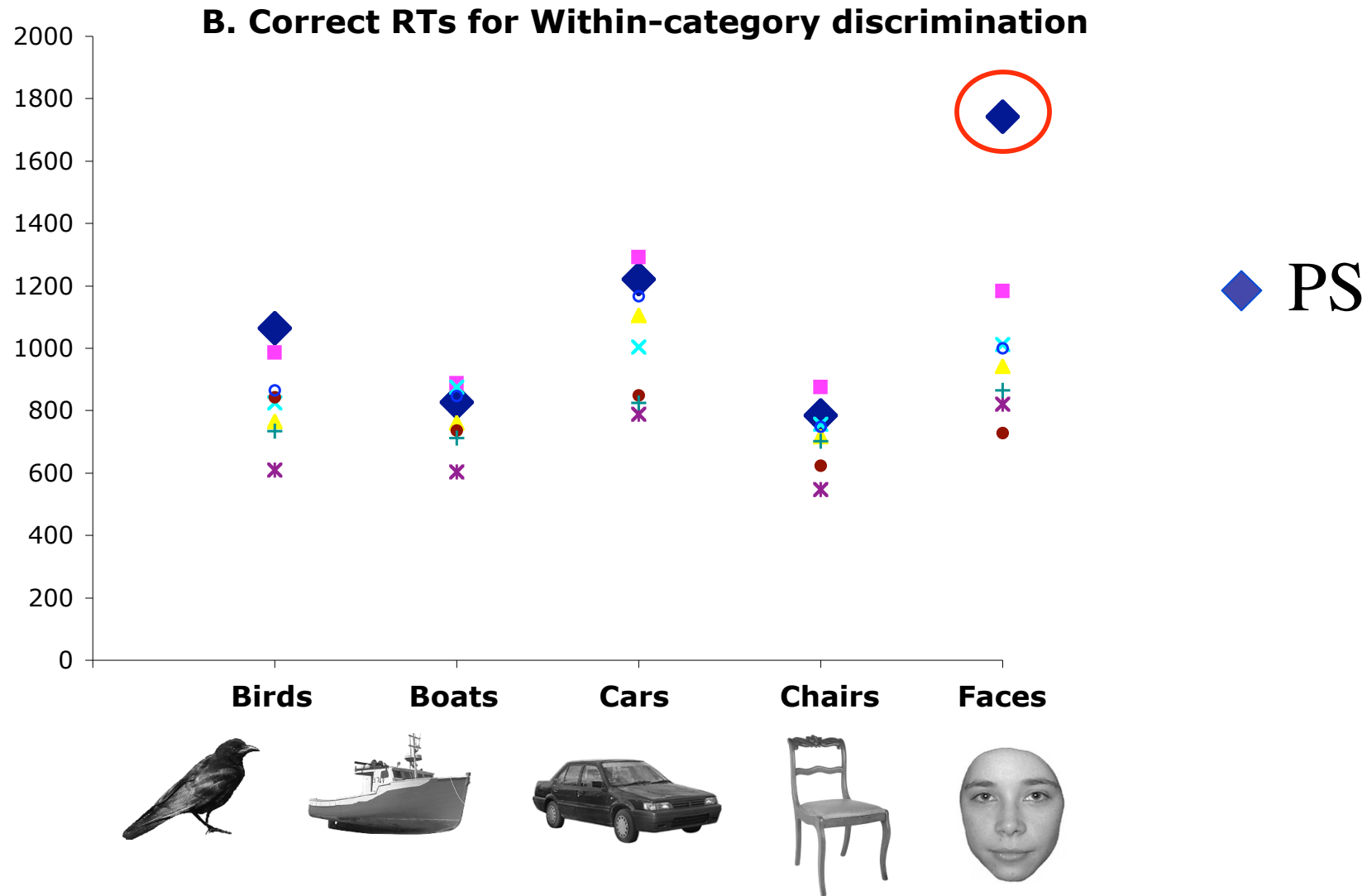


# 2AFC: Matching at basic level

**A. Correct RTs for Between-category discrimination**

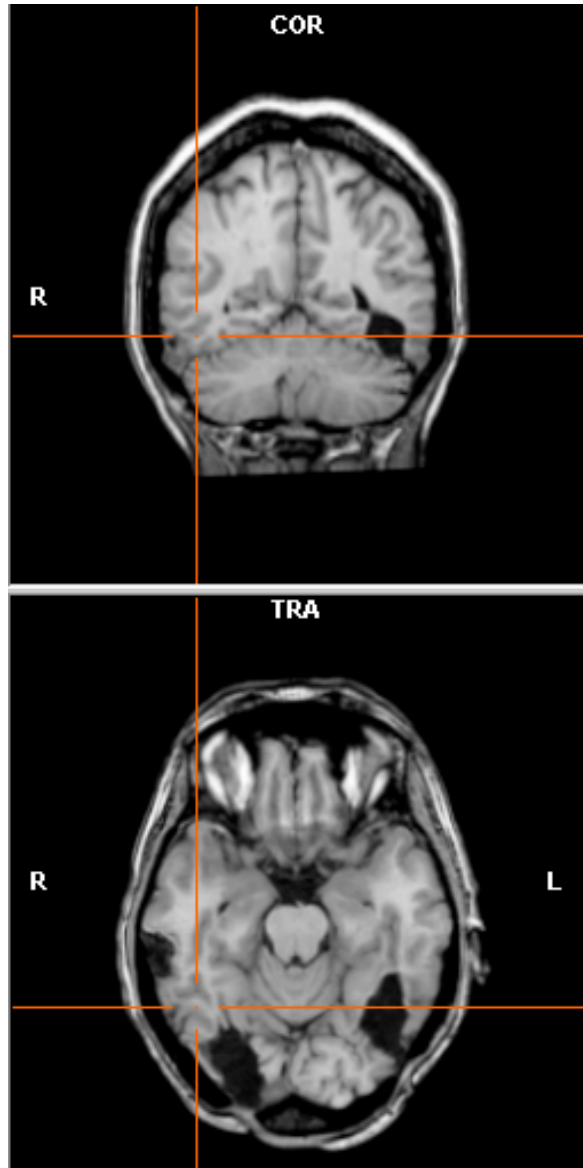


