Jean-Marie Annoni

Parler plusieurs langues est-il un facteur de protection contre les troubles neurocognitifs ?

4eme cours lémanique
Jeudi 10 janvier 2019

Plan

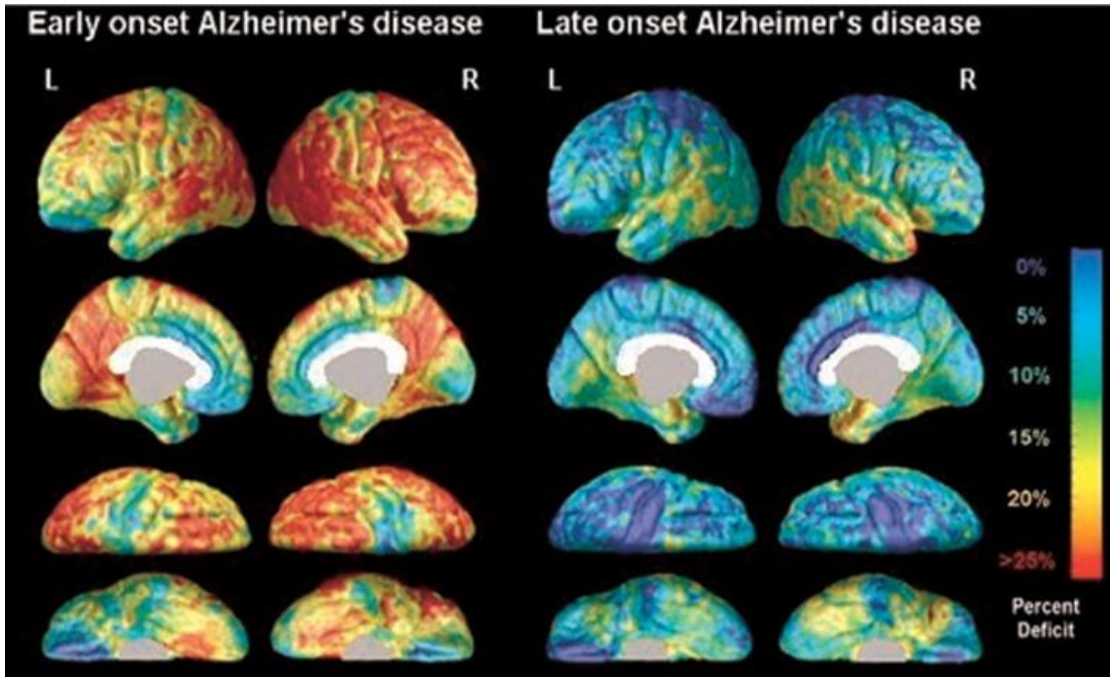
- **Quelques observations sur les personnes bilingues et la maladie d'Alzheimer et hypothèses**

- **Cerveau bilingue**

- **Bilinguisme et Alzheimer : Doutes et Situation actuelle**

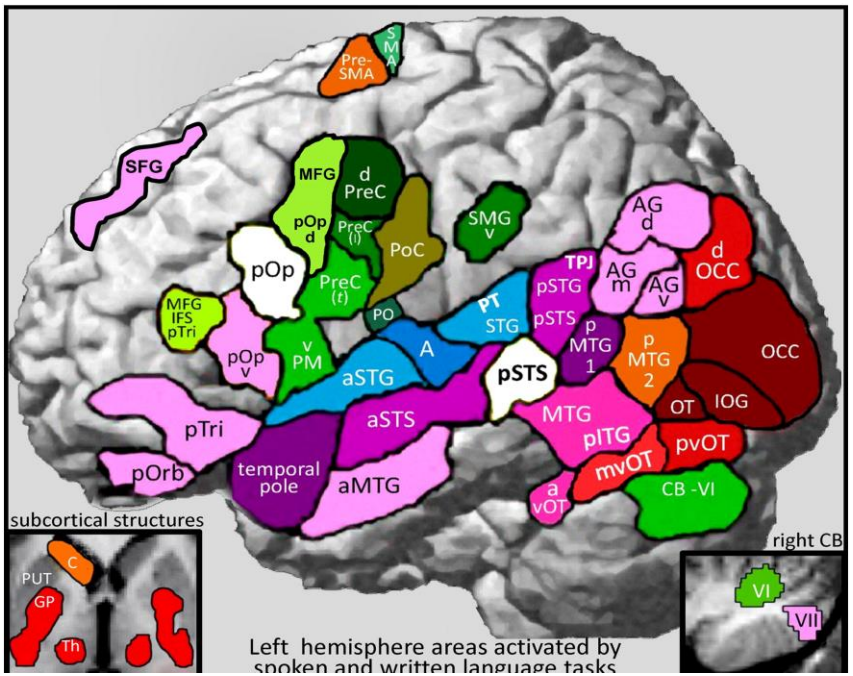
Langage et Mémoire : Même combat ?

