

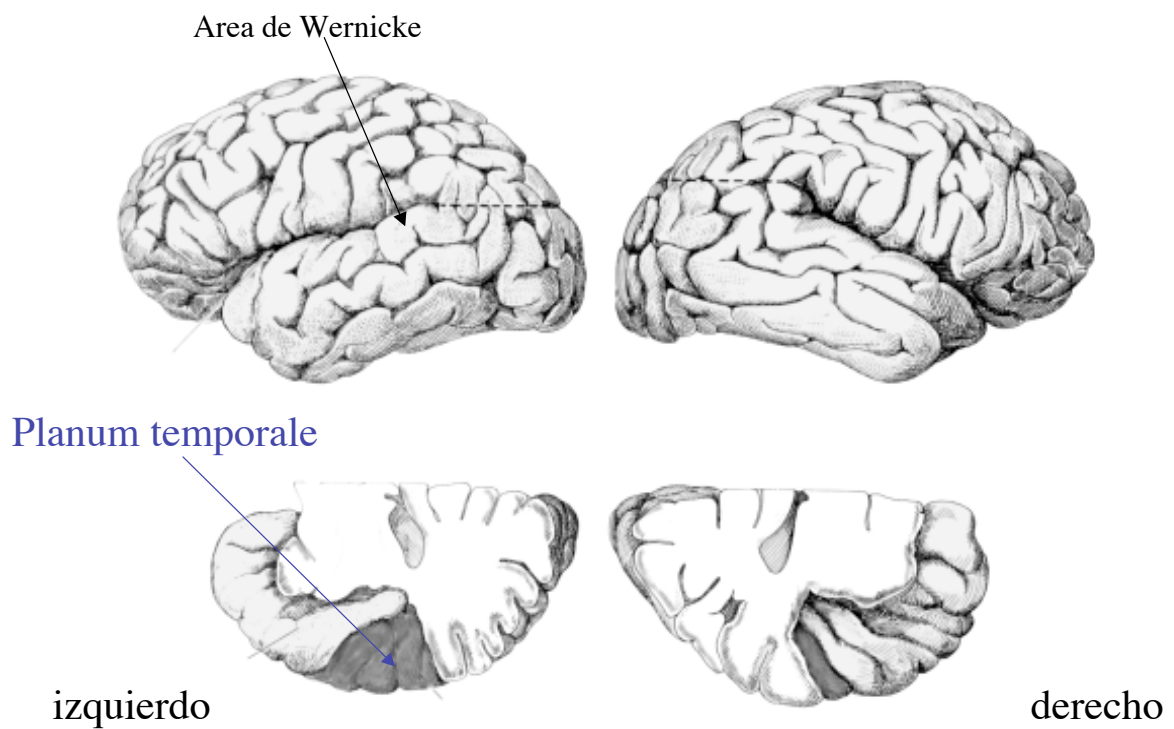
# El cerebro del disléxico

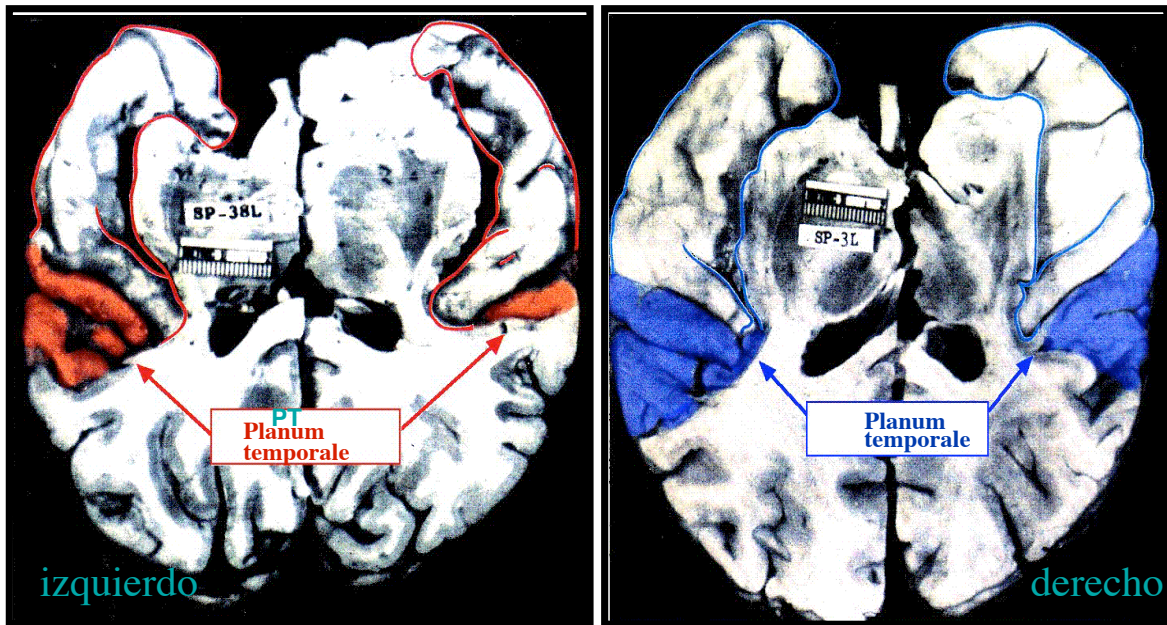
Morfología y función

I/ Modificaciones morfológicas



Norman Geschwind : 1926-1984

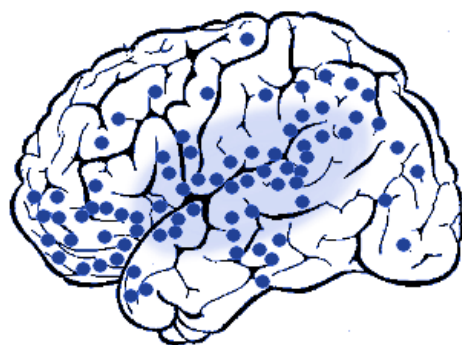
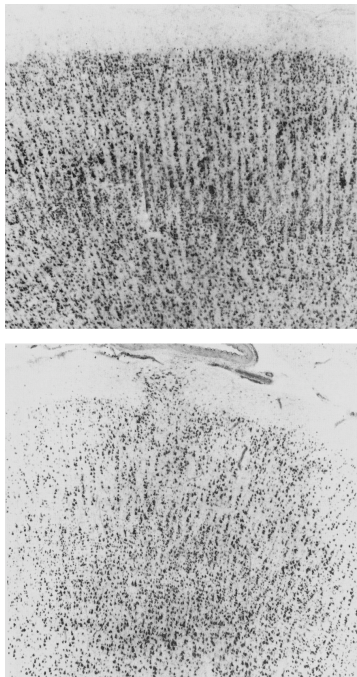




**NO DISLEXICO**

**DISLEXICO**

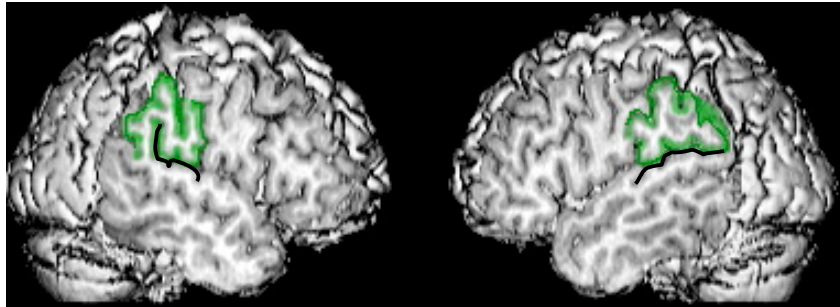
Ausencia de asimetría de planum en el cerebro disléxico de Galaburda et al., 1979; 1985



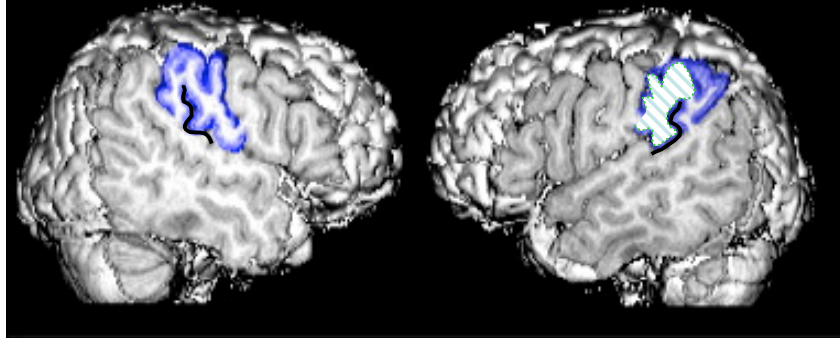
**Ectopías en el cerebro disléxico (Galaburda et al., 1979, 1985)**