## 2AFC: Matching at individual level

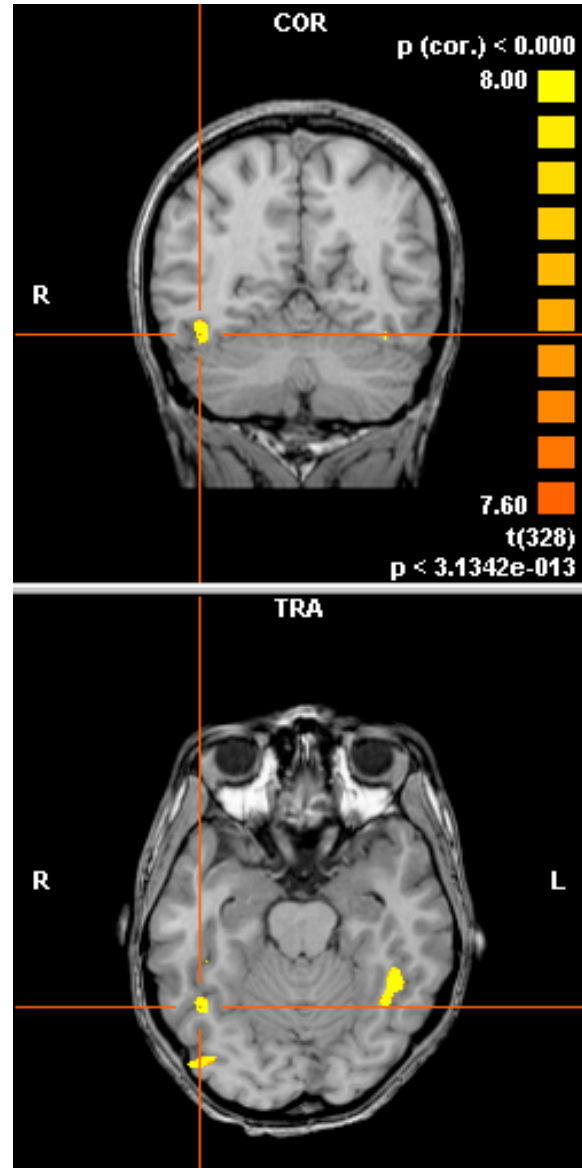


# Anatomical scan: PS's lesions spare the right 'FFA'

PS



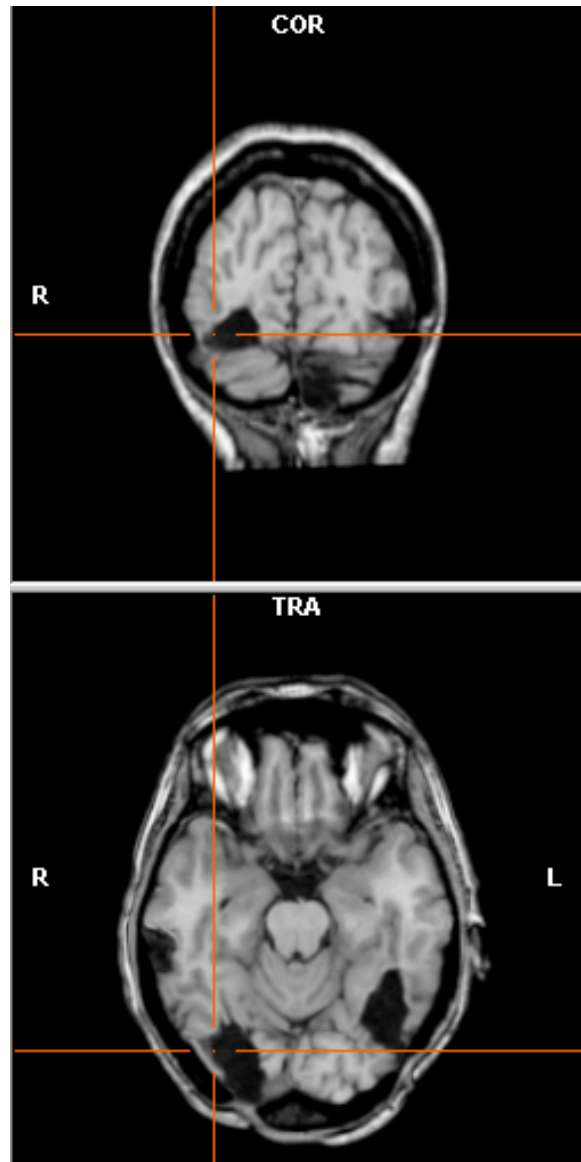
Control