Aires sensibles à la maladie d'Alzheimer



The topography of grey matter involvement in early and late onset Alzheimer's disease
Frisoni 2007, Pini 2016

Aires impliquées dans le langage



•A review and synthesis of the first 20 years of PET and fMRI studies of heard speech, spoken language and reading Price, 2012

Delaying the onset of Alzheimer disease

Bilingualism as a form of cognitive reserve

Fergus I.M. Craik, PhD
Ellen Bialystok, PhD
Morris Freedman, MD

Methods: Data were collected from 211 consecutive patients diagnosed with probable Alzheimer disease (AD). Patients' age at onset of cognitive impairment was recorded, as was information on occupational history, education, and language history, including fluency in English and any other languages. Following this procedure, 102 patients were classified as bilingual and 109 as monolingual.

Results: We found that the bilingual patients had been diagnosed 4.3 years later and had reported the onset of symptoms 5.1 years later than the monolingual patients. The groups were equivalent on measures of cognitive and occupational level, there was no apparent effect of immigration status, and the monolingual patients had received more formal education. There were no gender differences.

Conclusions: The present data confirm results from an earlier study, and thus we conclude that lifelong bilingualism confers protection against the onset of AD. The effect does not appear to be attributable to such possible confounding factors as education, occupational status, or immigration. Bilingualism thus appears to contribute to cognitive reserve, which acts to compensate for the effects of accumulated neuropathology. *Neurology*® 2010;75:1726-1729

- Replicates earlier study 2007
- The criterion for classification as bilingual was having spent the majority of life, at least from early adulthood, regularly using at least 2 languages.
- 21 first languages : Yiddish (n 24), Polish (n 12), Italian (n 11), Hungarian (n 9), and French (n 7).

Table Mean value (SD) for descriptors for each language group

Language group	No.	Age at onset, y[a]	Age at first appointment, y[b]	Duration, y[c]	MMSE[d] at first appointment	Years of education	Occupation status[e]
Monolingual	109	72.6 (10.0)	76.5 (10.0)	3.8 (2.9)	21.5 (5.7)	12.6 (4.1)	2.8 (1.3)
Men	49						
Women	60						
Bilingual	102	77.7 (7.9)	80.8 (7.7)	3.1 (1.9)	20.4 (5.6)	10.6 (5.1)	2.5 (1.1)
Men	42						
Women	60						

Craig , 2010

Etude séminale indienne (sur 648 patients)

Bilingualism delays age at onset of dementia, independent of education and immigration status

Results: Overall, bilingual patients developed dementia 4.5 years later than the monolingual ones. A significant difference in age at onset was found across Alzheimer disease dementia as well as frontotemporal dementia and vascular dementia, and was also observed in illiterate patients. There was no additional benefit to speaking more than 2 languages. The bilingual effect on age at dementia onset was shown independently of other potential confounding factors such as education, sex, occupation, and urban vs rural dwelling of subjects.

Conclusions: This is the largest study so far documenting a delayed onset of dementia in bilingual patients and the first one to show it separately in different dementia subtypes. It is the first study reporting a bilingual advantage in those who are illiterate, suggesting that education is not a sufficient explanation for the observed difference. The findings are interpreted in the context of the bilingual advantages in attention and executive functions. *Neurology*® 2013;81:1–7

Suvarna Alladi et al

The Protective Effect of Cantonese/ Mandarin Bilingualism on the Onset of Alzheimer Disease

