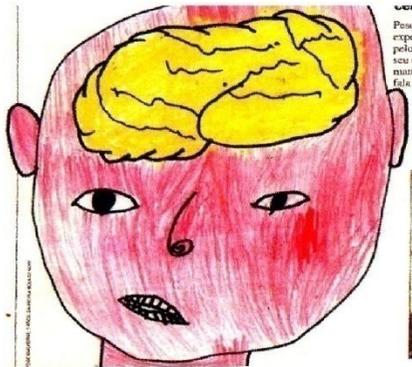

Cerveau Social & Autisme

Monica Zilbovicius



INSERM U1000,

Necker Enfants Malades, Paris

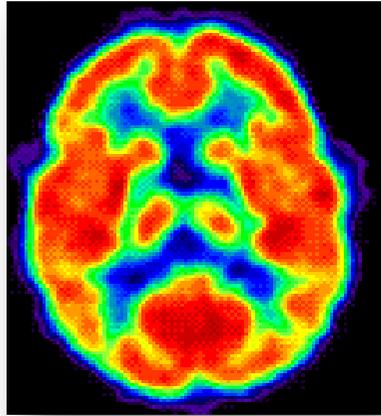
Troubles du spectre autistique

(autism spectrum disorders – ASD)

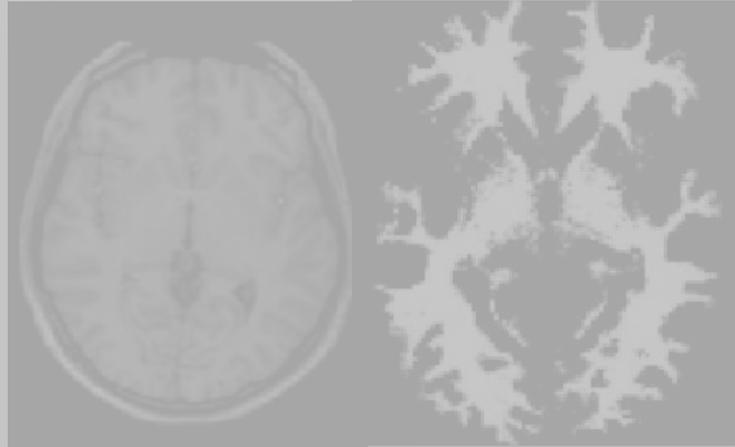




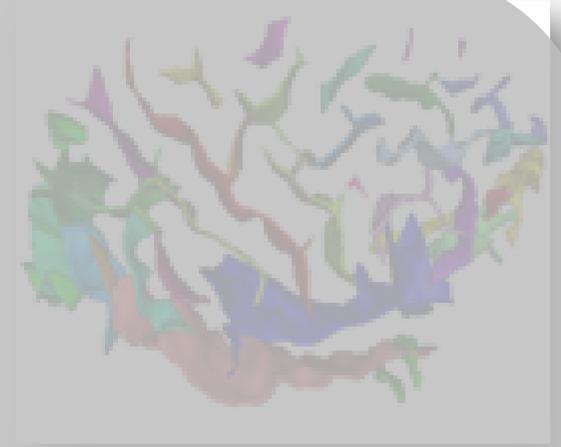
Imagerie & Autisme - INSERM U1000



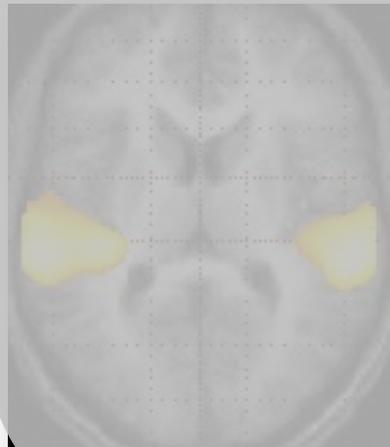
TEP – DSC repos



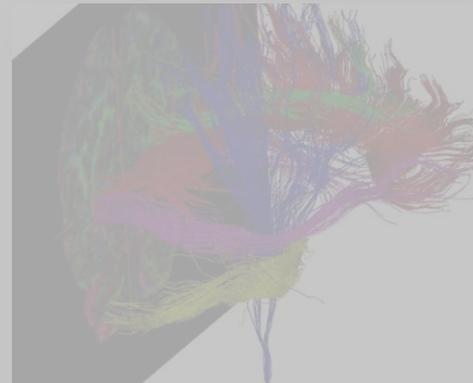
IRM statistique



Sulci



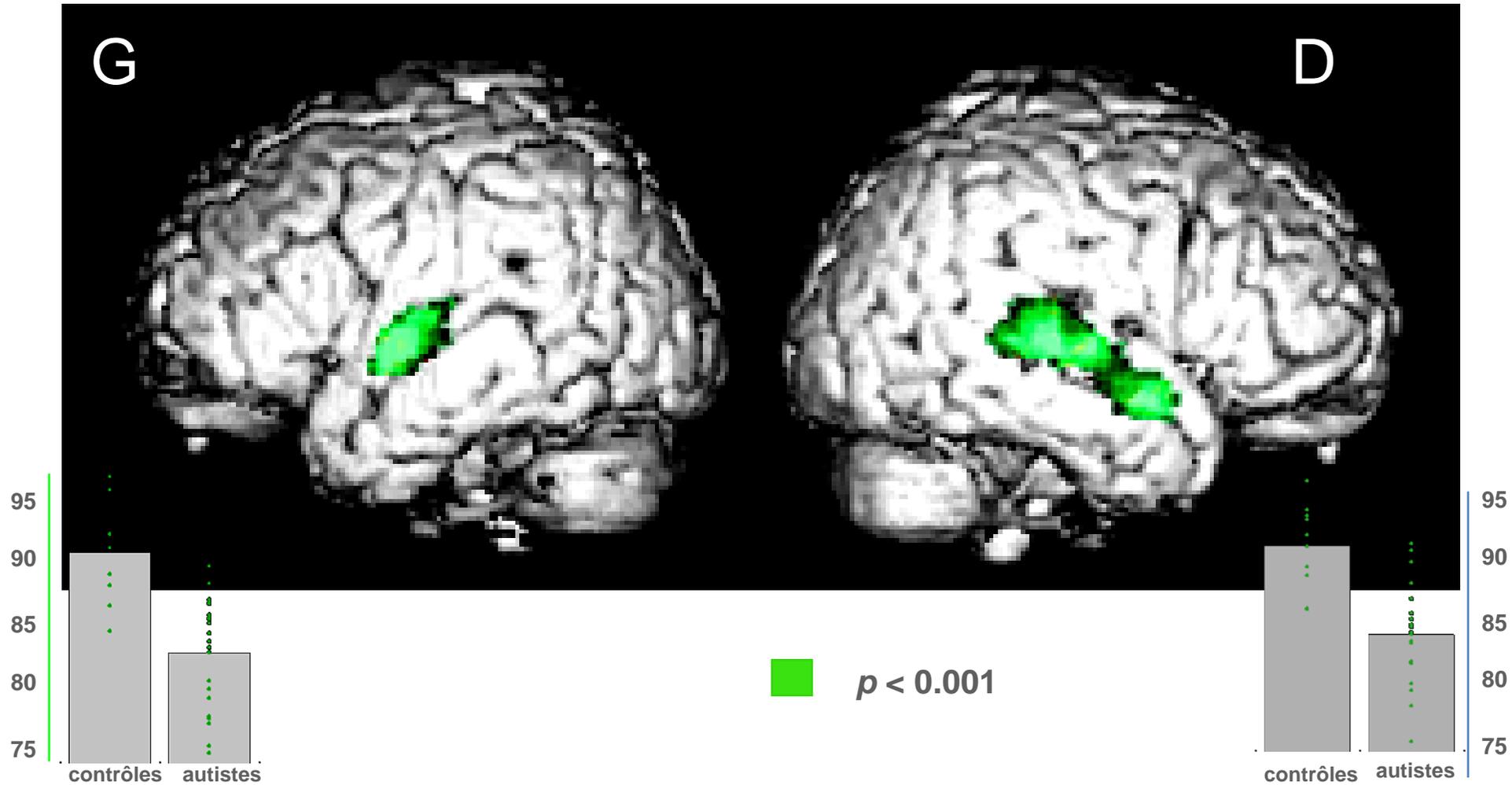
IRMf



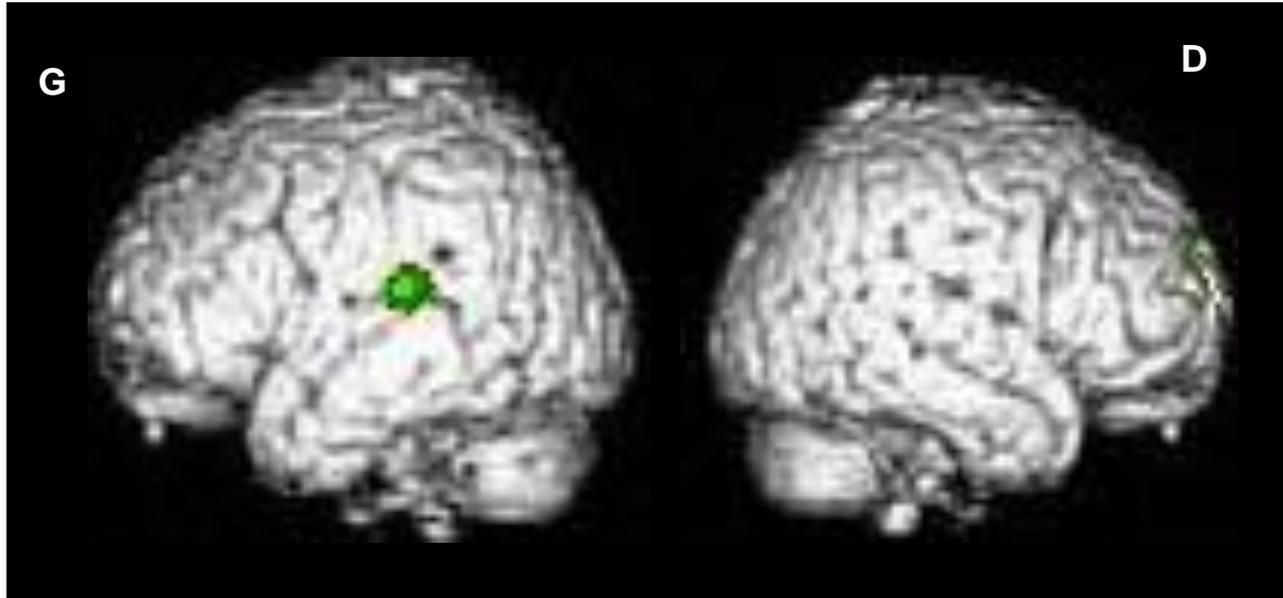
IRM diffusion