## Asimetría cortical y dislexia

controles



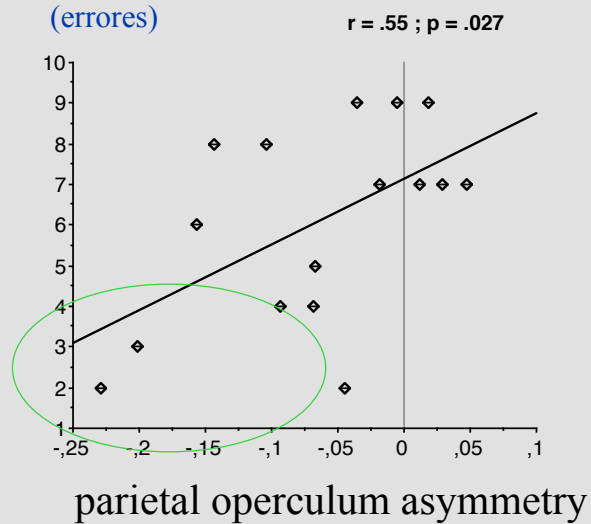
disléticos



Tarea de búsqueda del intruso (« categorización de sonidos »)

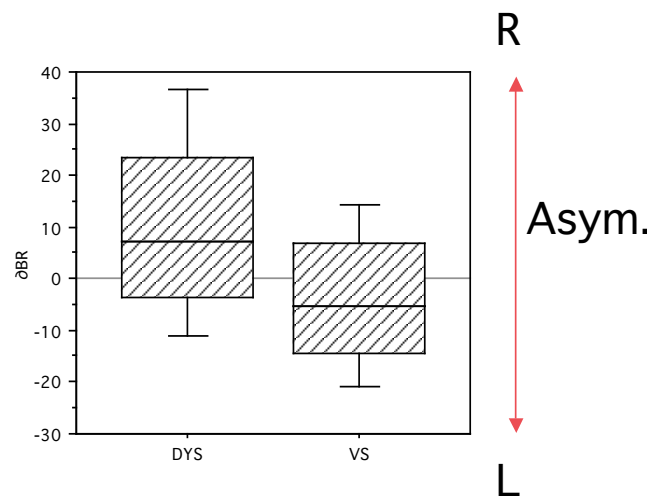
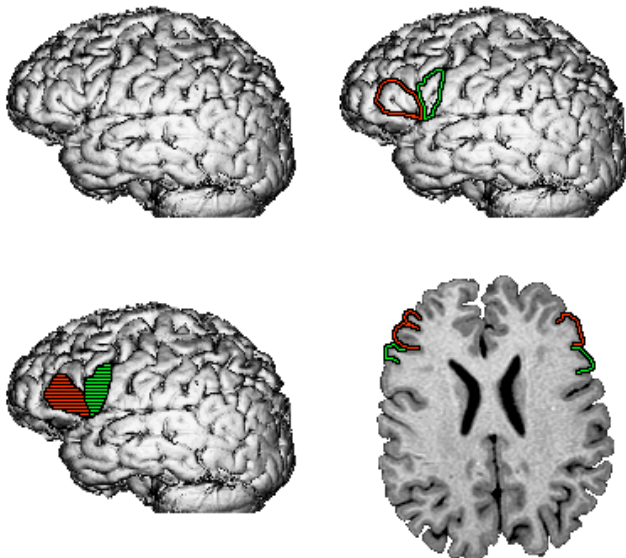
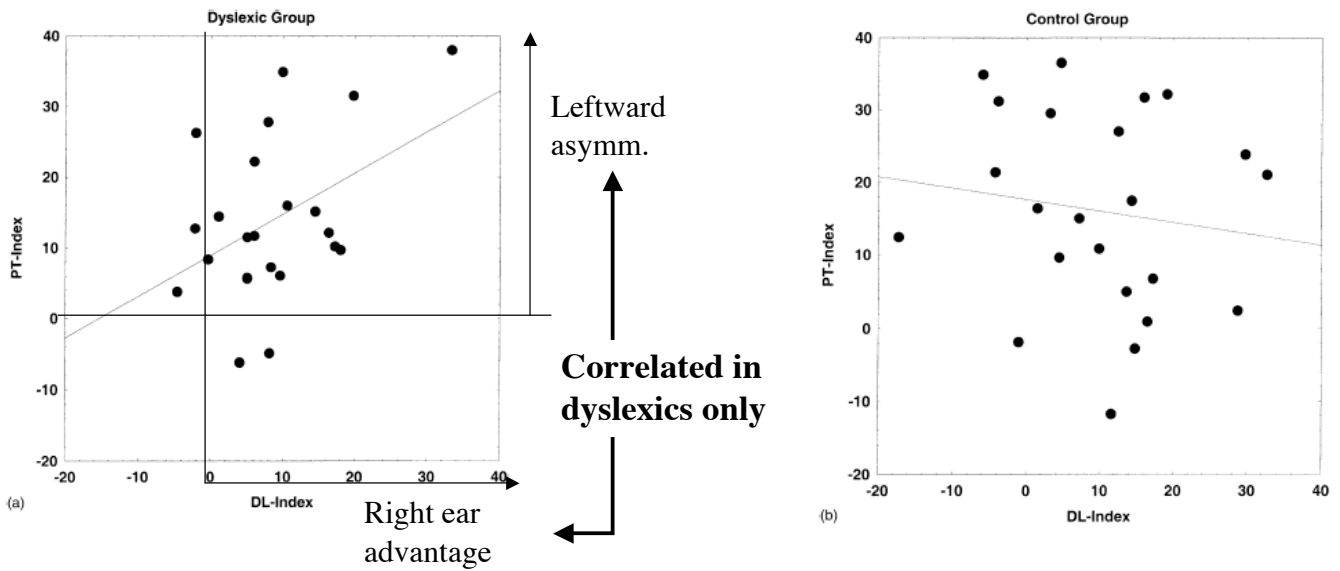
test de categorización de sonidos  
(errores)