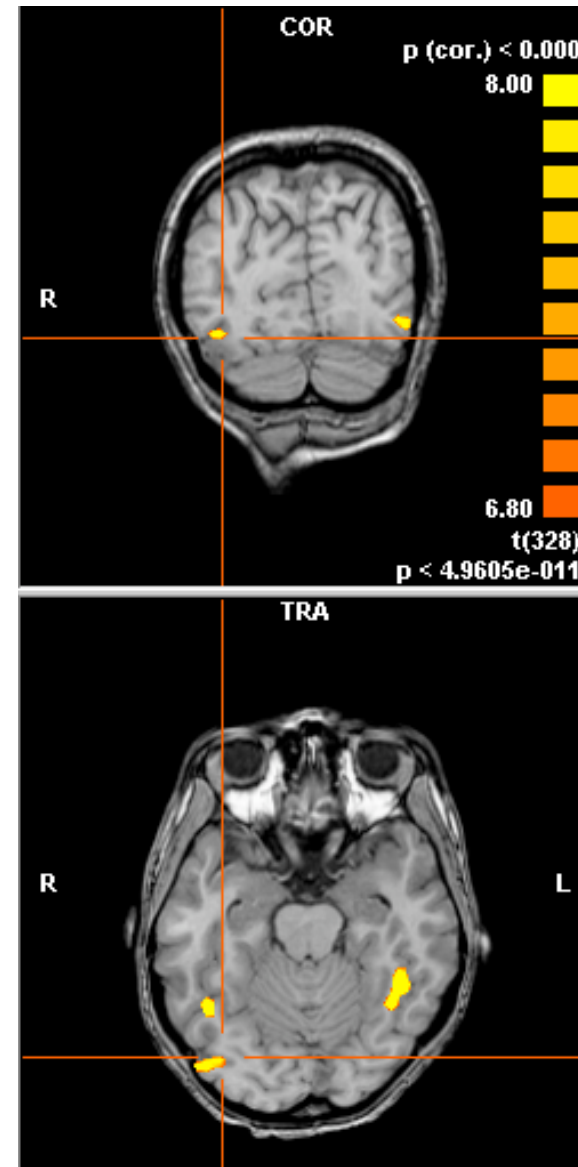
*Results*

# PS's lesions concern the right 'OFA'

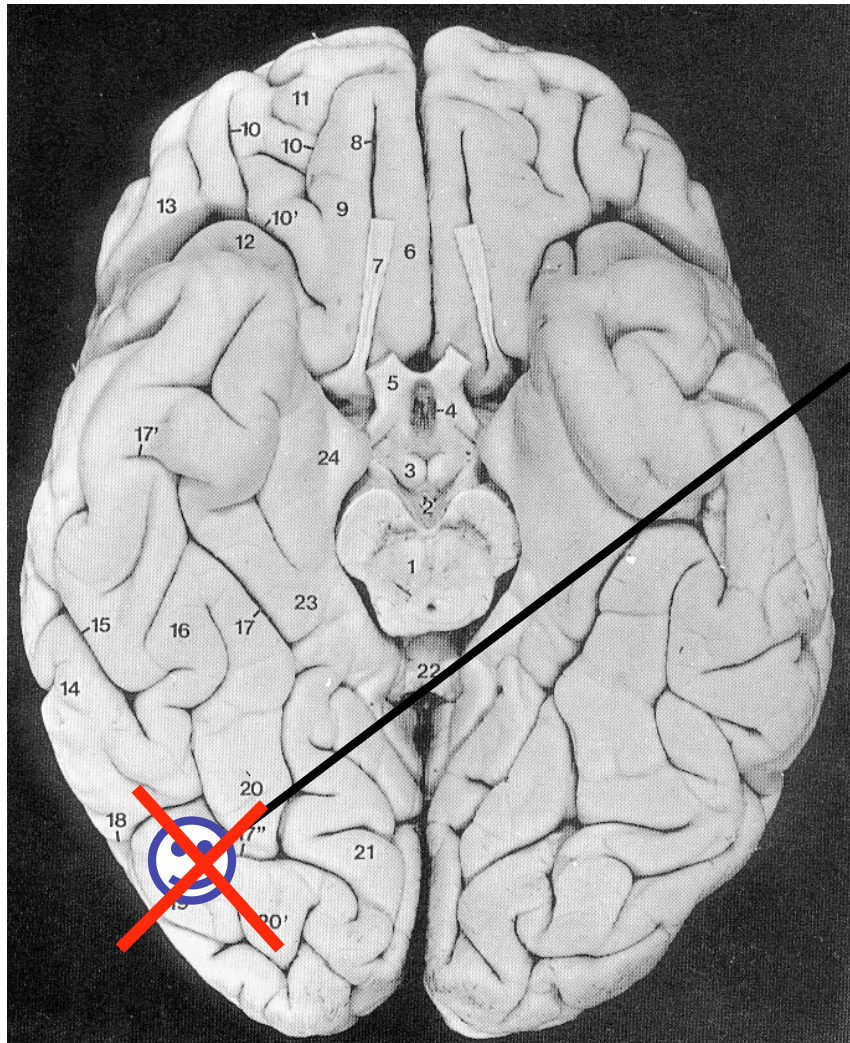
PS



Control



*Results*



'Occipital face area' (OFA)