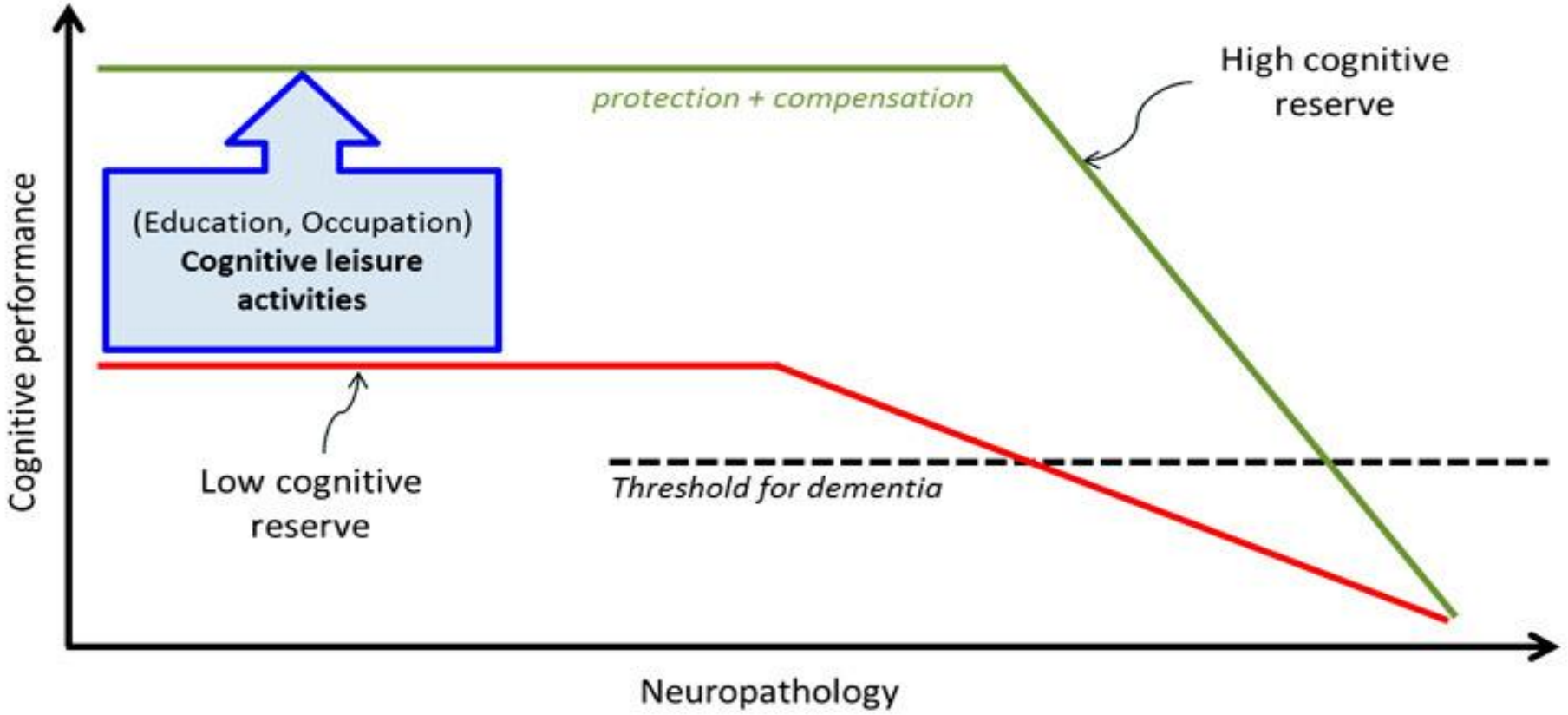
Yifan Zheng Qi Wu Fengjuan Su Yingying Fang Jinsheng Zeng Zhong Pei

Department of Neurology, The First Affiliated Hospital, Sun Yat-sen University, Guangzhou, PR China

Variable	*p* value
Usage of languages (C-mono or C/M-bi)	0.017
Sex	0.555
Years of education	0.724
Occupation status	0.315
Relocation history	0.082
Constant leisure activities	0.001
Constant physical activities	0.235
Hypertension	0.965
Type 2 diabetes	0.886
Smoking	0.628
Living in a city or countryside	0.258

Dement Geriatr Cogn Disord 2018;45:210–219

Alzheimer et Réserve cognitive



Mistridis et al 2017 : Use it or lose it! Cognitive activity as a protective factor for cognitive decline associated with Alzheimer's diseas

Bilinguisme et Réserve Cognitive

- Bilingualism has been recently indicated as one of the sustained stimulating activities that may foster healthy aging by promoting "cognitive reserve" *(Stern, 2002)*

- Maintain functioning in the presence of changes in brain integrity or neurodegenerative lesions *(Bialystok et al., 2016; Perani & Abutalebi, 2015)*