**Blé**  
**Bleu**  
**Bras**  
**Blanc**

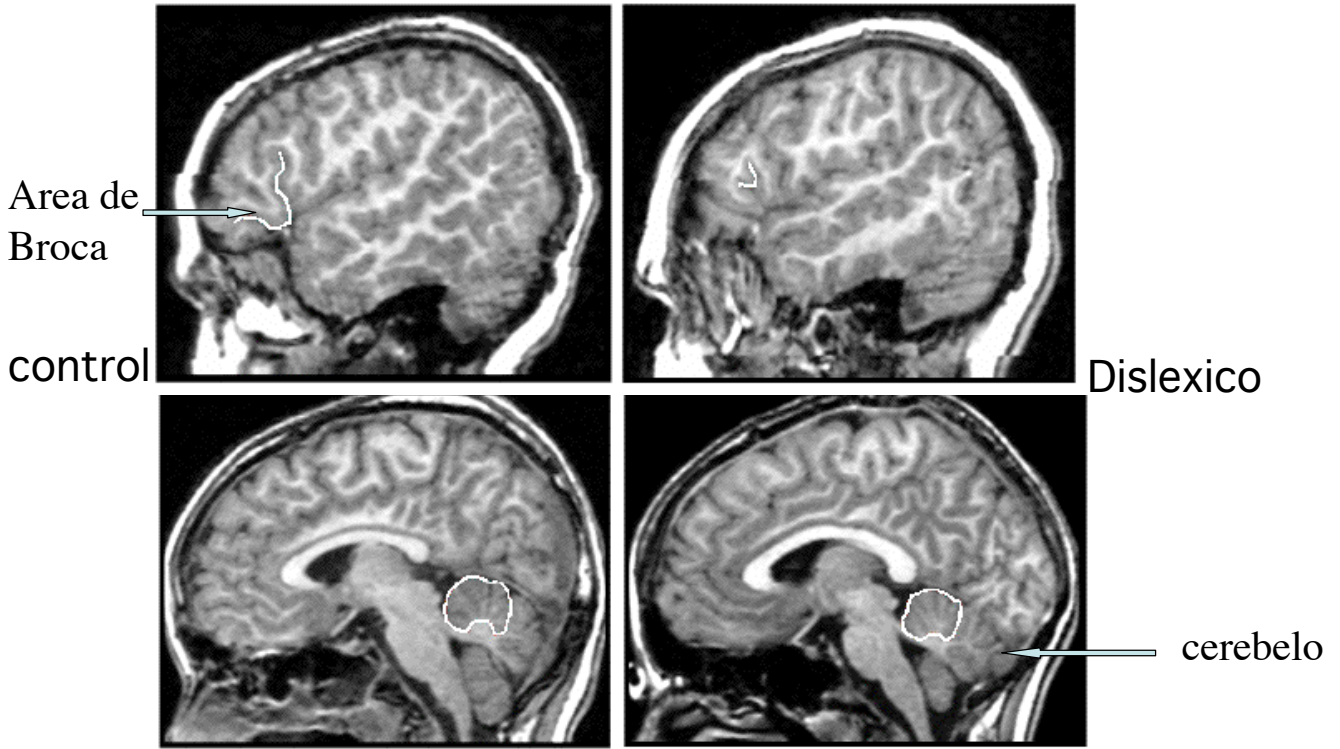


## Significant relation between MR measures of planum temporale area and dichotic processing of syllables in dyslexic children

Kenneth Hugdahl<sup>a,\*</sup>, Einar Heiervang<sup>b</sup>, Lars Ersland<sup>c</sup>, Arvid Lundervold<sup>f</sup>,  
Helmuth Steinmetz<sup>c</sup>, Alf Inge Smievoll<sup>d</sup>



Robichon et al. (2000) : réduction (inversion) d'asymétrie de l'aire de Broca chez les adultes dyslexiques



C.

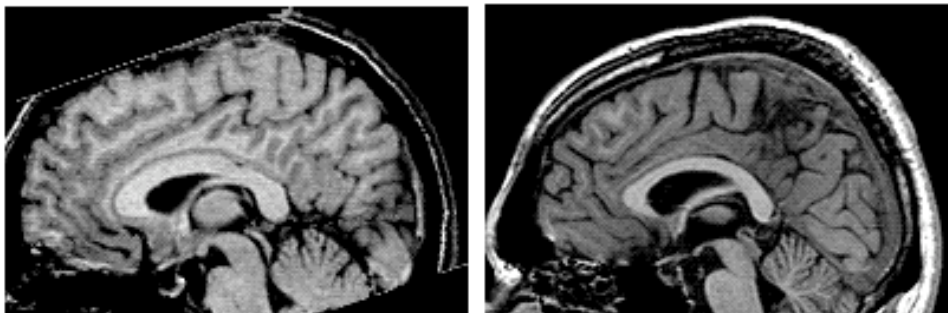
DOI: 10.1093/brain/awg026

Brain (2003), 126, 482-494

### Anatomical correlates of dyslexia: frontal and cerebellar findings

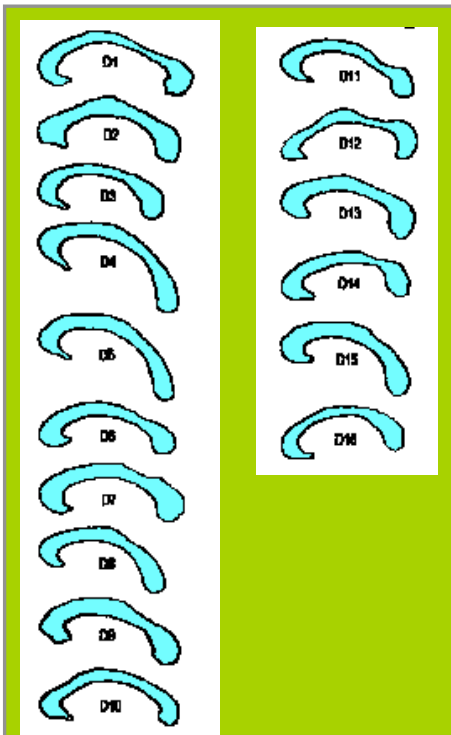
Mark A. Eckert,<sup>1</sup> Christiana M. Leonard,<sup>1</sup> Todd L. Richards,<sup>2</sup> Elizabeth H. Aylward,<sup>2</sup> Jennifer Thomson<sup>3</sup> and Virginia W. Berninger<sup>3</sup>

### Tamaño aumentado del cuerpo caloso

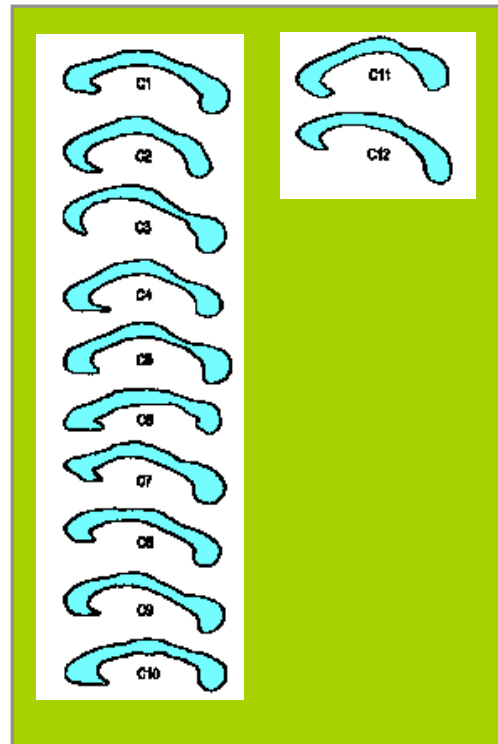


disléxico (2136)