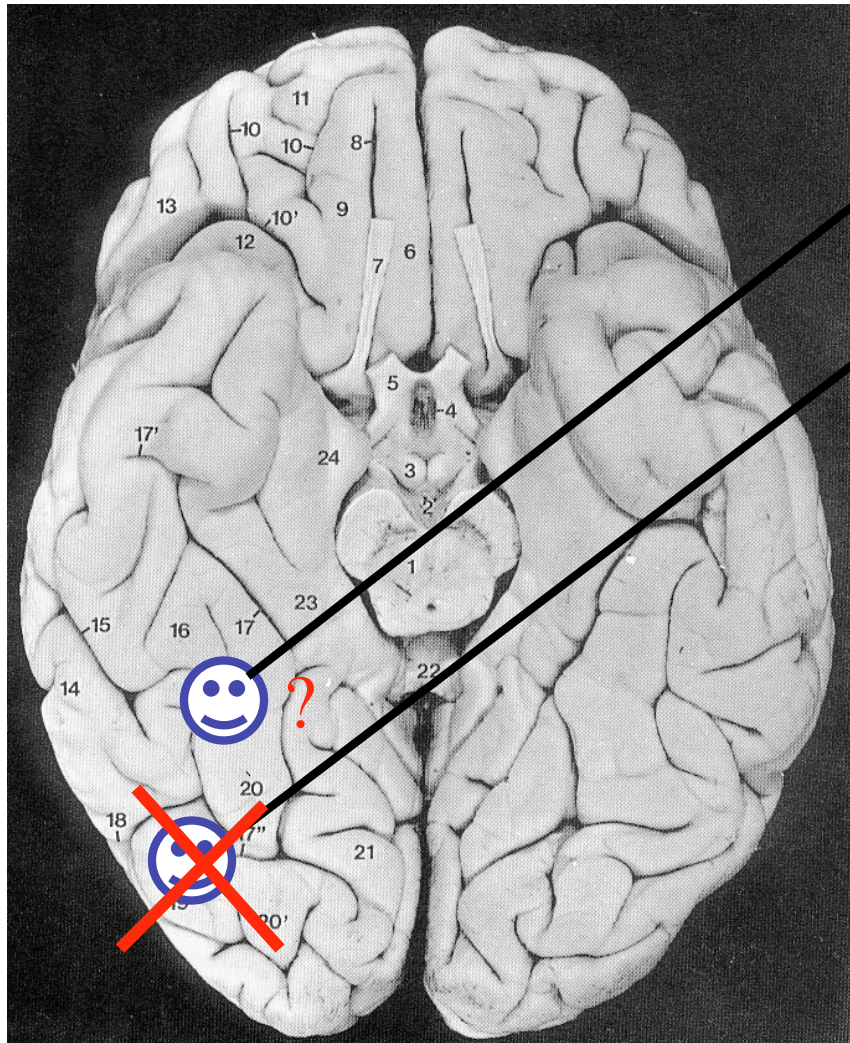
## Conclusion 1:

The right 'OFA' is **necessary** for normal face processing

Can we **activate** the **right middle fusiform gyrus (FFA)** for faces despite the face impairment and lesion to the right **inferior occipital cortex (OFA)**?