TEP - Hypoperfusion Temporale

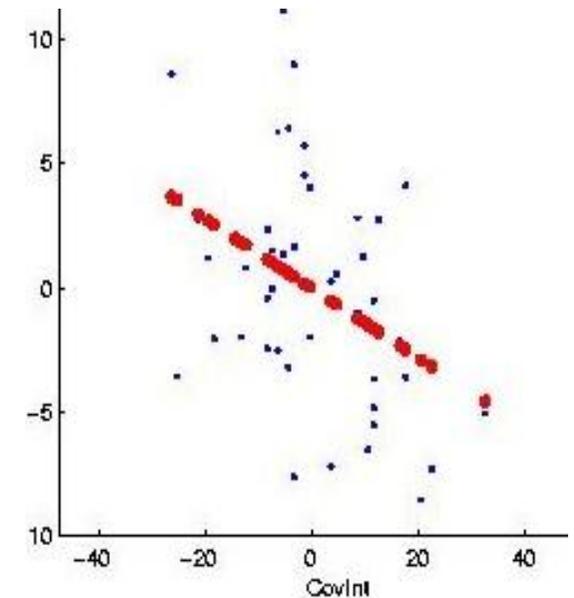
32 enfants autistes



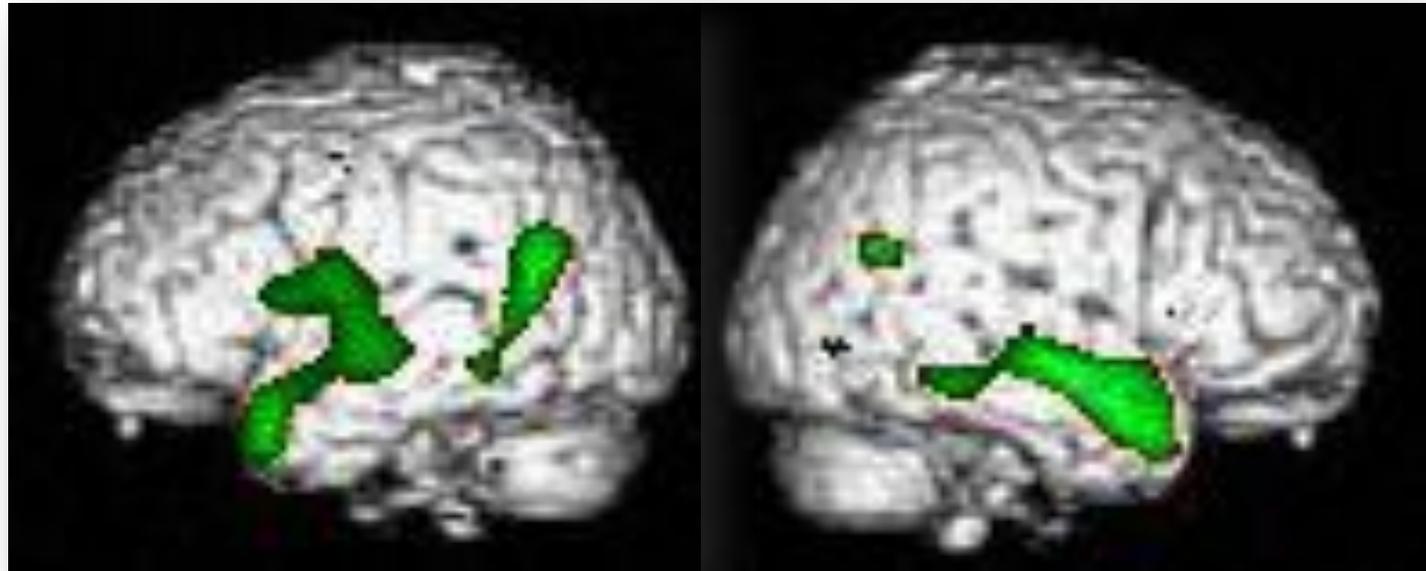
Corrélation entre le DSC et la sévérité du syndrome autistique



Corrélation négative avec l'ADI global ($p < 0.001$)



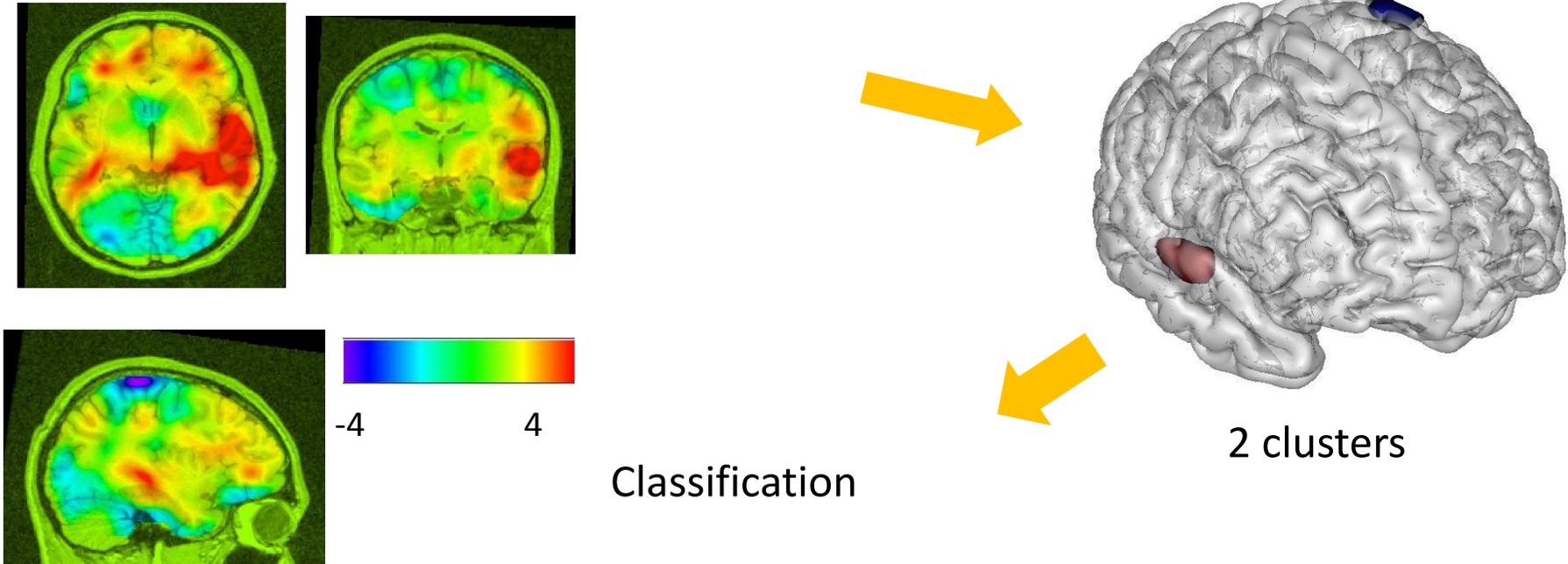
Détection Individuelle de l'anomalie temporelle – 80 % des enfants



 $p < 0.01$

Analyse Multivariée & détection individuelle

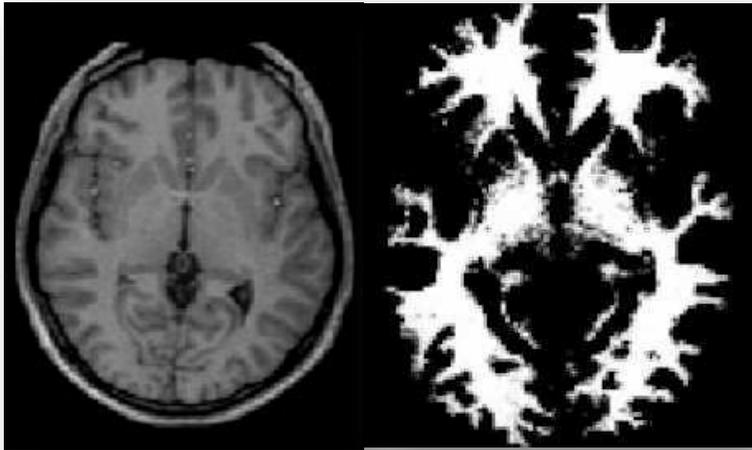
45 A, 13 R (5-12 ans), TEP



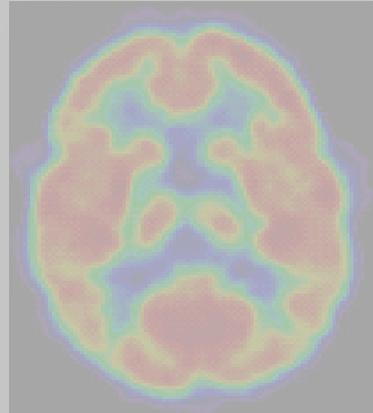
Detection individuelle : 88%

A: 91% (41/45) R: 77% (10/13)