control

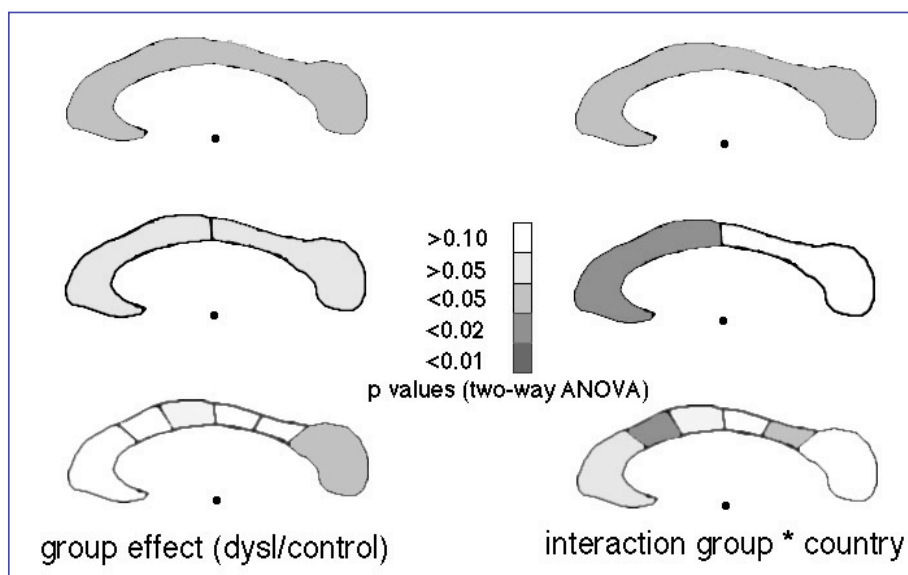


**DISLEXICOS**



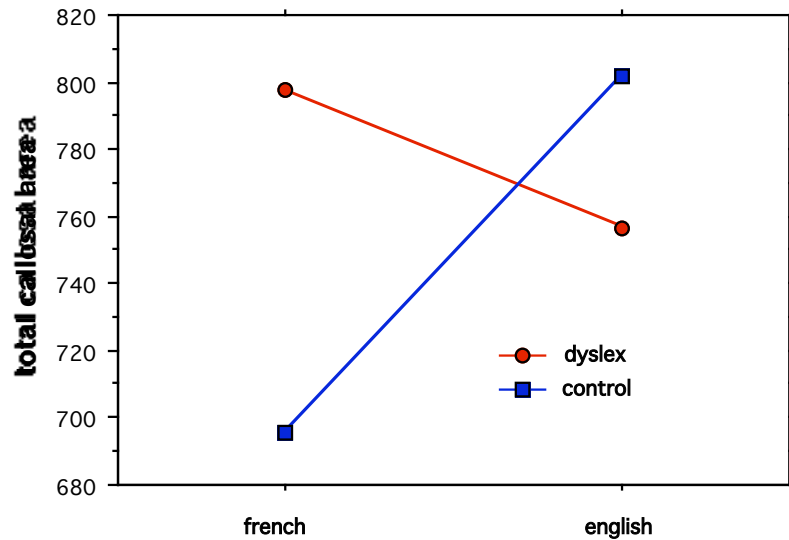
**CONTROLES**

Efecto de grupo (DIS/CONT) y país (FR/INGL) en el tamaño calloso



# Total área callosa : interacción grupo x país

$F(1,60)=9.337; p=0.033$



ELSEVIER

Cognitive Brain Research 10 (2000) 37–44

COGNITIVE  
BRAIN  
RESEARCH

[www.elsevier.com/locate/bres](http://www.elsevier.com/locate/bres)

Research report

## Corpus callosum size in children with developmental language disorder

Sabine Preis<sup>a,\*</sup>, Helmuth Steinmetz<sup>b</sup>, Uwe Knorr<sup>b</sup>, Lutz Jäncke<sup>c</sup>

Anomalies chez les dyslexiques, pas chez les dysphasiques

ANAT.

Déficit chez les dyslexiques, mais plus prononcé chez les dysphasiques



PERGAMON

Neuropsychologia 1393 (2002) 1–6

NEUROPSYCHOLOGIA

[www.elsevier.com/locate/neuropsychologia](http://www.elsevier.com/locate/neuropsychologia)

## A callosal transfer deficit in children with developmental language disorder

Franco Fabbro<sup>\*</sup>, Lucilla Libera, Alessandro Tavano

FONCT.



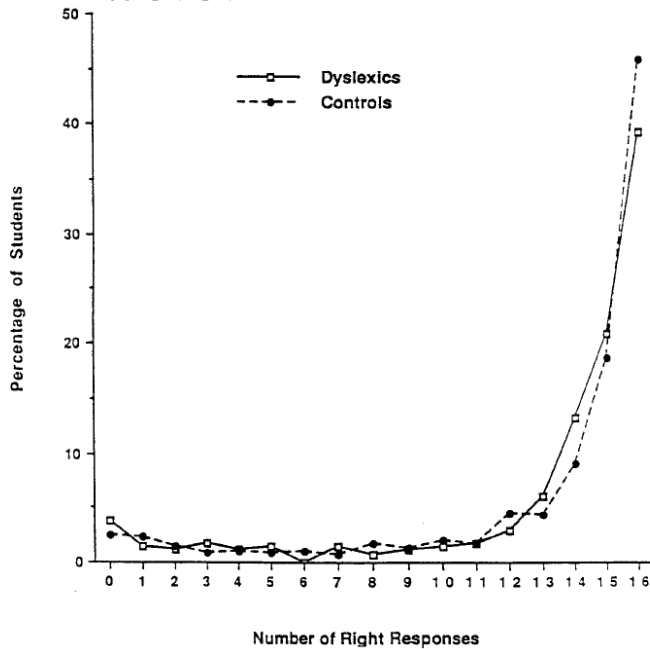


PERGAMON

## Handedness in developmental dyslexia: direct observation of a large sample

John L. Locke<sup>a,\*</sup>, Paul Macaruso<sup>b</sup>

<sup>a</sup>University of Sheffield, Sheffield, UK



### Abstract

Manual laterality was assessed by direct observation of 407 students in a school for dyslexic young people and 604 students in regular public school classes. The task required subjects to pantomime 16 activities (e.g., dealing cards, writing a letter). Analysis revealed that although the dyslexics did not show precisely the same pattern of right and left responses as the controls, differences between groups were few and not present at the extremes of the continuum, i.e., there was neither a significantly lower percentage of pure right-handers nor a higher percentage of pure left-handers among the dyslexics. Moreover, left-handed dyslexics were not more severely reading-disabled than strongly right-handed dyslexics. Since the typical dyslexic adolescent is strongly right-handed, etiological theories based on hemispheric differences must derive support from other types of data. © 1999 : Ltd. All rights reserved.

## Sex Differences in Developmental Reading Disability

New Findings From 4 Epidemiological Studies

(Reprinted) JAMA, April 28, 2004—Vol 291, No. 16 2007

Michael Rutter, MD

Avshalom Caspi, PhD

David Fergusson, PhD

L. John Horwood, MSc

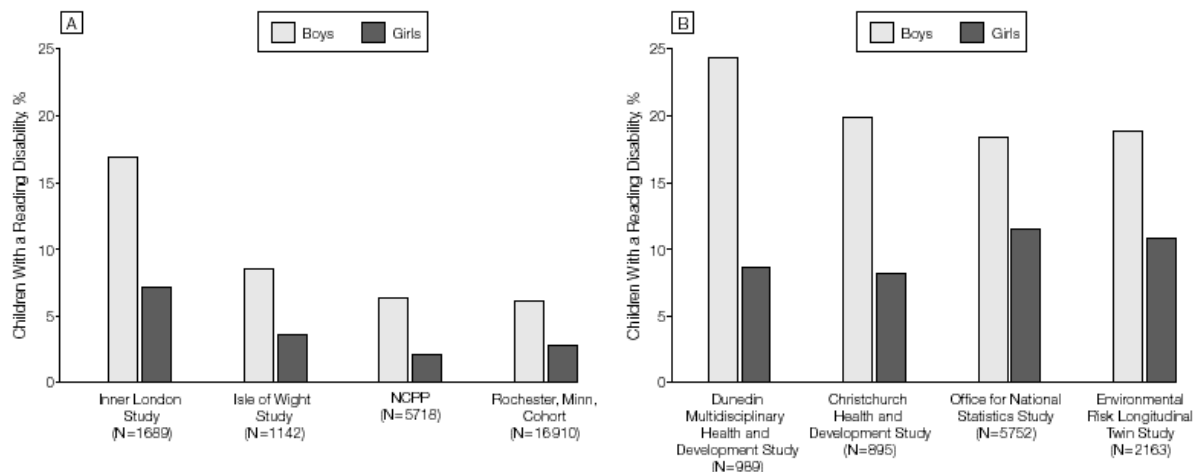
Robert Goodman, MD

Barbara Maughan, PhD

Terrie E. Moffitt, PhD

Howard Meltzer, PhD

Julia Carroll, PhD



4 estudios clasicos

4 nuevos

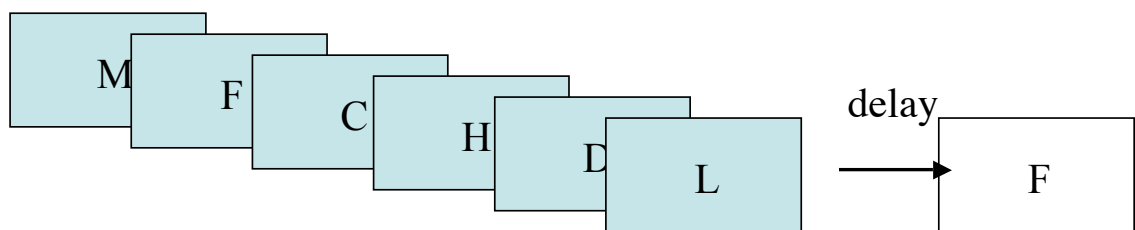
## Modificaciones neuroanatómicas en la dislexia : Cual realidad? Cual significado?