*Results*

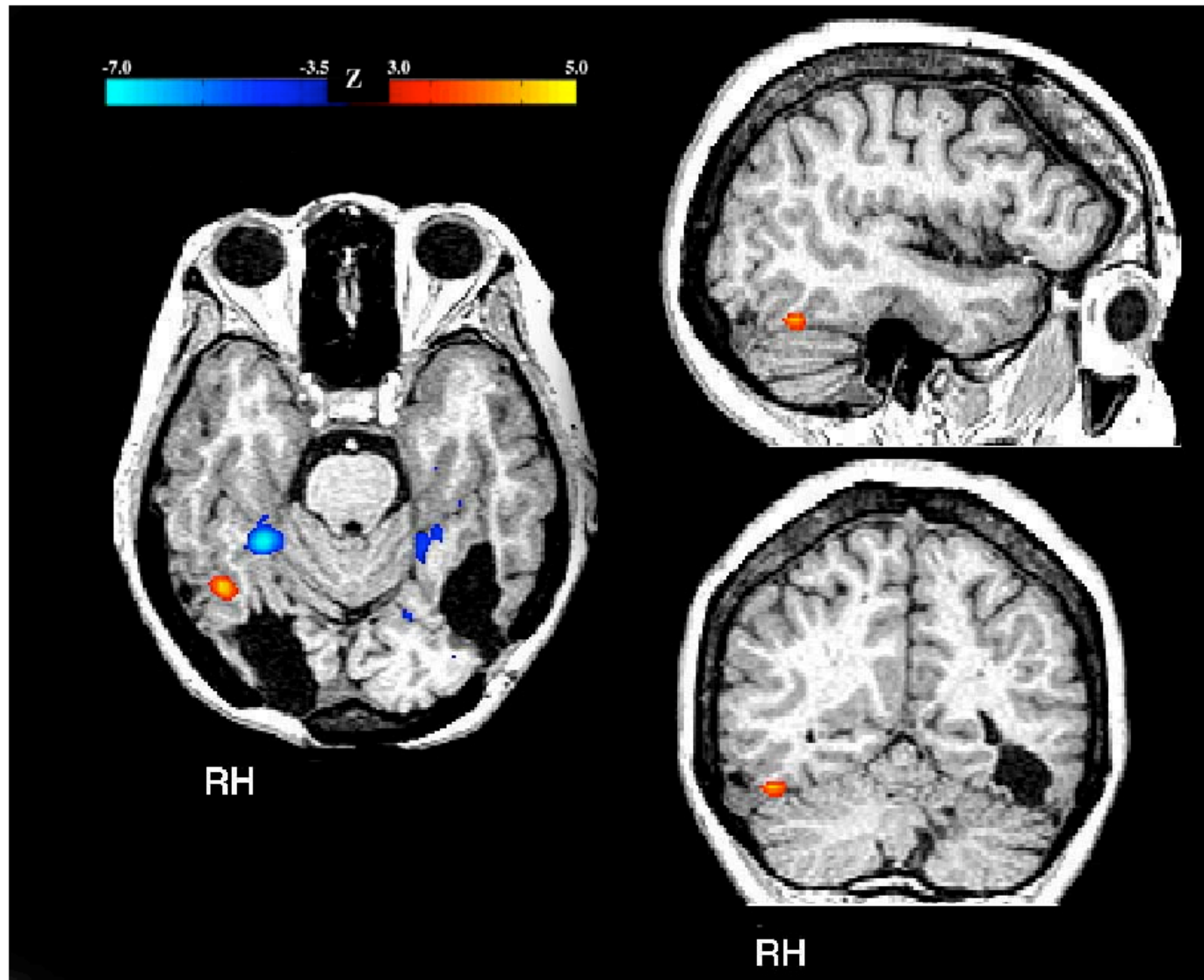




‘Fusiform face area’ (FFA)

‘Occipital face area’ (OFA)



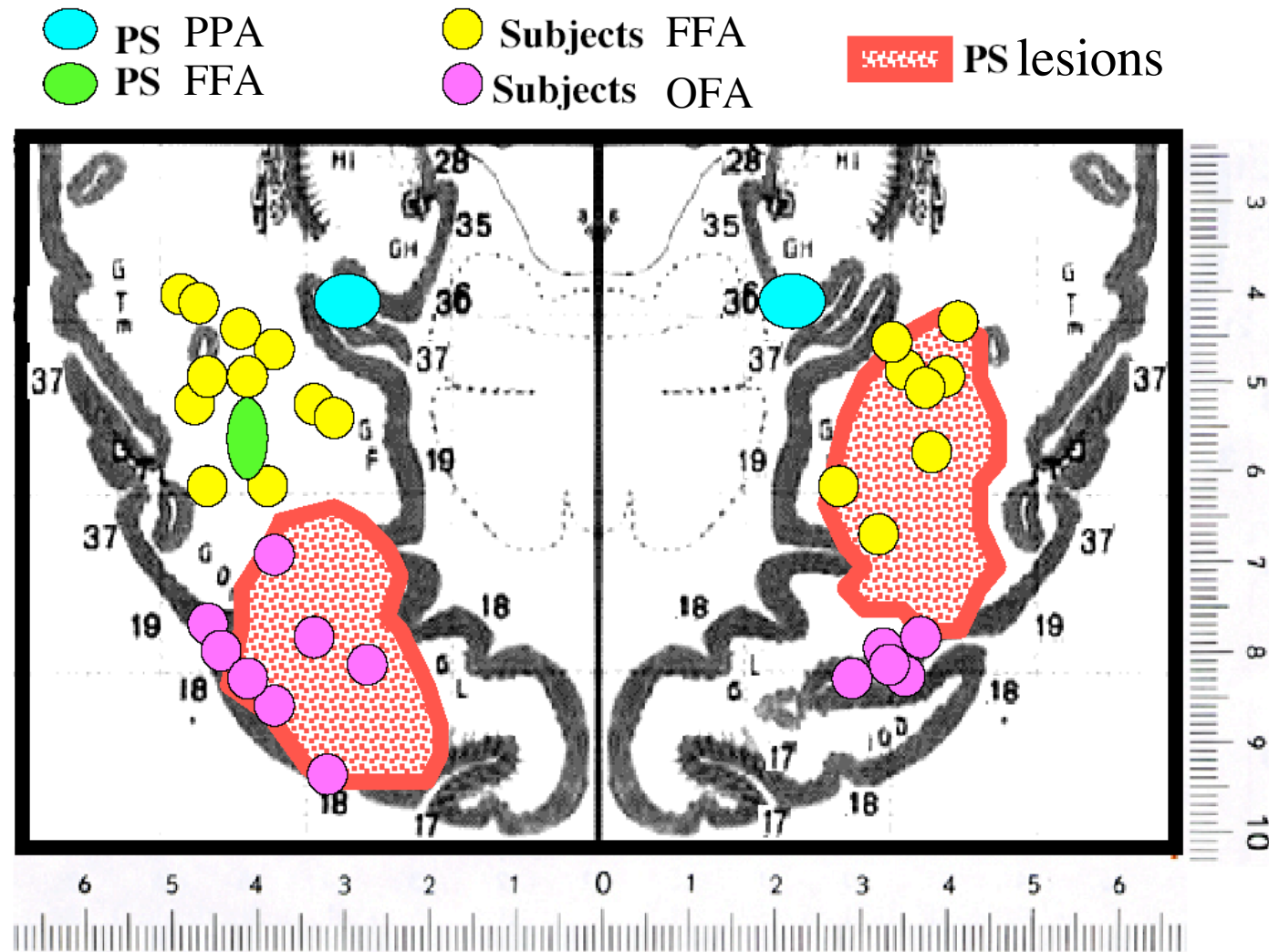


## Right middle fusiform activation in patient PS

Faces - Objects, block design fMRI

*Results*

The localization of PS' right FFA is similar to that of controls  
(note the degree of variability between subjects)