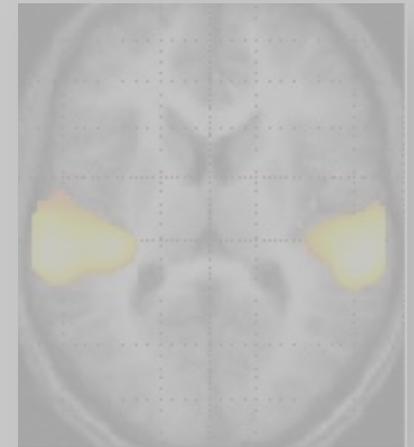
Imagerie & Autisme - INSERM U1000



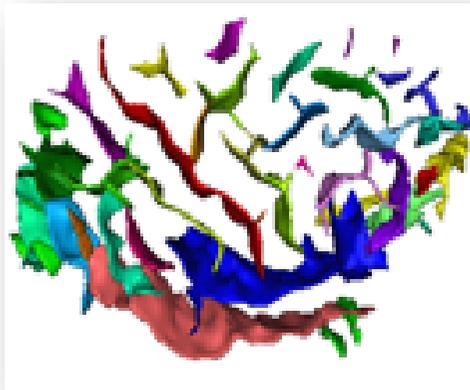
MRI-VBM



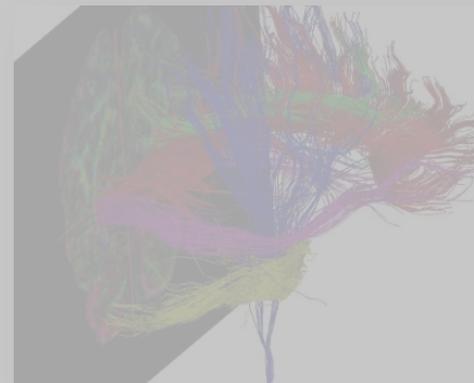
PET – rest CBF



fMRI

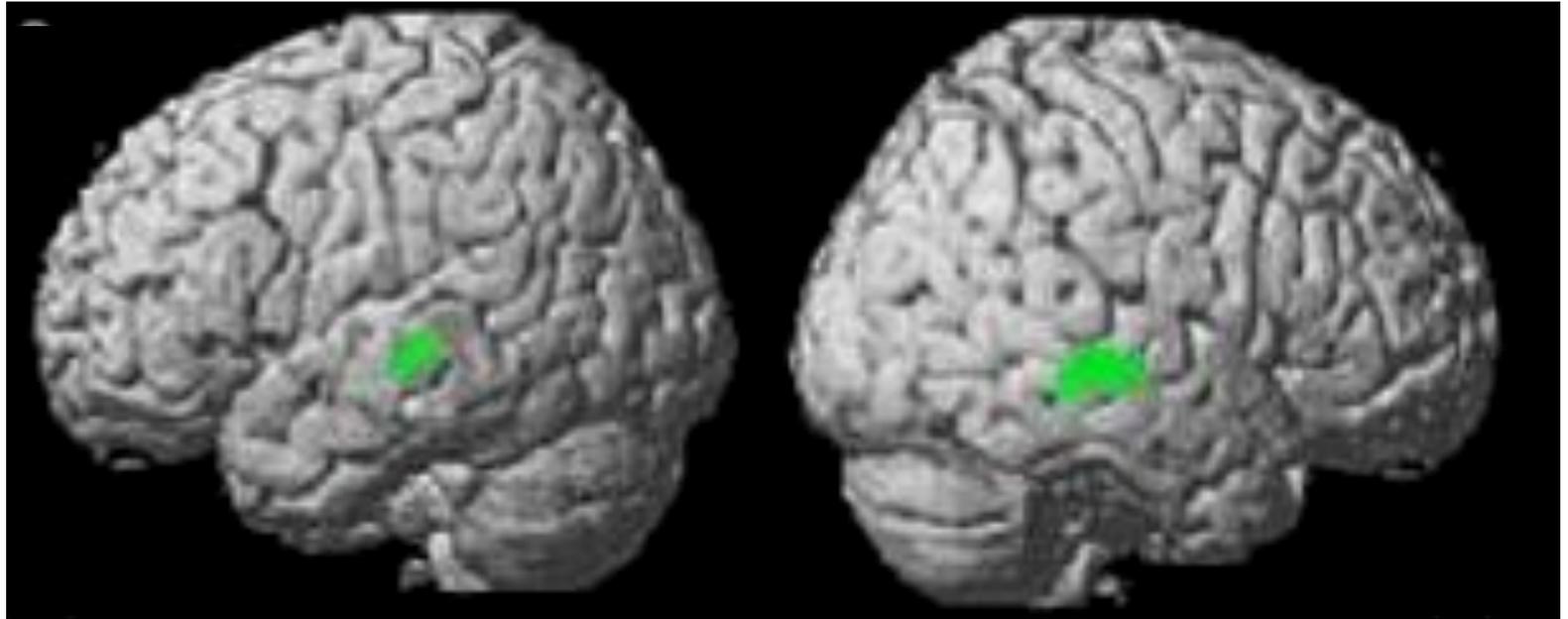


Sulcus



DTI

IRM - Anomalies Anatomiques dans l'Autisme

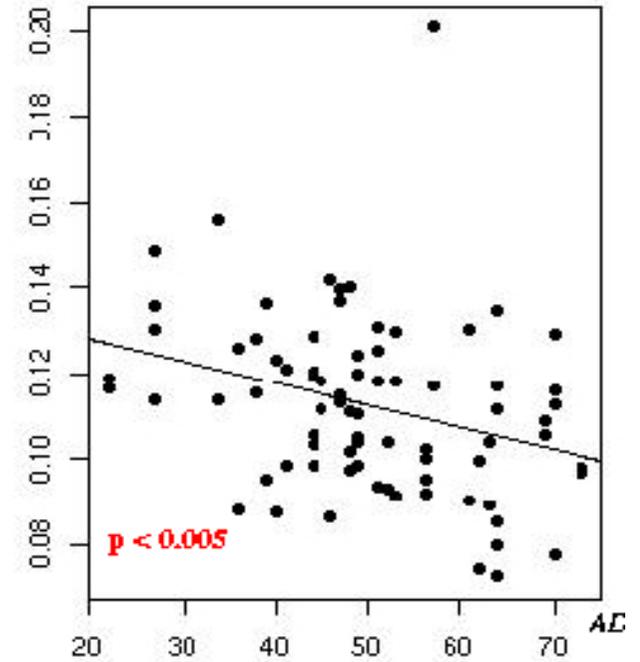
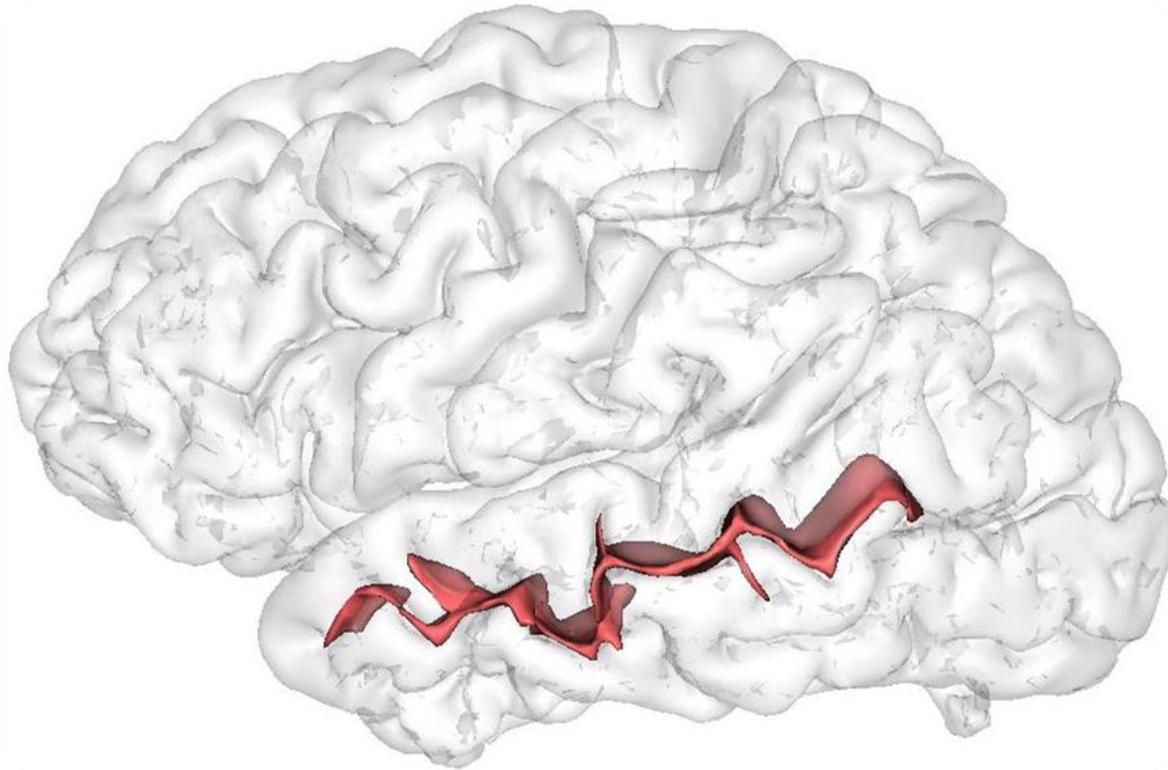


Diminution de la substance grise bi-temporale

Boddaert et al., NeuroImage, 2004

■ $p < 0.001$

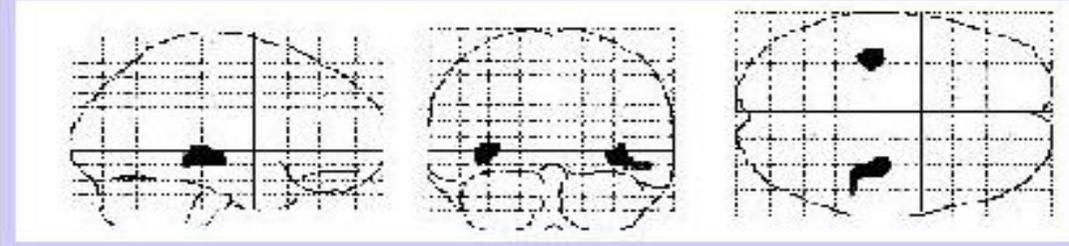
Corrélation - anatomie STS & sévérité autisme (ADI-R)