- Un cerebro con asimetría atípica
  - Pero no donde se esperaba (parietal y frontal)
  - En un sentido variable
- Relaciones interhemisféricas diferentes
  - En general en el sentido de una hipertrofia
  - Pero en ciertos casos hipotrofia

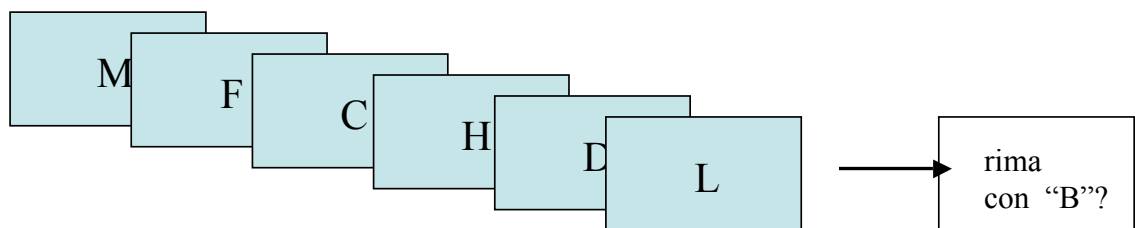
## Modificaciones neuroanatómicas en la dislexia : Cual significado?

- Un exceso de neuronas o de conexiones interhemisféricas no serían relacionados necesariamente a factores genéticos (rol de medioambiente pre o post natal)
- Las diferencias observadas
  - no están necesariamente causales de los déficits al nivel comportamental
  - Podrían ser no más que un proceso dismaturo más global

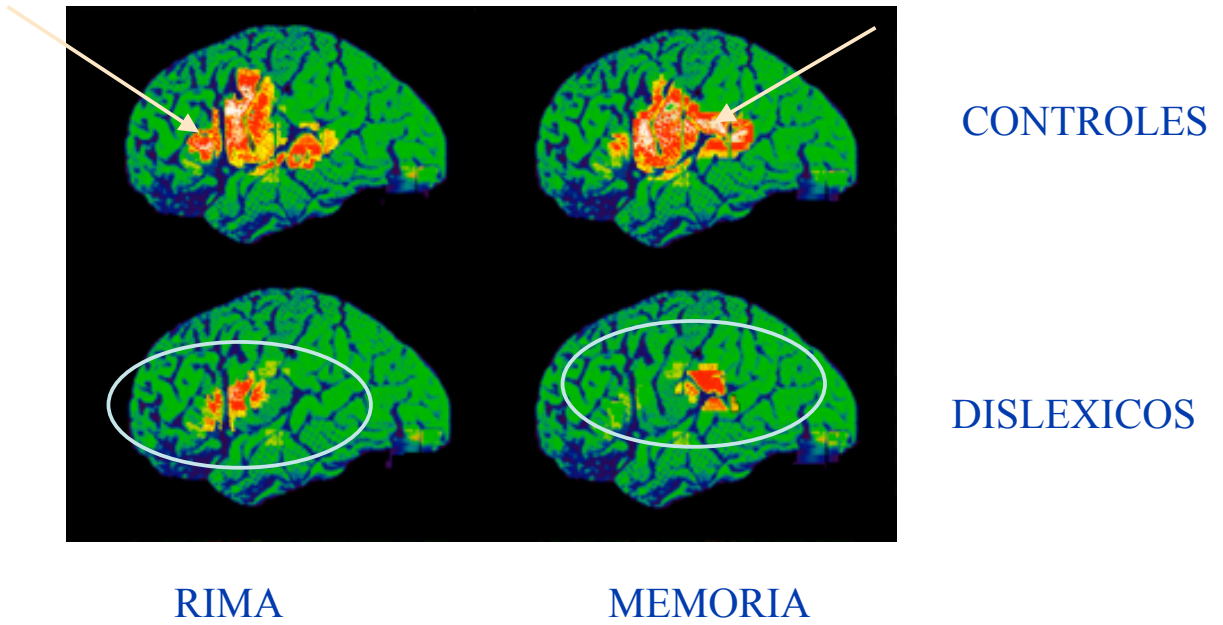
## II/ Imageria funcional durante la lectura y pruebas fonológicas