*Results*

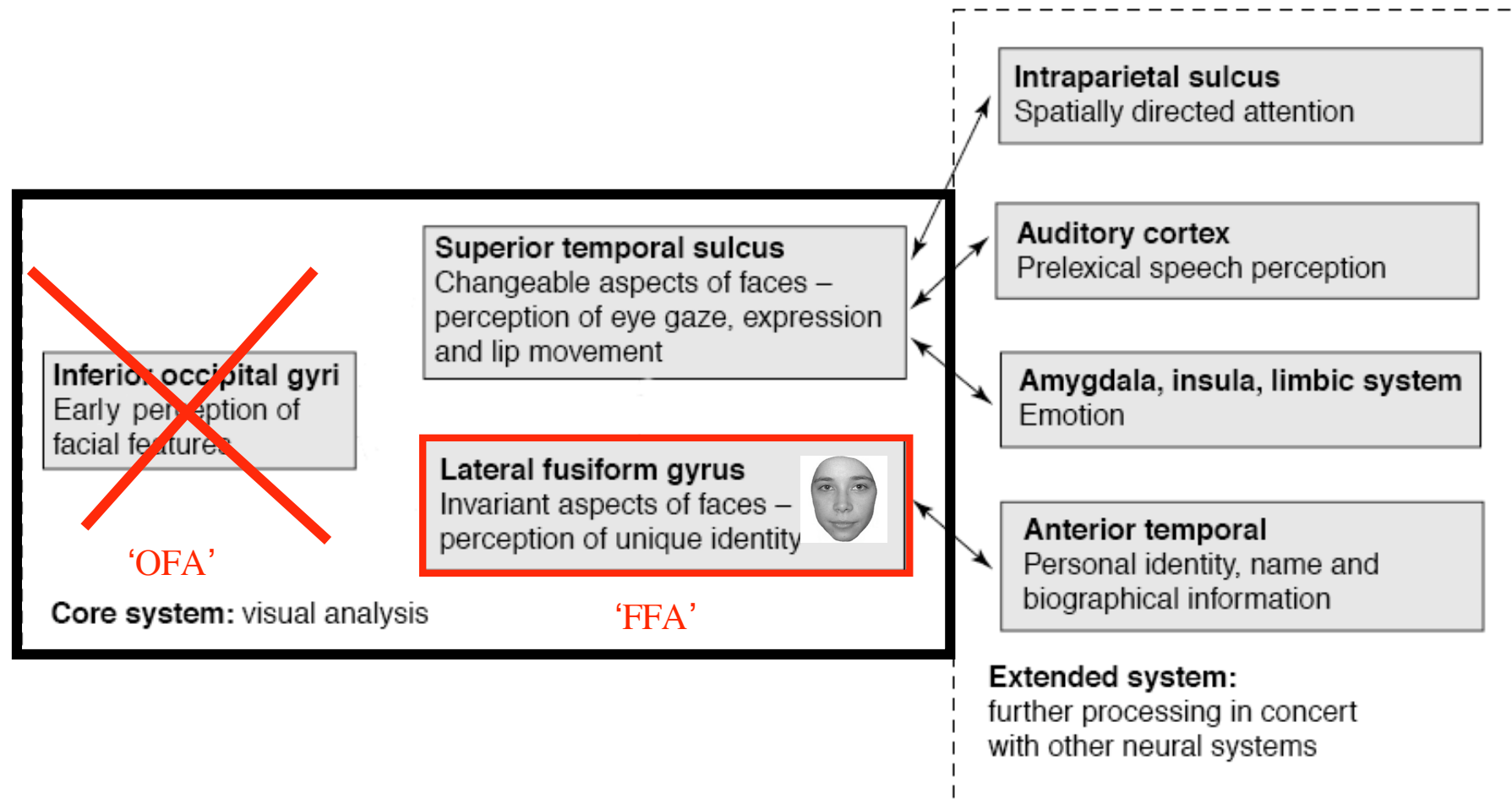
The level of activation of PS' right FFA is in the normal range

Subjects	Talairach coordinates (X, Y, Z)	Z-mean	Size (cm <sup>3</sup> )
S5	42 -44 -14	5.23	0.72
S1	38 -62 -15	4.66	0.86
S11	47 -54 -13	4.23	3.33
S2	45 -62 -17	4.03	1.75
S4	46 -50 -15	3.90	2.51
S3	38 -46 -16	3.74	0.55
S6	41 -48 -14	3.46	0.36
<b>PS(1)</b>	<b>42 -59 -18</b>	<b>3.43</b>	<b>0.17</b>
<b>PS(2)</b>	<b>41 -59 -18</b>	<b>3.22</b>	<b>0.24</b>
S7	32 -53 -21	3.38	0.22
S10	47 -40 -15	3.16	0.26
S8	31 -54 -25	2.92	0.04
S9	48 -41 -18	2.80	0.04

*Results*

The right OFA is not **necessary** for face-sensitive activation at the level of the FFA

This contradicts a view according to which the ‘OFA’ would be the front end of the system (e.g. Haxby et al., 2000)