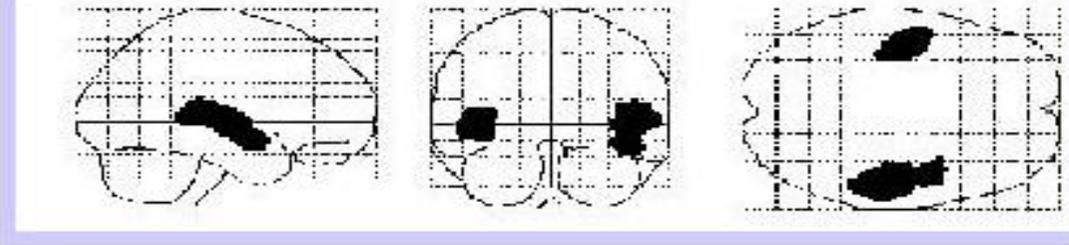
Cachia et al. soumis

Anomalies Temporales & Autisme

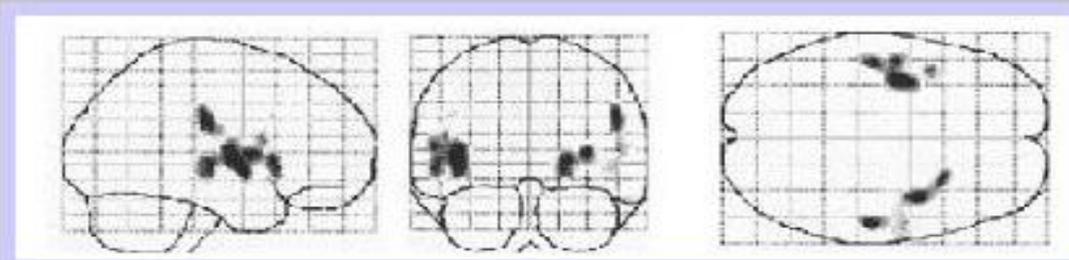
IRM

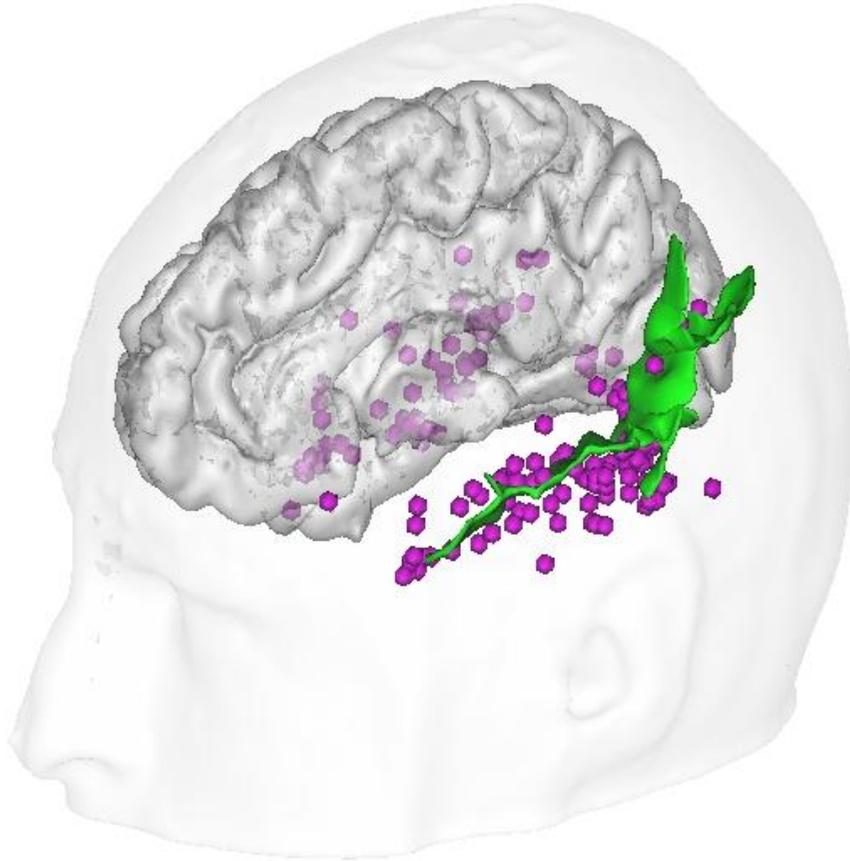


TEP



SPECT





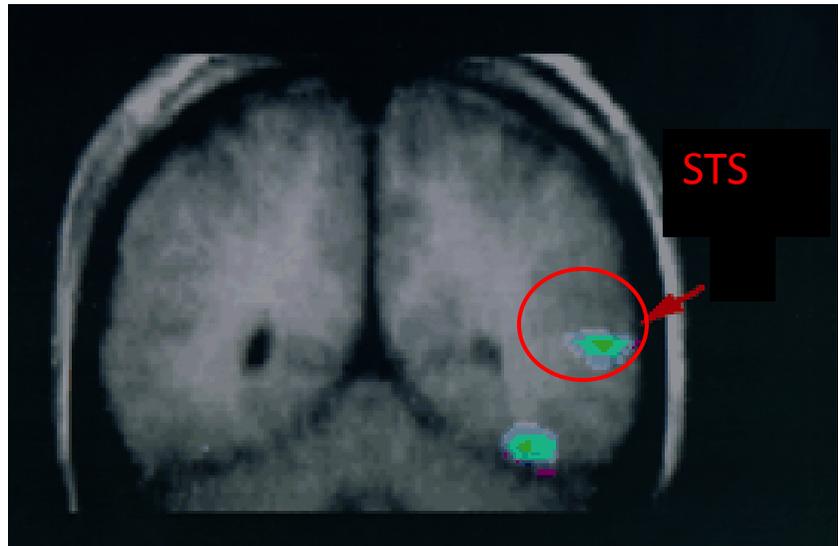
**TEP & IRM anatomique :
anomalies au niveau du STS.**

Quel est le rôle du STS dans le cerveau normal ?

Chez l'Homme

Pas de connaissance sur le rôle spécifique du STS
jusqu'à la fin des années 90 !

Activation inattendue du STS - perception du mouvement - Howard et al., 96
Mouvement Humain – activation du STS – Bonda et al., 96



STS & Perception Sociale

Perception Sociale -

Perception des mouvements biologiques

visages, yeux, corps, mains



Sillon
Temporal
Supérieur



"Not Too Good"



"Pretty Good"



"Very Good"

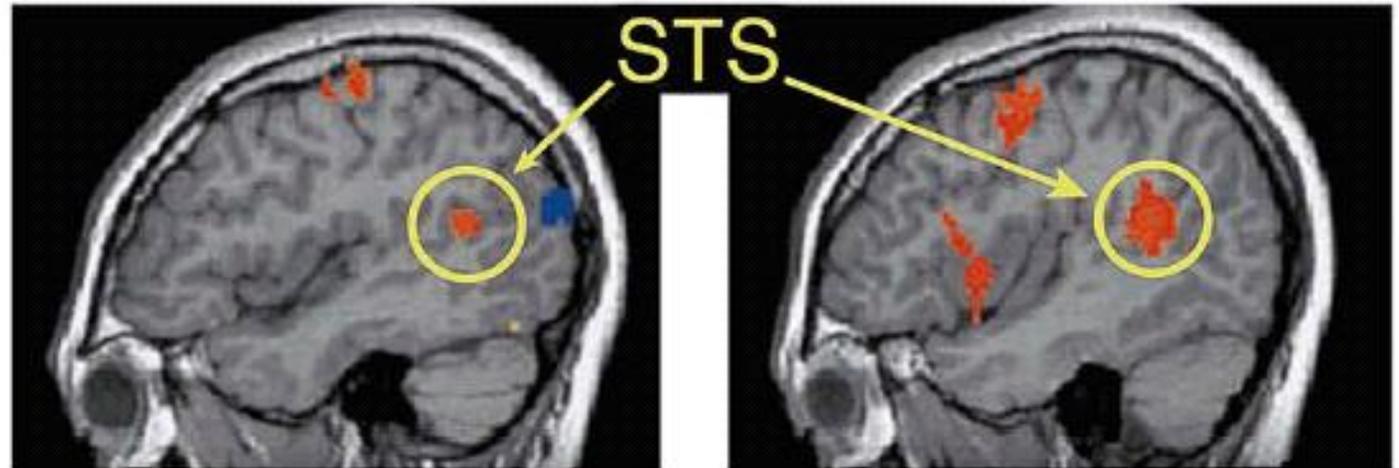
Le Regard

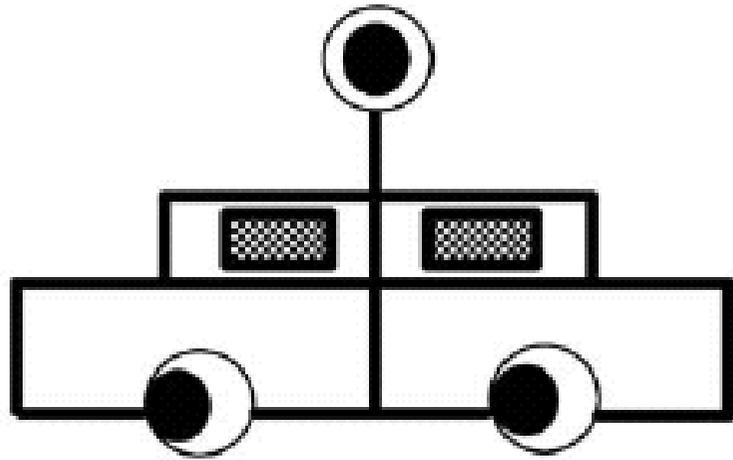
Gaze vs. Arrow



Left

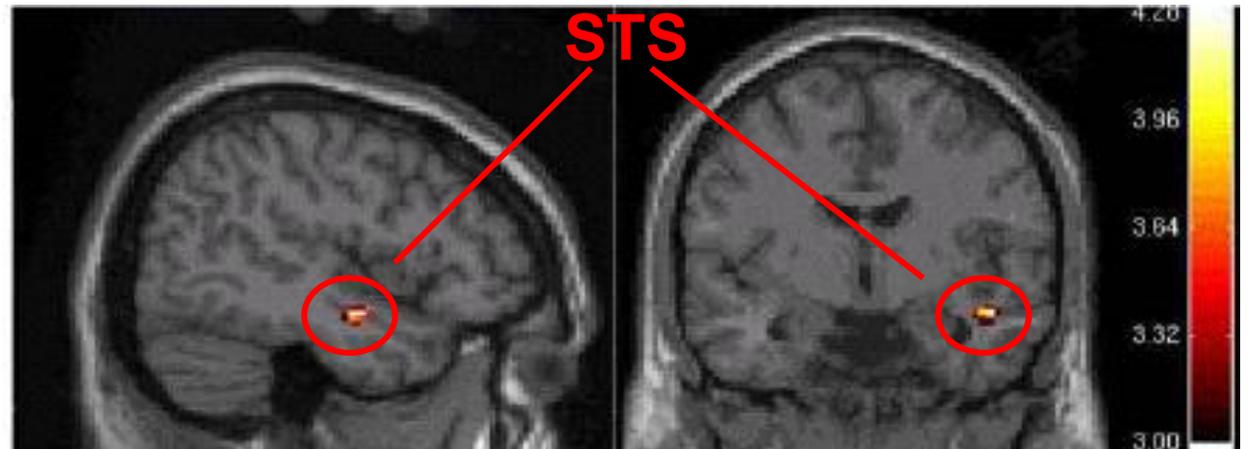
Right





Voiture ou oeil ?