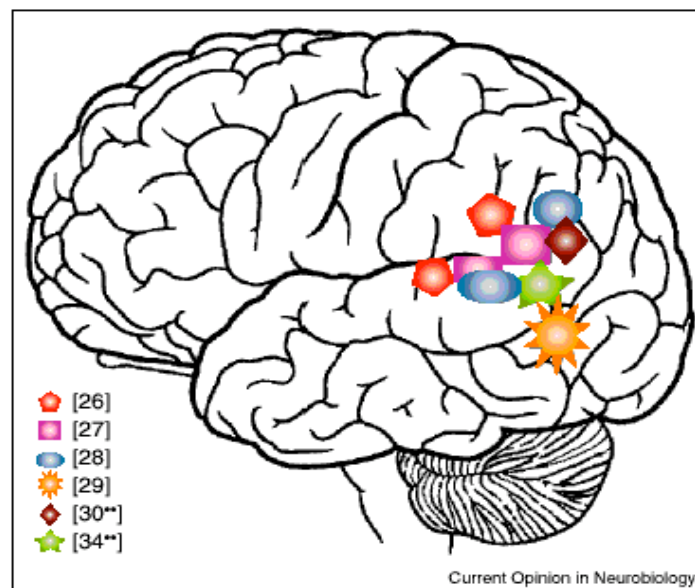
MEMORIA



RIMA



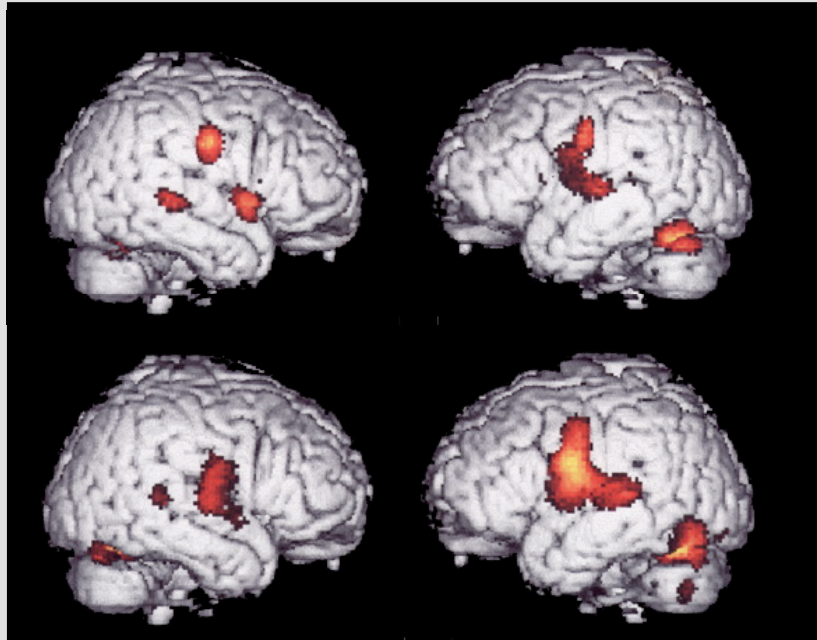
Paulesu et al., 1996



Elise Temple (2002) : Neural disruption of phonological processing in dyslexia

# palabras-rest

controles

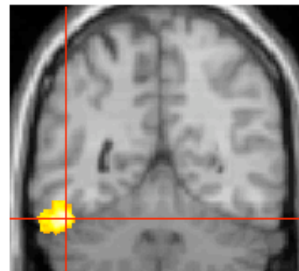


disléxicos

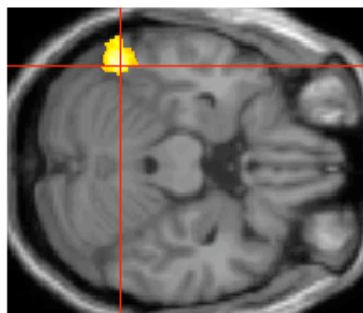
sagittal



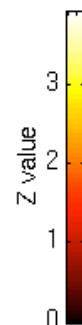
coronal



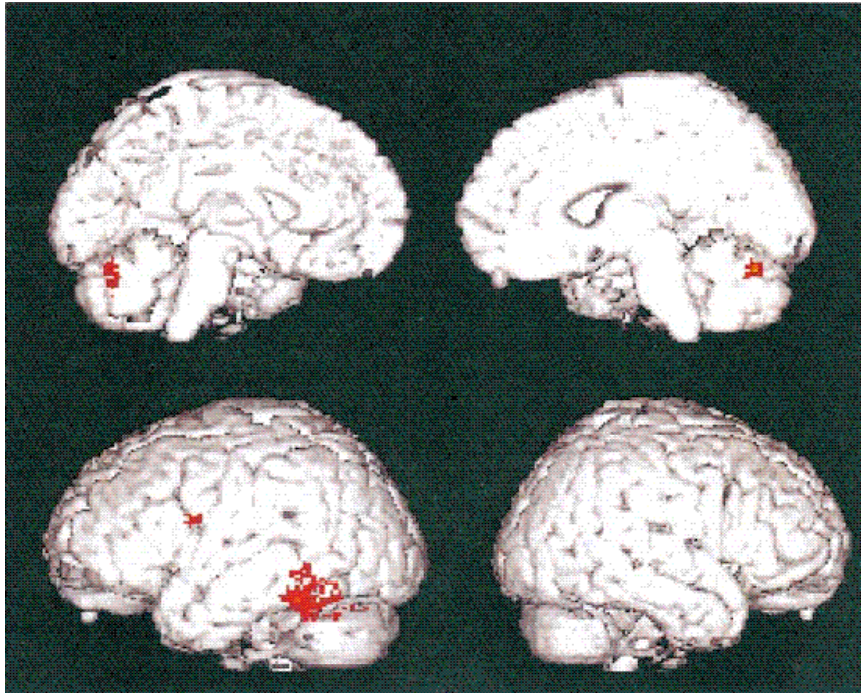
transverse



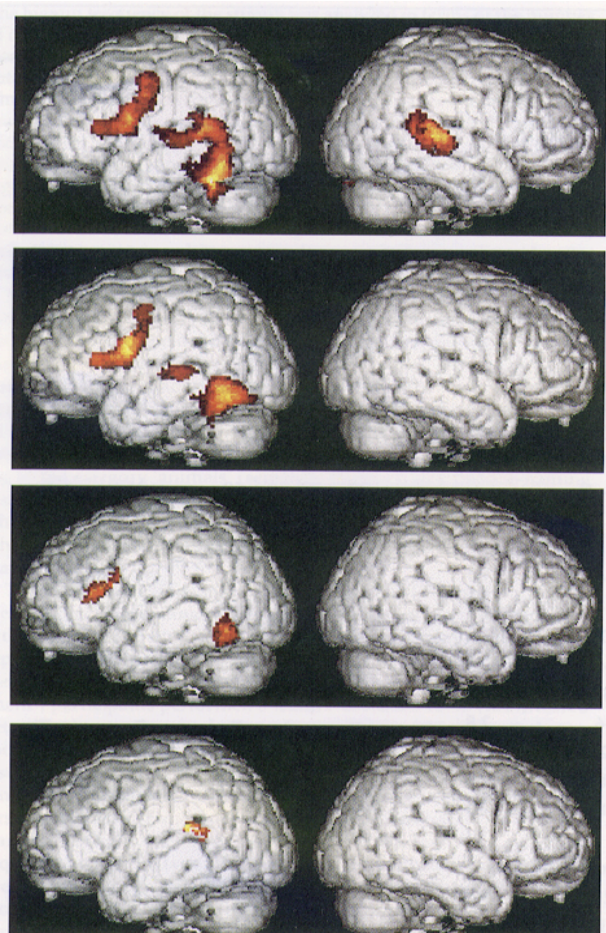
Reading Words in Controls  
compared to Dyslexics



(Chanoine et al., 1998)



Areas of reduced activation in dyslexics relative to controls reading aloud words and non-words (Brunswick et al., 1999)



Paulesu et al. (2000)  
A cultural effect on brain function

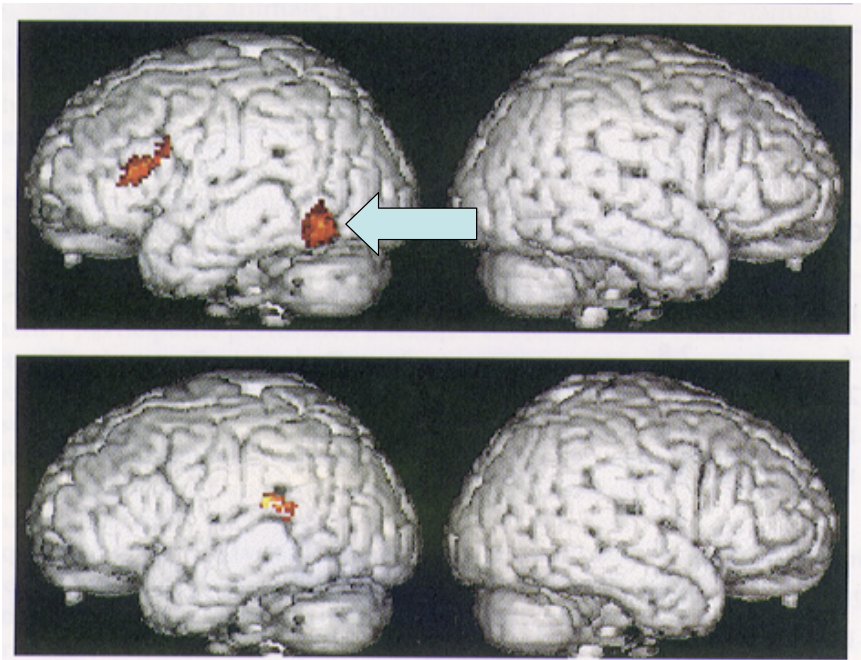
English + Italians :  
common reading system

English + Italians :  
non-words - words

English > Italians :  
(non-words)

Italians > English  
(all word types)

Paulesu et al. (2000)  
A cultural effect on brain function



English > Italians :  
(non-words)

Italians > English  
(all word types)

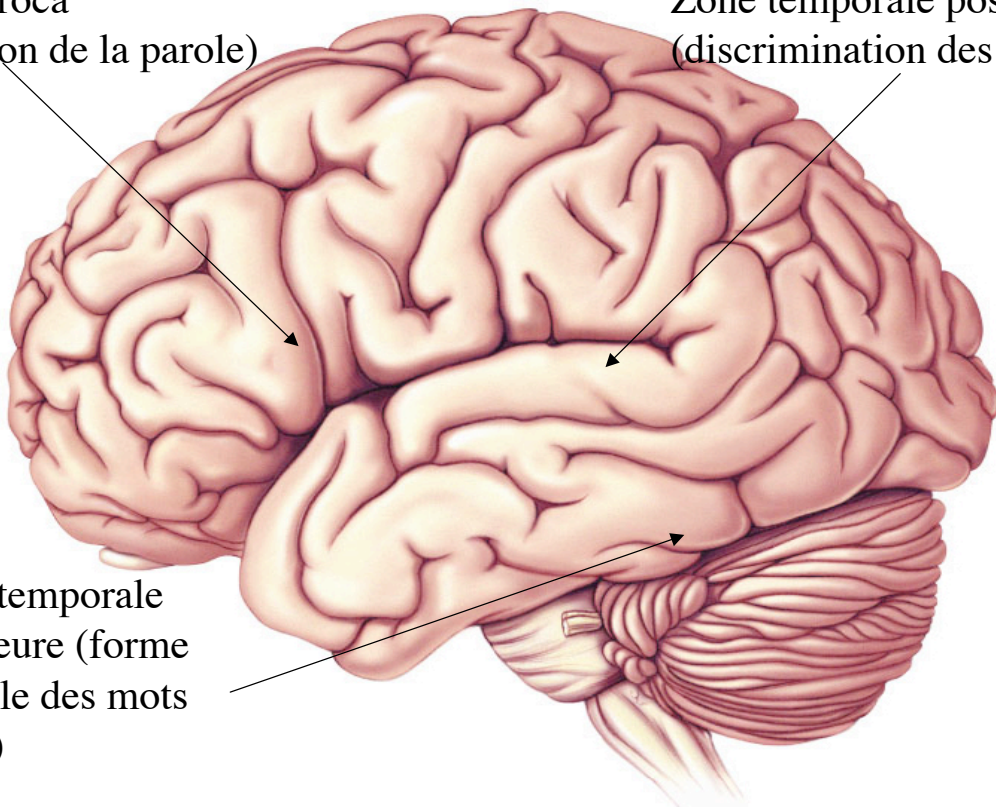
## cerveau singulier du dyslexique (2) anatomie fonctionnelle