Model from Haxby et al., 2000  
*Conclusions*

## What have we learned?

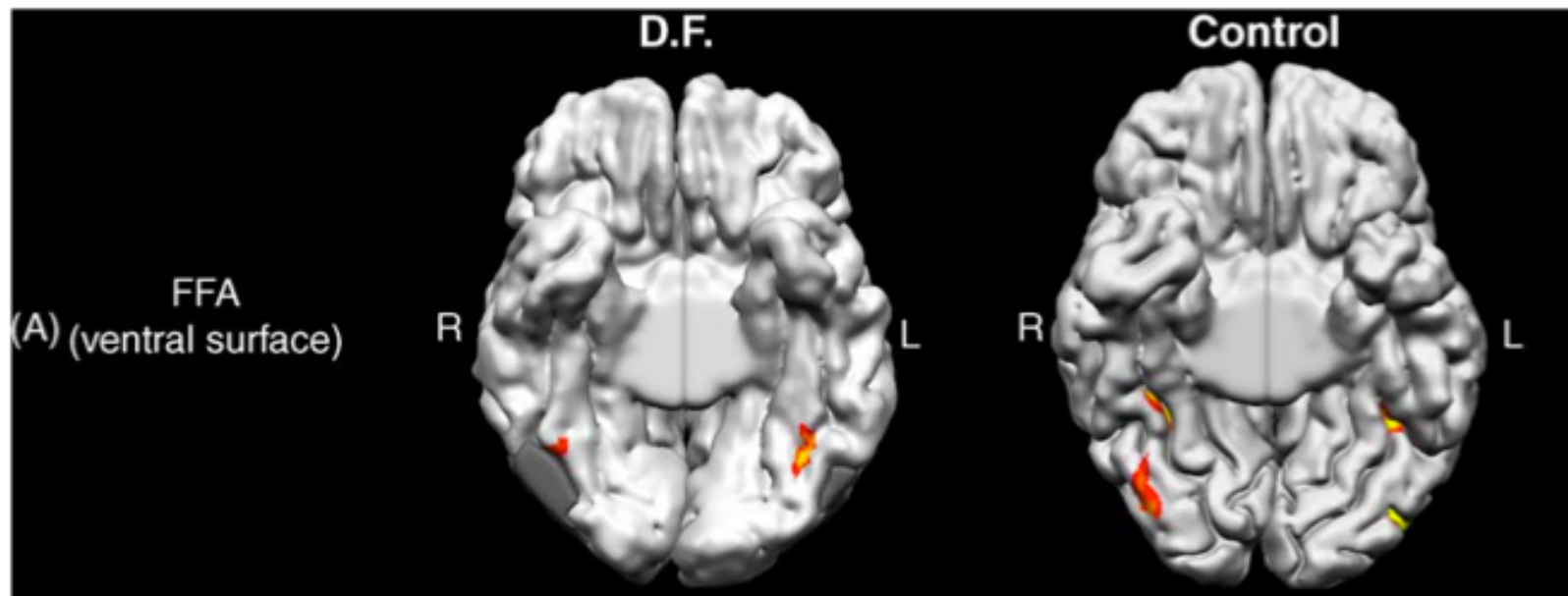
1. The integrity of the right inferior occipital cortex (OFA) is **necessary** for normal face processing

But ...

2. The integrity of the right inferior occipital cortex (OFA) is **NOT necessary** for face-preferential responses in the fusiform gyrus (FFA)

# Recently: Another prosopagnosic patient (DF) with bilateral 'OFA' damage and 'FFA' activation

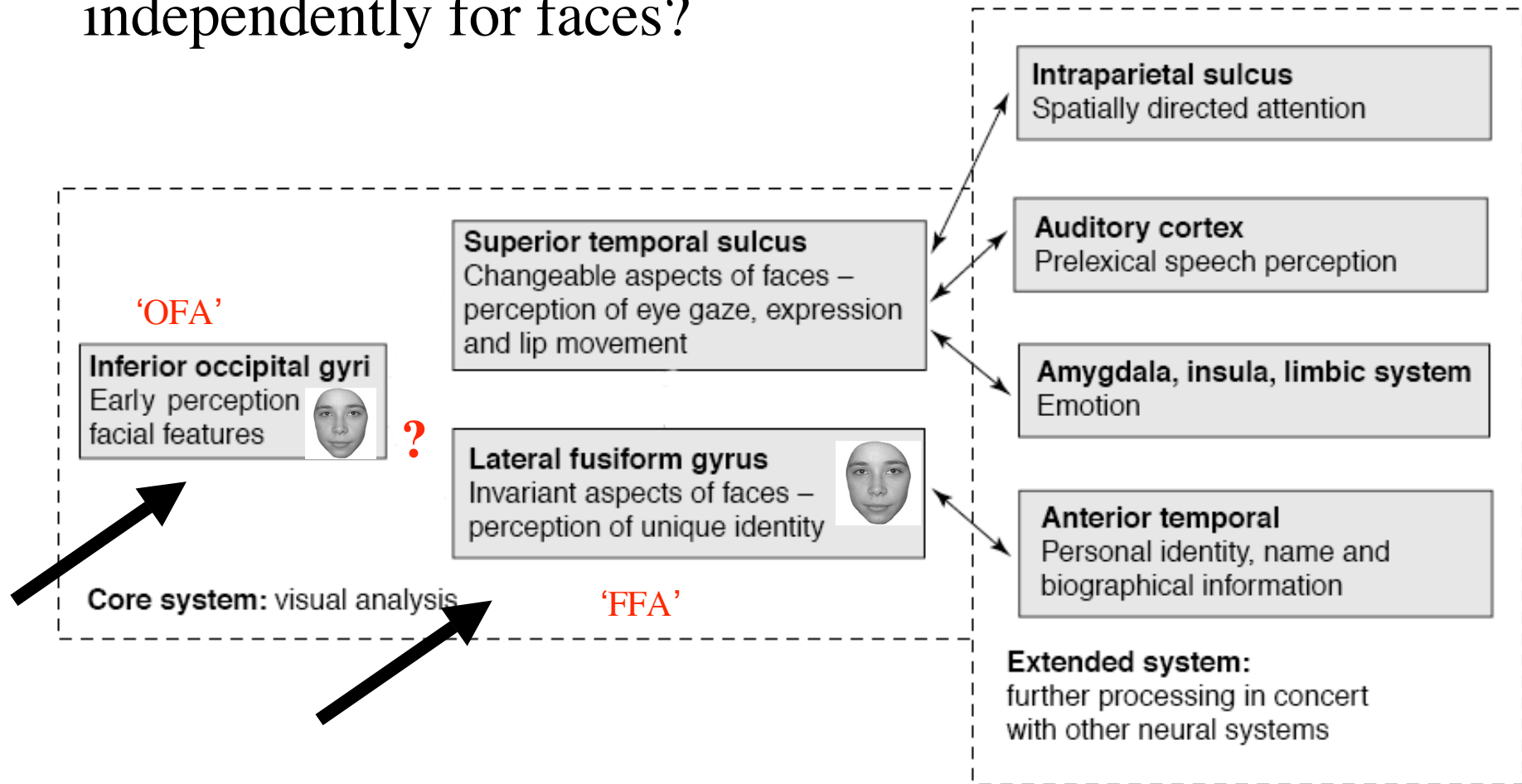
Steeves et al., 2006, *Neuropsychologia*