Plan

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- **Cerveau bilingue**
-

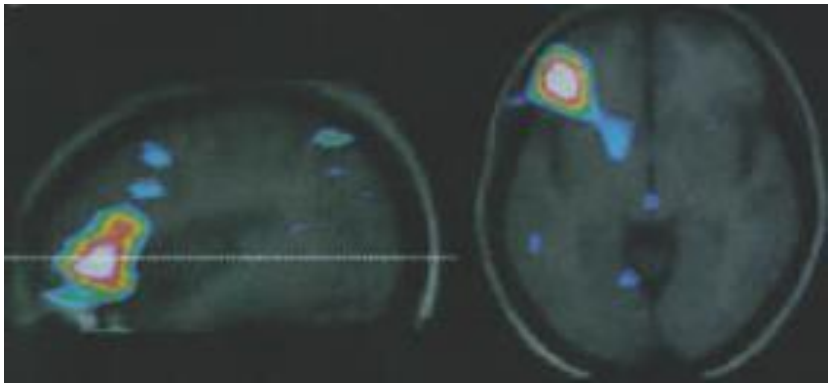
Définitions du bilinguisme

- **Restrictive**
  - *Simultaneous acquisition during childhood (Bloomfield 1933)*
- **Permissive**
  - *Management of at least one linguistic ability in another language (Macnamara 1967)*
- **Psycholinguistique**
  - *Express himself in a mother tongue and at least in a second learned language in the daily life (Grosjean 1998).*