- Les zones activées par la lecture : une illustration 'on line'
- Imager le trouble phonologique : l'épreuve de jugement de rimes
- Utilisation de l'imagerie fonctionnelle pour observer l'effet d'un entraînement
- Utilisation de l'imagerie fonctionnelle pour juger de l'effet du milieu

Aire de Broca  
(articulation de la parole)

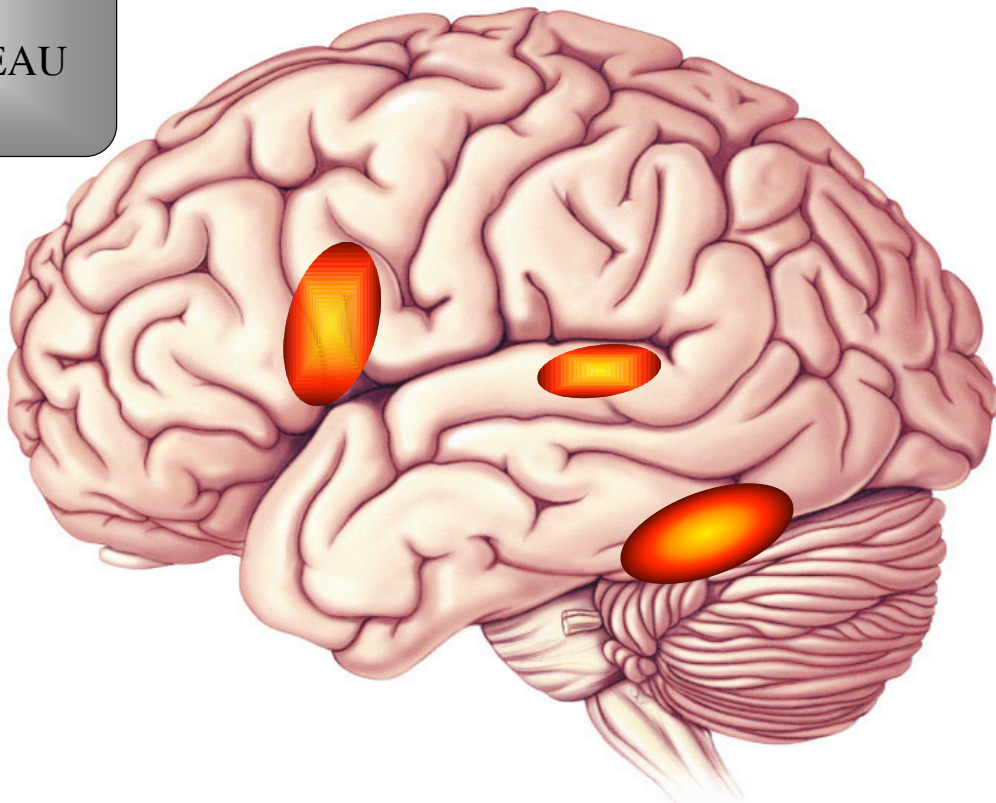
Zone temporelle postérieure  
(discrimination des sons)

Zone temporelle  
Inférieure (forme  
visuelle des mots  
écrits)



L'hémisphère gauche du cerveau humain et ses régions  
activées par la lecture

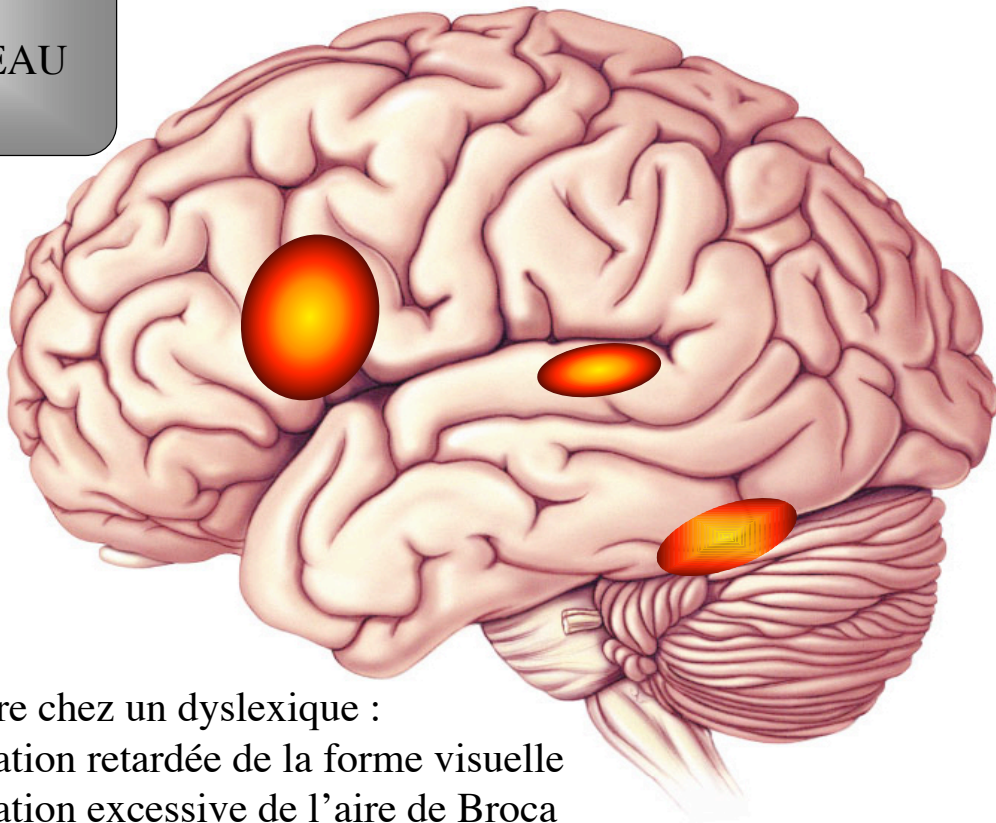
CHAPEAU



Lecture normale : activation initiale et prédominante de la forme  
visuelle des mots



CHAPEAU

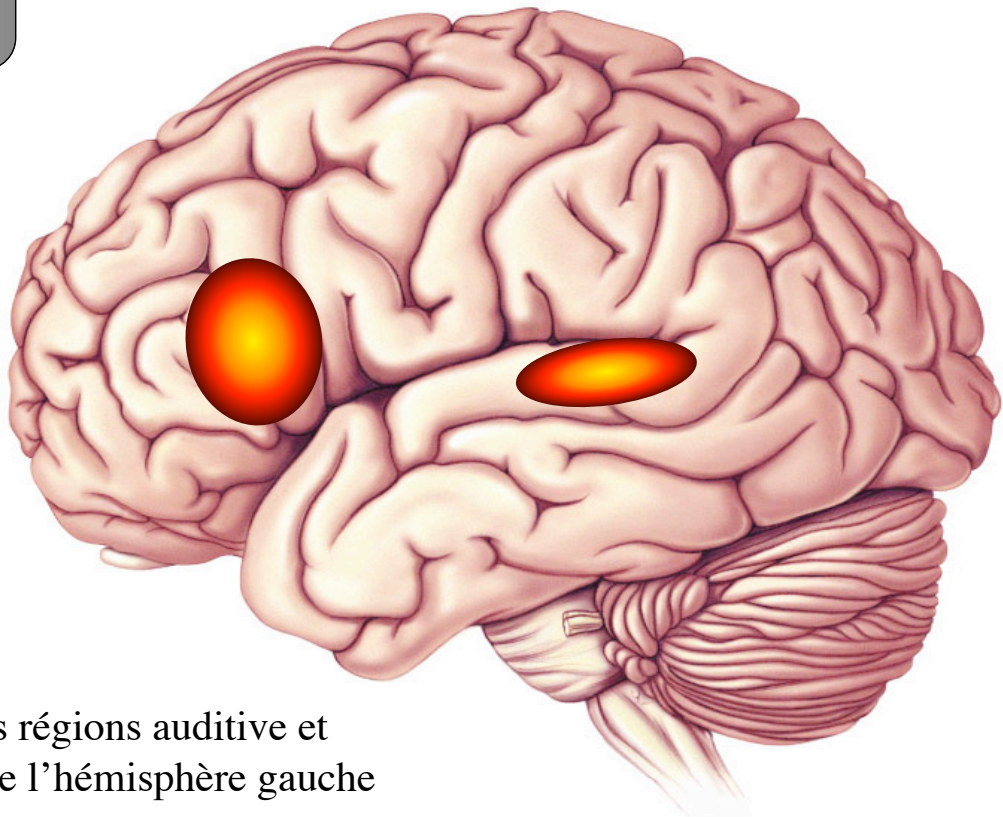


Lecture chez un dyslexique :  
Activation retardée de la forme visuelle  
Activation excessive de l'aire de Broca