*Conclusions*

# What is happening in normal subjects ?

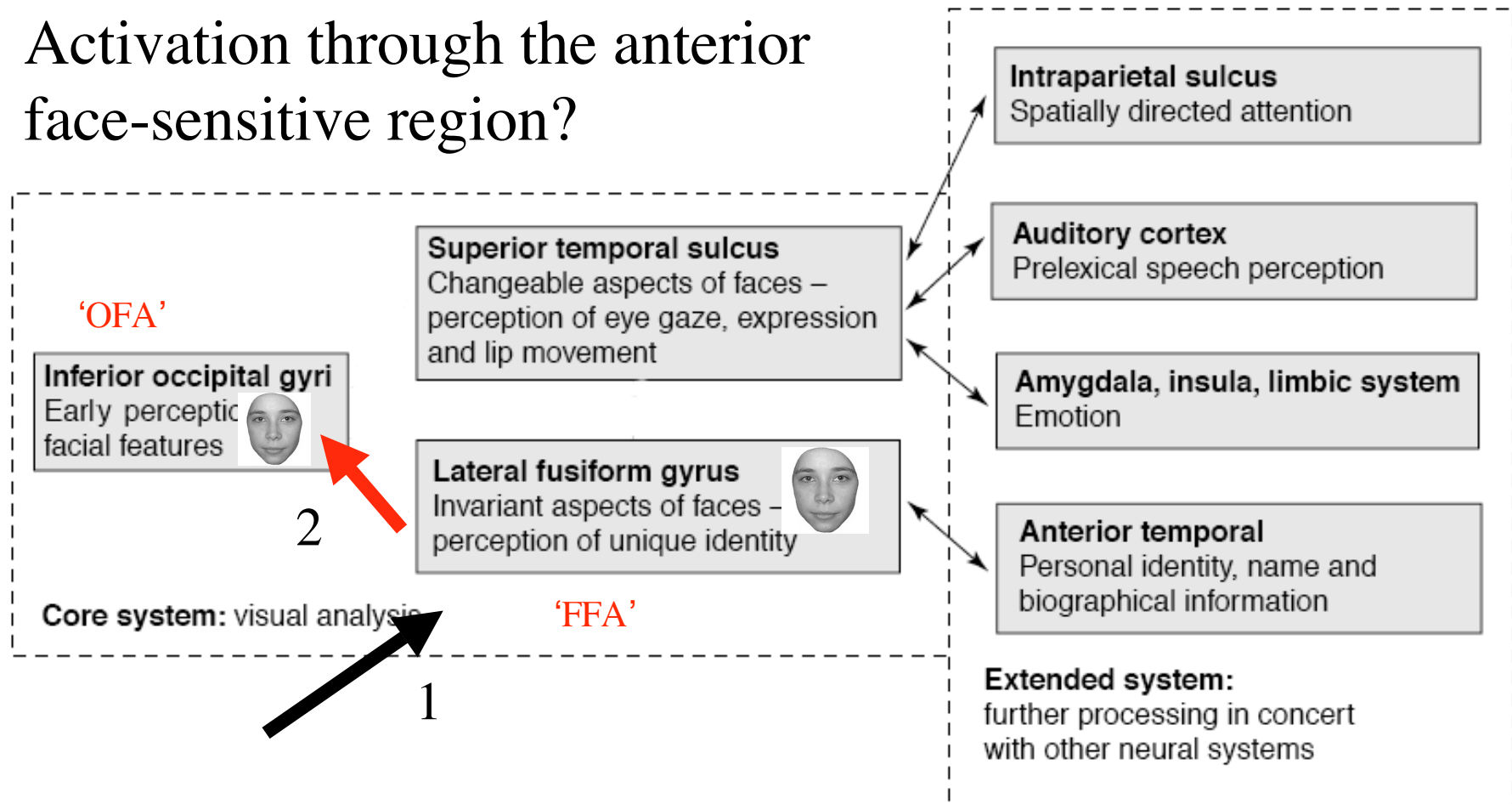
Parallel processing in both regions, activated independently for faces?



*Conclusions*

Or ...

Activation through the anterior face-sensitive region?



*Conclusions*