... oeil

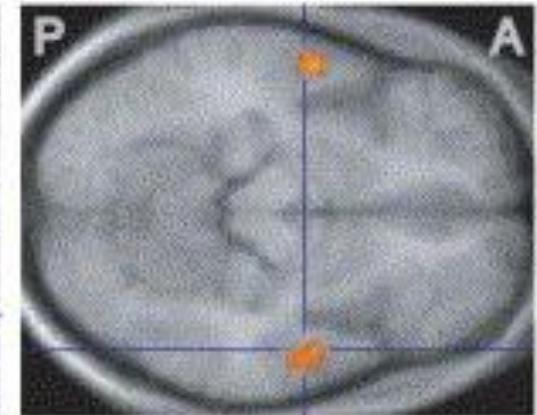
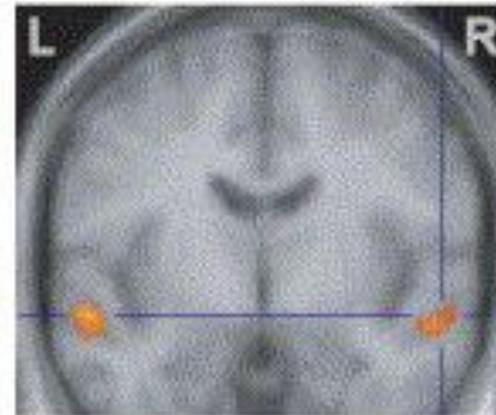
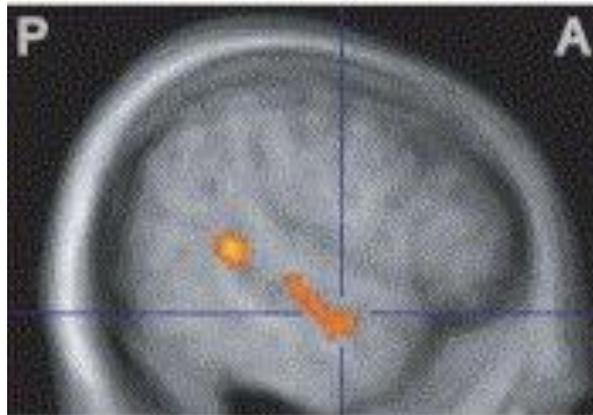


Bâillement

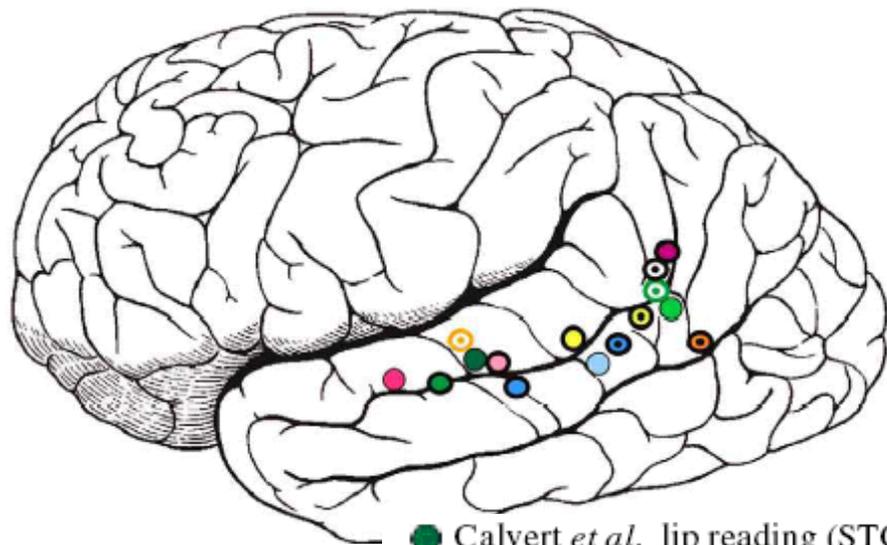
Yawn



C. Yawn-specific activation



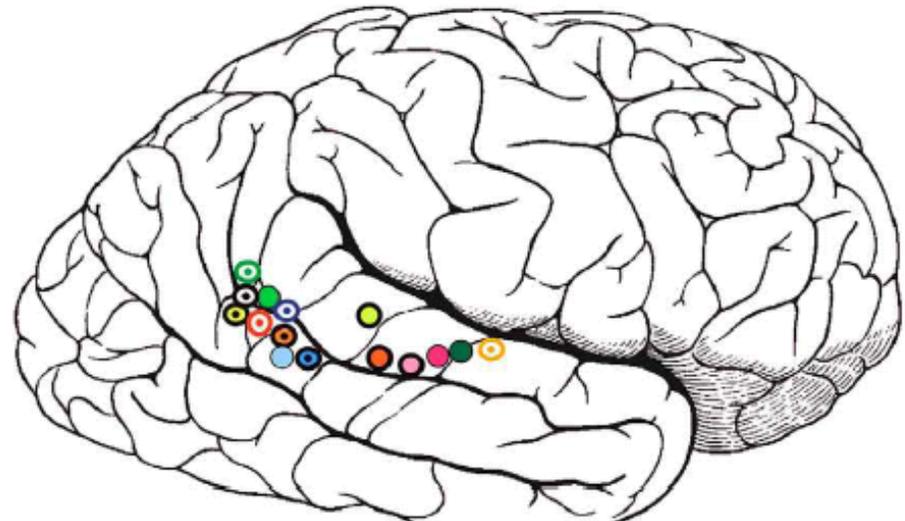
Perception Sociale & STS



- Calvert *et al.* lip reading (STG)
- Calvert *et al.* lip reading (AG)
- Puce *et al.* mouth movement
- Puce & Allison mouth movement

body

- Howard *et al.* body movement
- Bonda *et al.* body movement
- Senior *et al.* body movement
- Kourtzi & Kanwisher
body movement
- Grossman *et al.* body movement



eyes

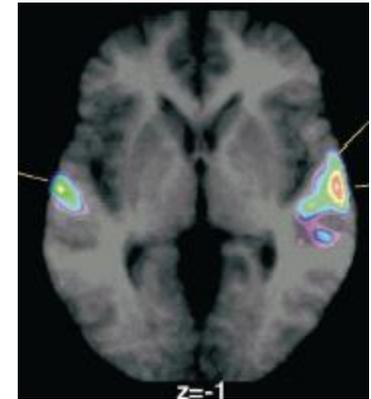
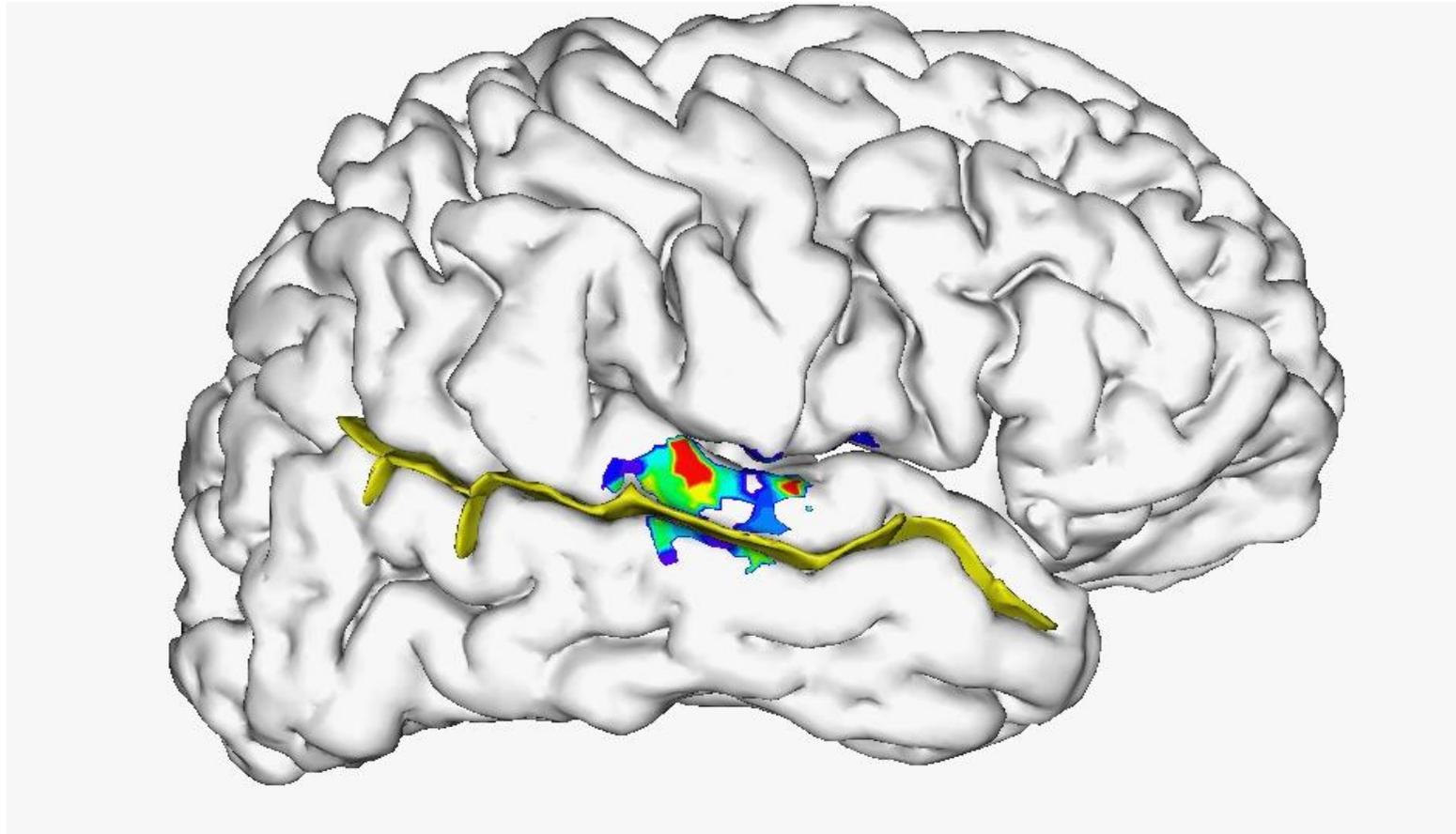
- Puce *et al.* eye gaze
- Wicker *et al.* eye gaze
- Hoffman & Haxby eye gaze

hand

- Neville *et al.* ASL
- Bonda *et al.* hand action
- Grezes *et al.* hand action
- Grezes *et al.* hand movement
- Grafton *et al.* hand grasp
- Rizzolatti *et al.* hand grasp