G H

Test de conscience phonologique; enfant non dyslexique

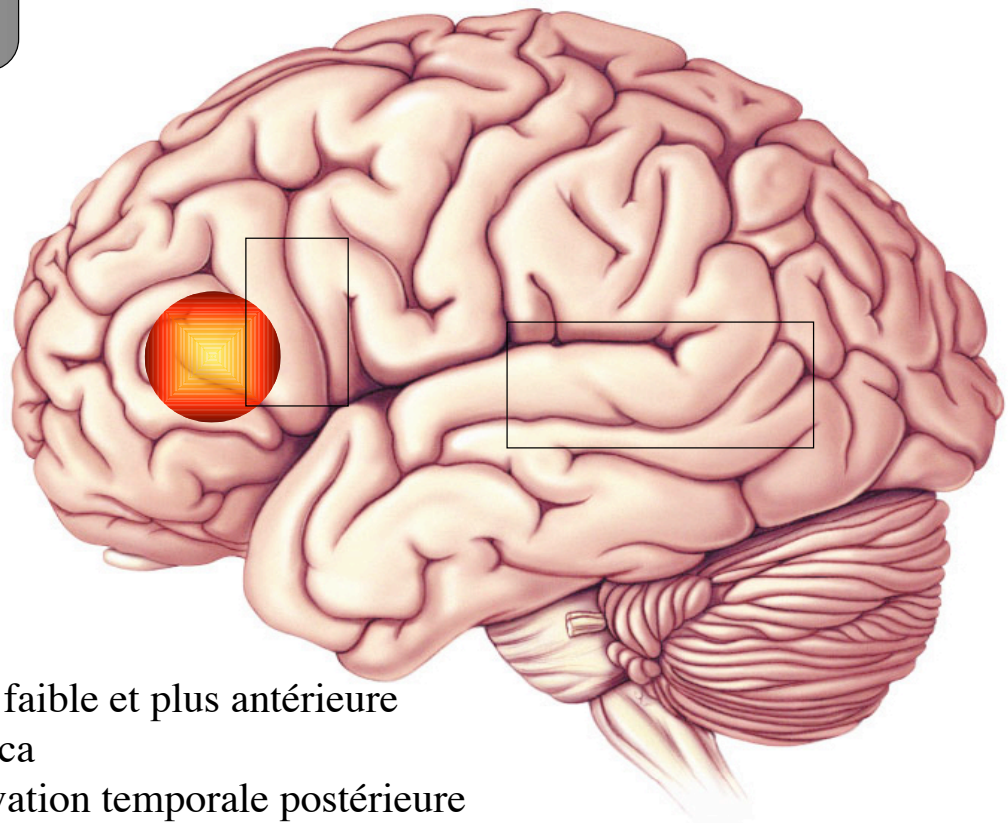
Lettres  
riment?



Activation des régions auditive et  
articulatoire de l'hémisphère gauche

G H

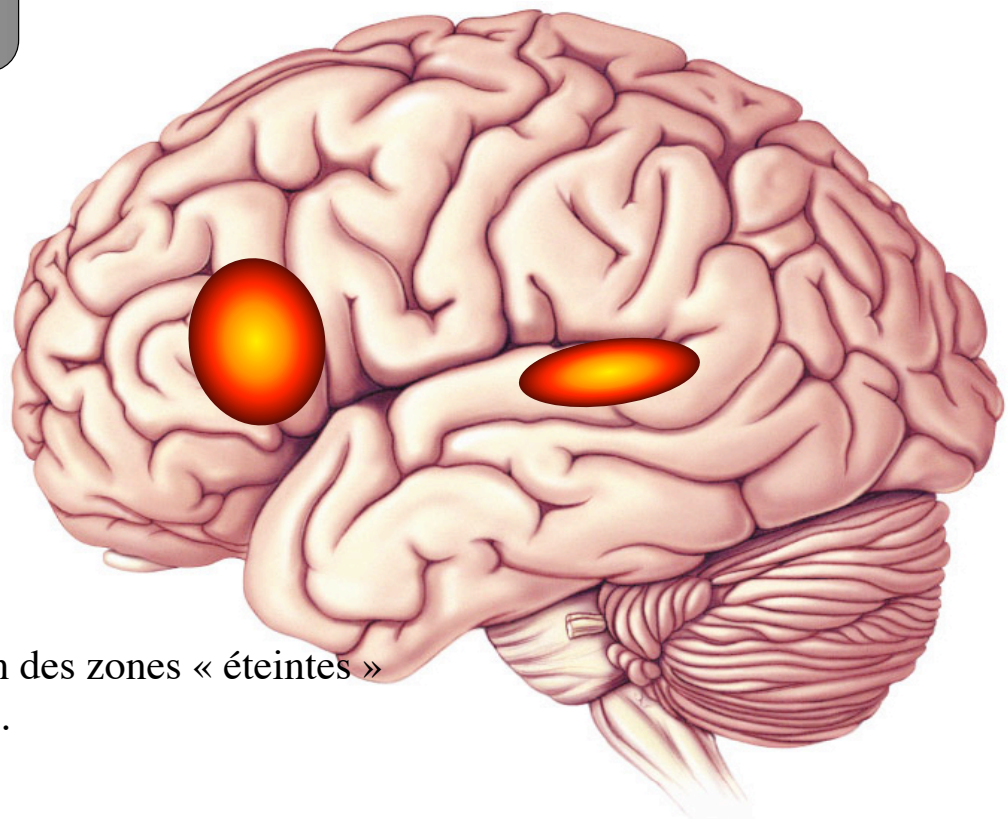
### Enfant dyslexique



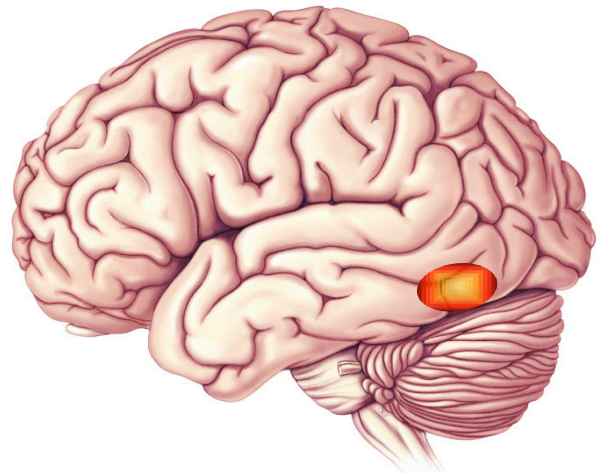
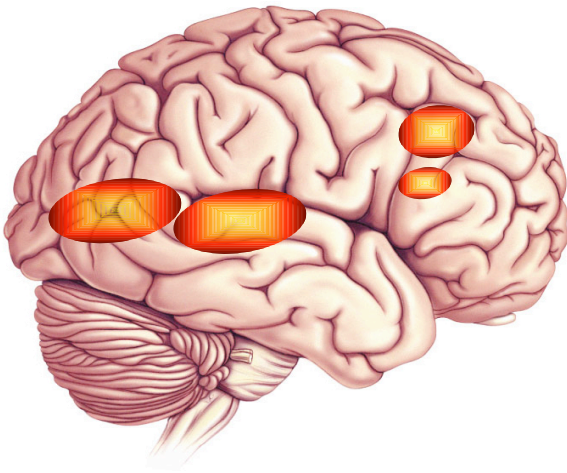
Activation plus faible et plus antérieure  
de l'aire de Broca  
Absence d'activation temporelle postérieure

G H

### Enfant dyslexique après entraînement (Fastforward®)



Réapparition des zones « éteintes »  
Mais aussi...



... apparition de zones non activées précédemment (et non activées chez le témoin) : mécanisme de compensation? réorganisation?