Allison et al., 2000

L'Aire de la Voix



Belin et al., 2000

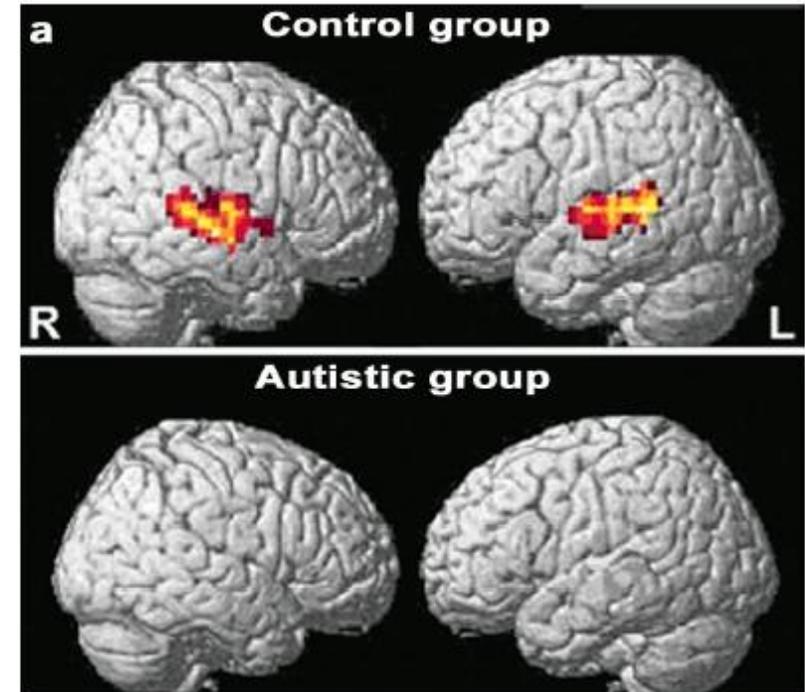
La perception sociale dans l'autisme

Les études en activation

Abnormal cortical voice processing in autism

Hélène Gervais¹, Pascal Belin^{2,3}, Nathalie Boddaert^{1,4}, Marion Leboyer⁵, Arnaud Coez¹, Ignacio Sfaello¹, Catherine Barthélémy⁶, Francis Brunelle^{1,4}, Yves Samson^{1,7} & Mônica Zilbovicius¹

Impairments in social interaction are a key feature of autism and are associated with atypical social information processing. Here we report functional magnetic resonance imaging (fMRI) results showing that individuals with autism failed to activate superior temporal sulcus (STS) voice-selective regions in response to vocal sounds, whereas they showed a normal activation pattern in response to nonvocal sounds. These findings suggest abnormal cortical processing of socially relevant auditory information in autism.



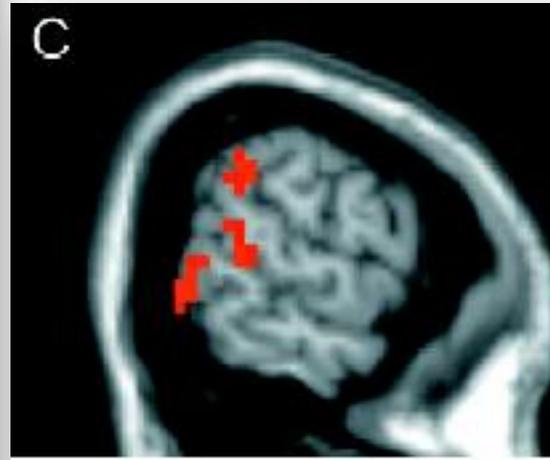
Congruent



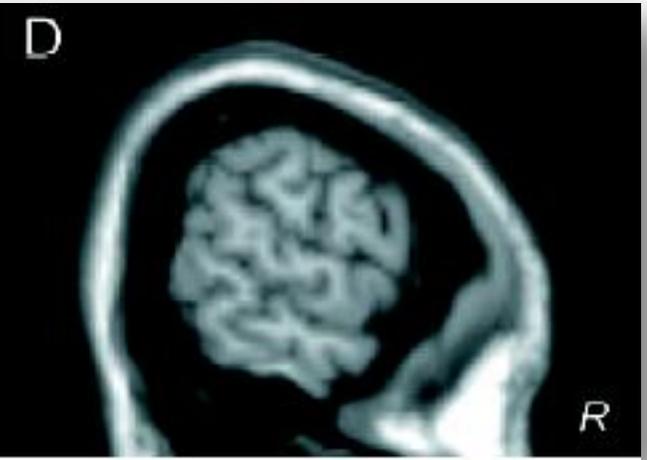
Incongruent



Controls



ASD



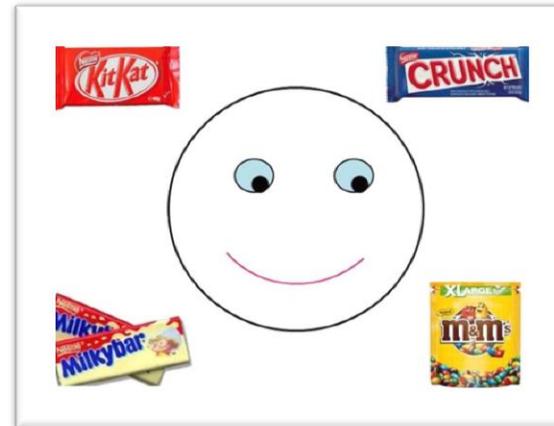
Pelphrey et al., 2005

La mesure du regard – eye tracking



Recherche eye-tracking & autisme - U1000

- Perception sociale: vidéos pour enfants
- Cognition sociale: théorie de l'esprit



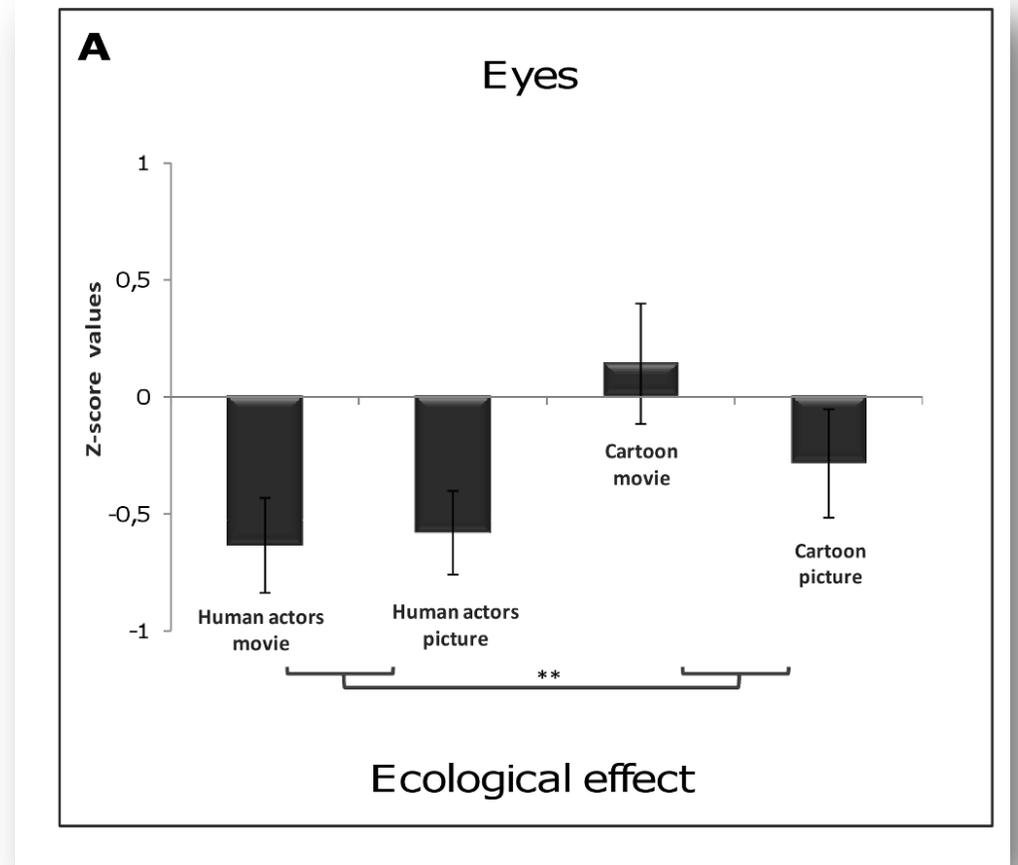
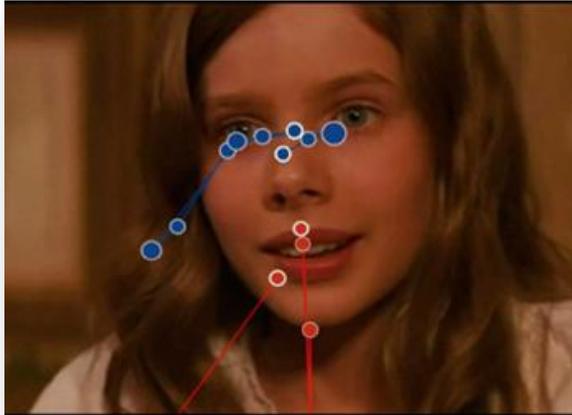






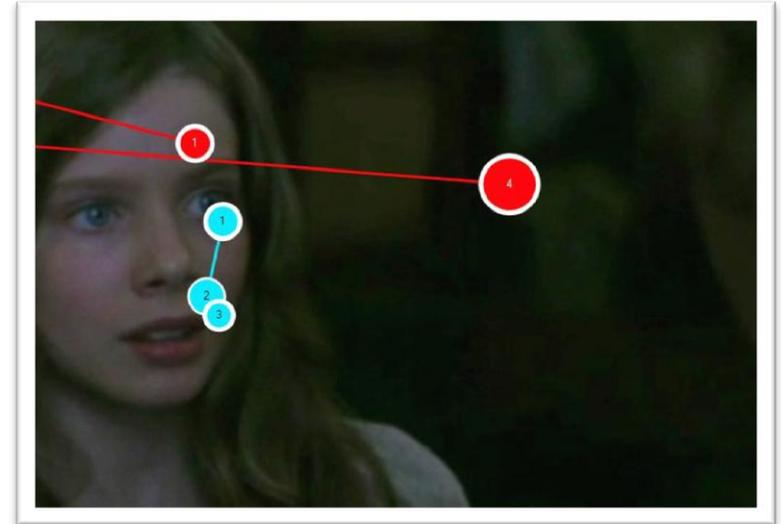
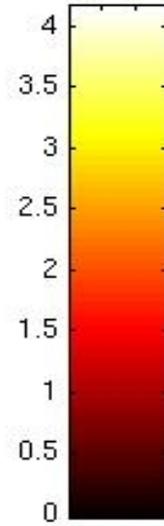
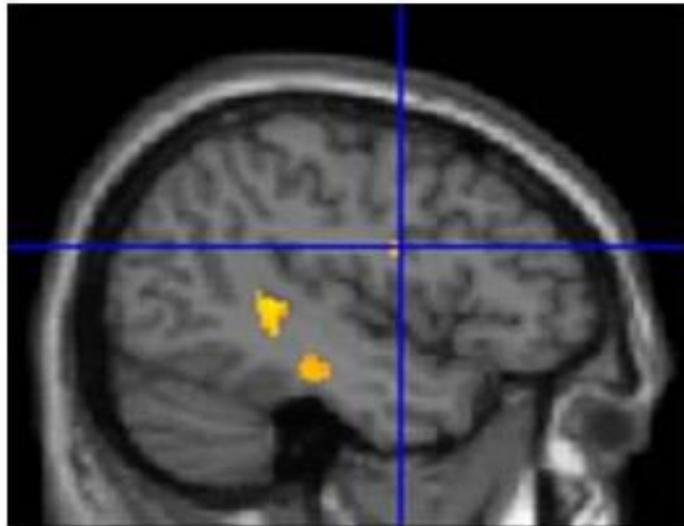


Résultats à présent



Corrélation eye-tracking & imagerie

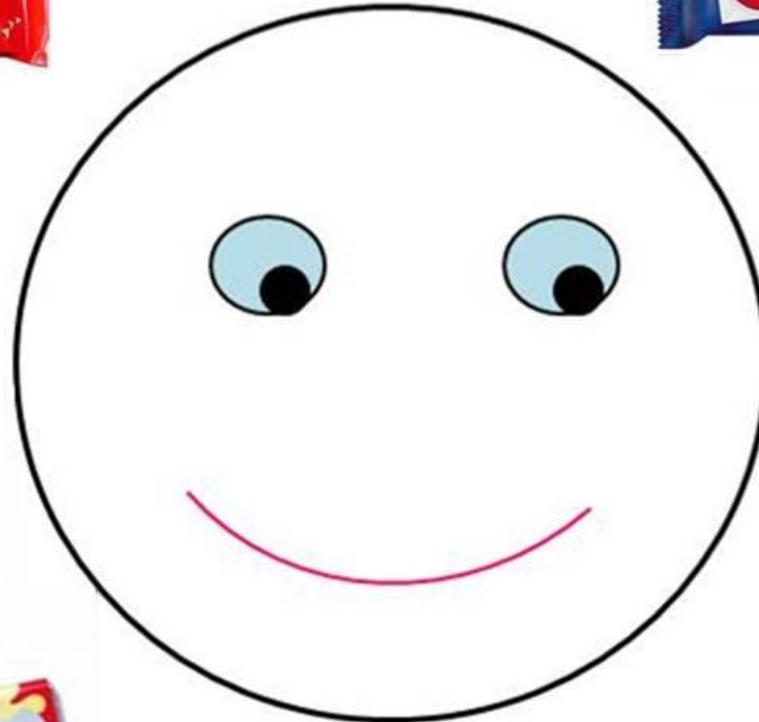
Peter Pan Film



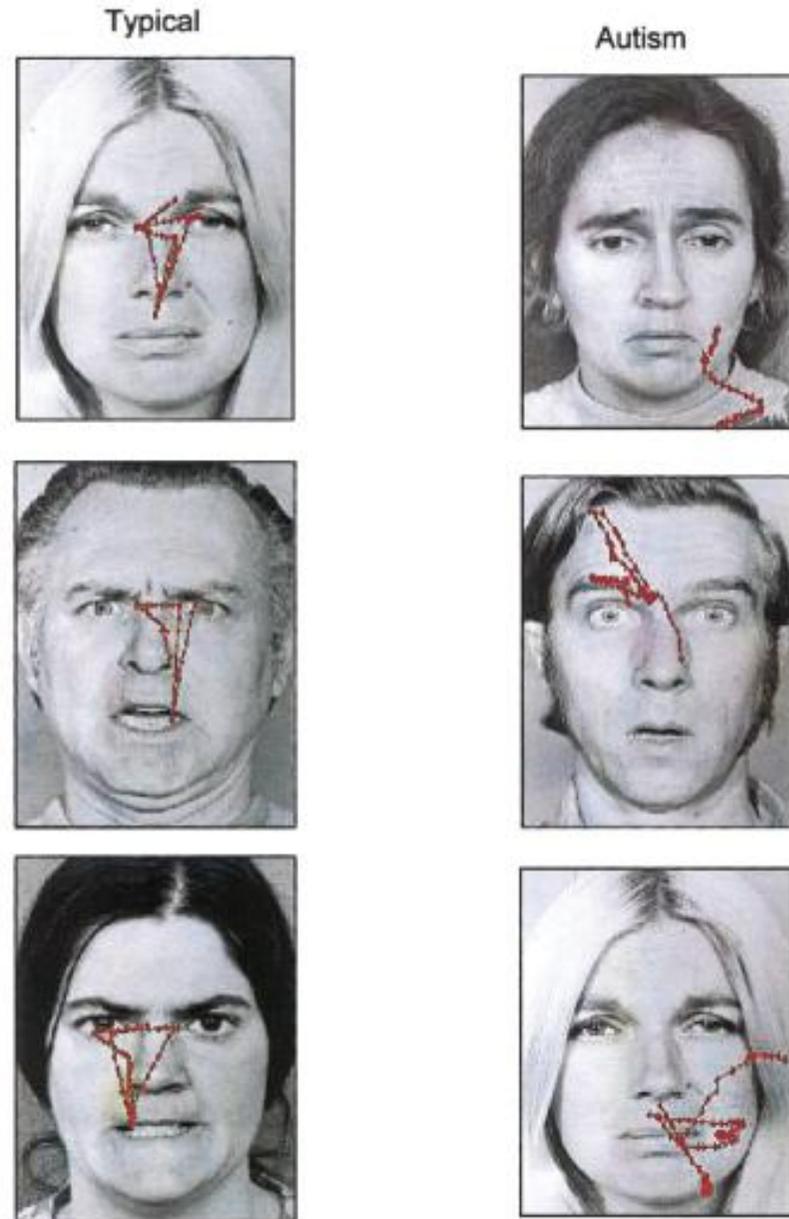
Résultats préliminaires:

Moins les enfants regardent les yeux des personnages, moins ils ont de fibres de la substance blanche au niveau du STS

Test de théorie de l'esprit: adapté de Baron-Cohen



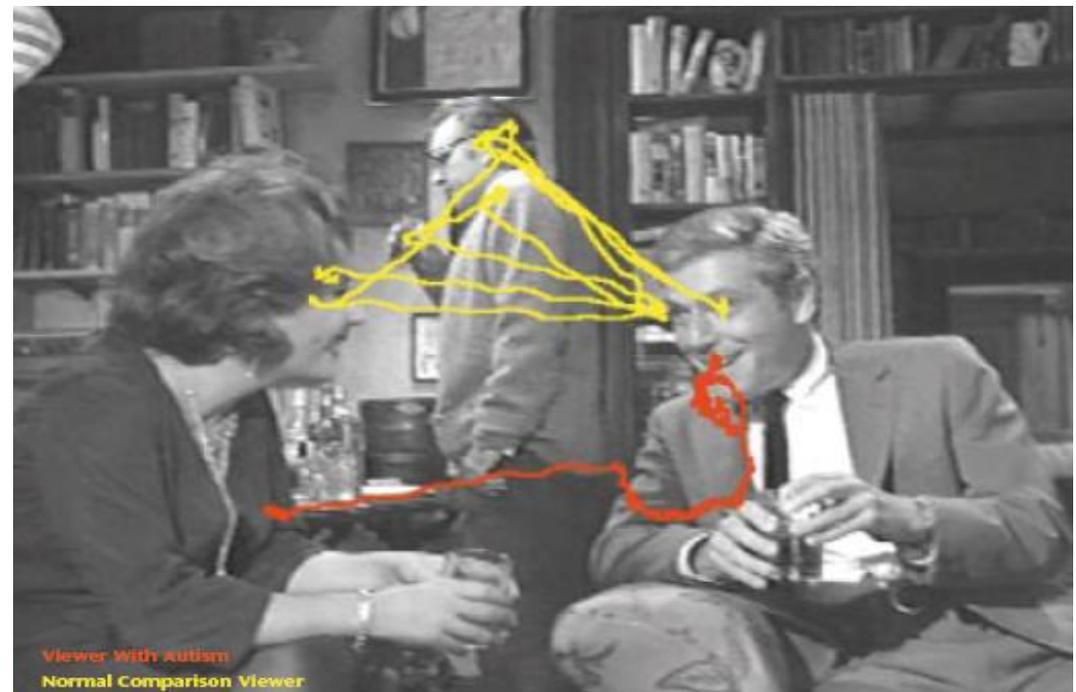
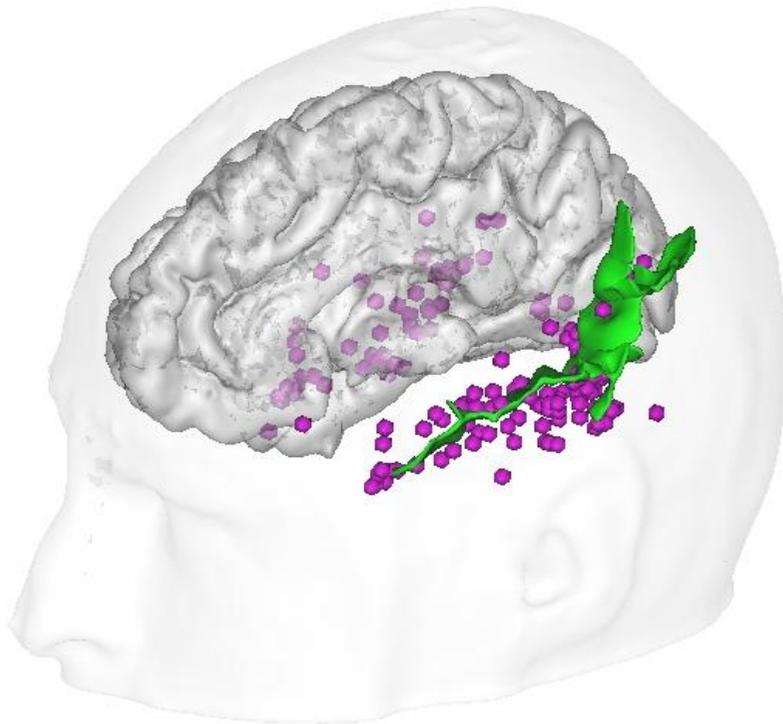
Le regard dans l'autisme: reconnaissance des émotions



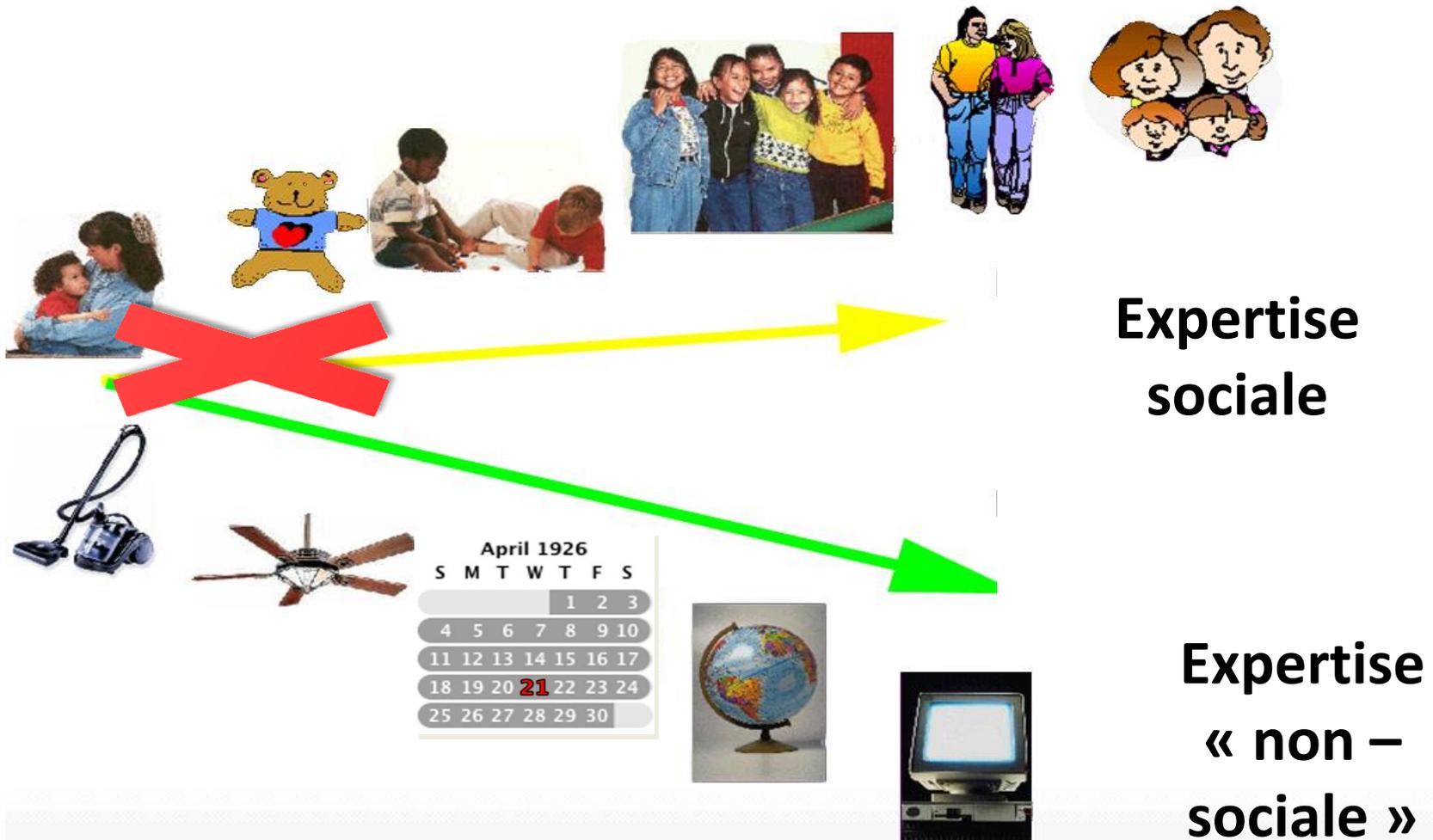
Pelphrey et al., 2002

INMED/TINS special issue

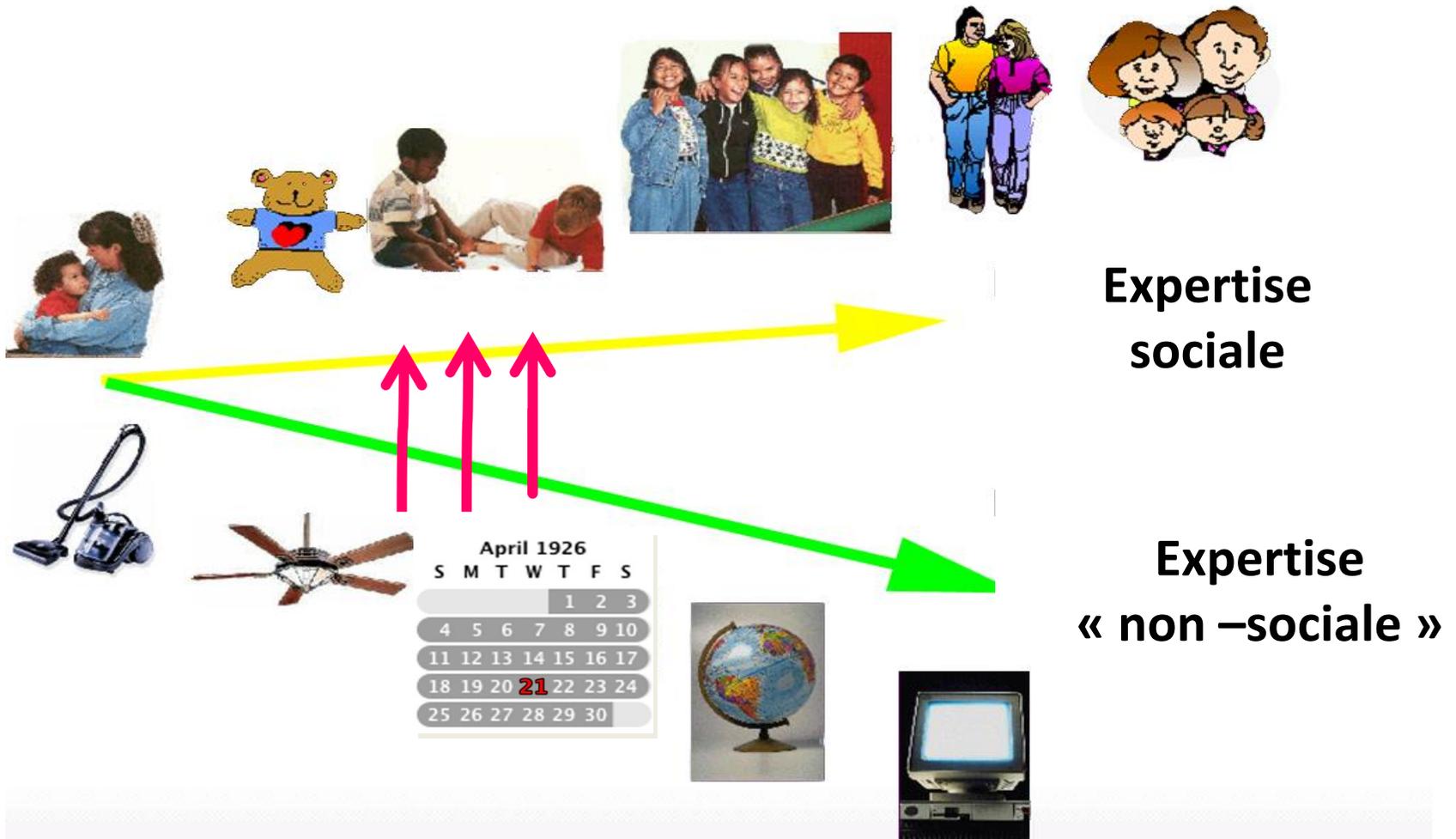
Autism, the superior temporal sulcus and social perception



Trajectoire Développementale



Trajectoire Développementale



**INSERM U1000,
Necker Enfants Malades, Paris**

**A. Bargiacchi
A. Saitovitch
R. Calmon
A. Philippe
N. Boddaert
A. Munnich
F. Brunelle
M. Zilbovicius**

**INSERM U1000
SHFJ, Orsay
NeuroSpin, Saclay**

**E. Duschenay
J. F. Mangin
J. L. Martinot**

Fondation Orange Fondation de France



Hôpital Robert Debré, Paris

**N. Chabanne
M. C. Mouren**

**Department of Psychology,
University of Glosgow, UK**

P. Belin

Yale University, USA

A. Klin