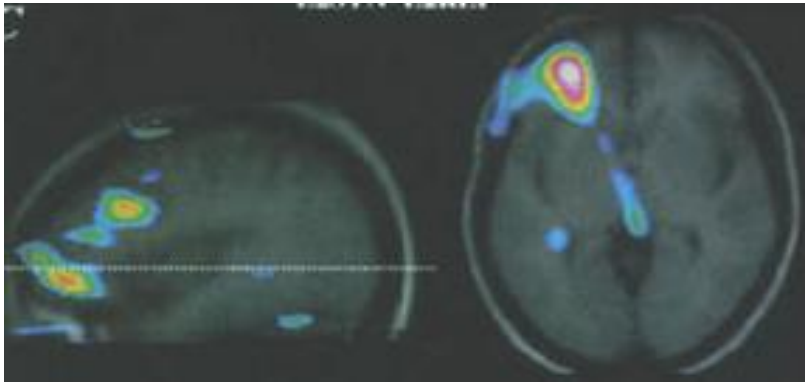
Le cerveau bilingue précoce

tardif,

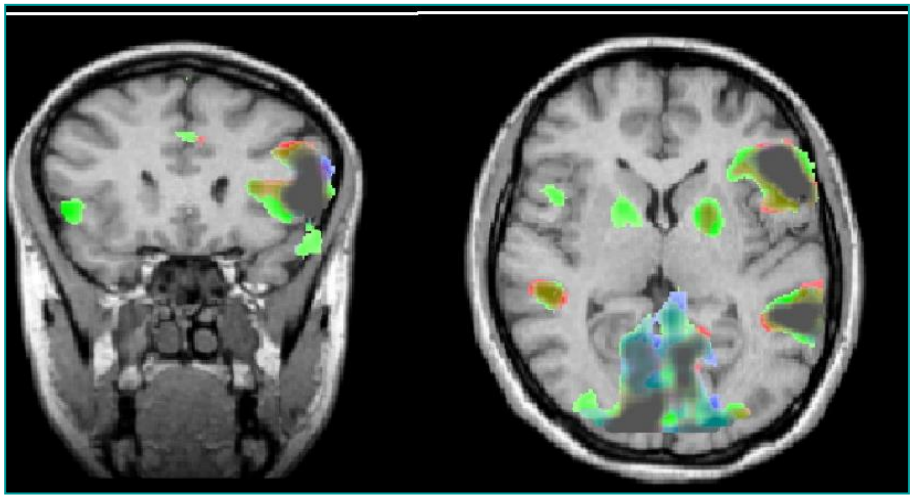
L1: trouver un synonyme



L2: trouver un synonyme



Racontez moi une histoire en L1 et en L2

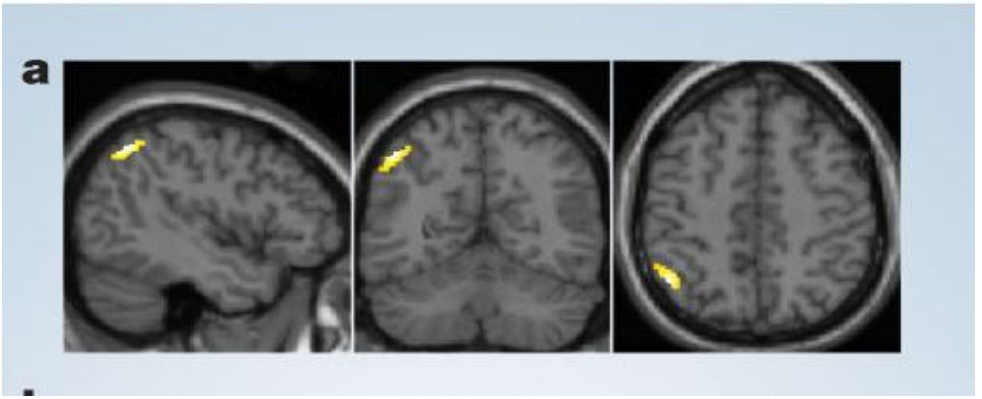


Klein et al., 1995, Bloch 2009

Bilinguisme induit une plasticité Structurelle

Language and Brain Structure
Language learning modulates brain

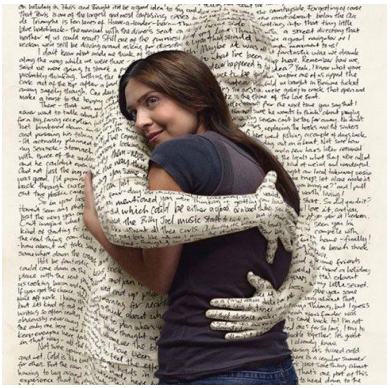
Nature **431**, 757 (2004) |
Neurolinguistics: Structural plasticity in the bilingual brain
Mechelli,



Bilinguisme induit une plasticité fonctionnelle

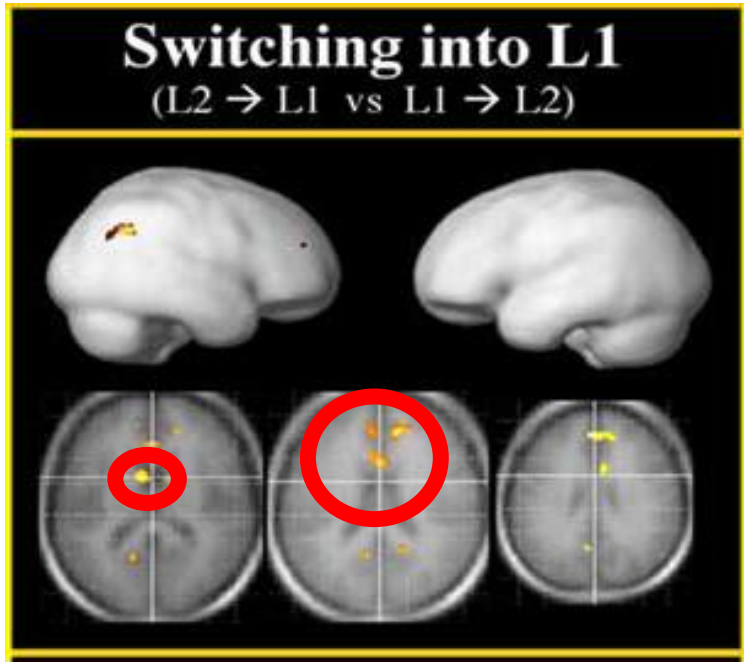
The Impact of Language Opacity and Proficiency on Reading Strategies in Bilinguals: An Eye Movement Study

Diego de León Rodríguez[1], Karin A. Buetler[1], Noëmi Eggenberger[2], Marina Laganaro[3], Thomas Nyffeler[2], Jean-Marie Annoni[1] and René M. Müri[2]*



2015-2016

Comment le bilingue sélectionne une langue
Processus EXECUTIF/INHIBITEUR

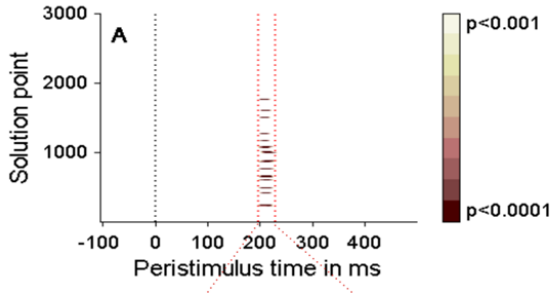


J Neurosciences, 2007
Cerebral cortex, 2008
Brain and language 2012

Regular Article

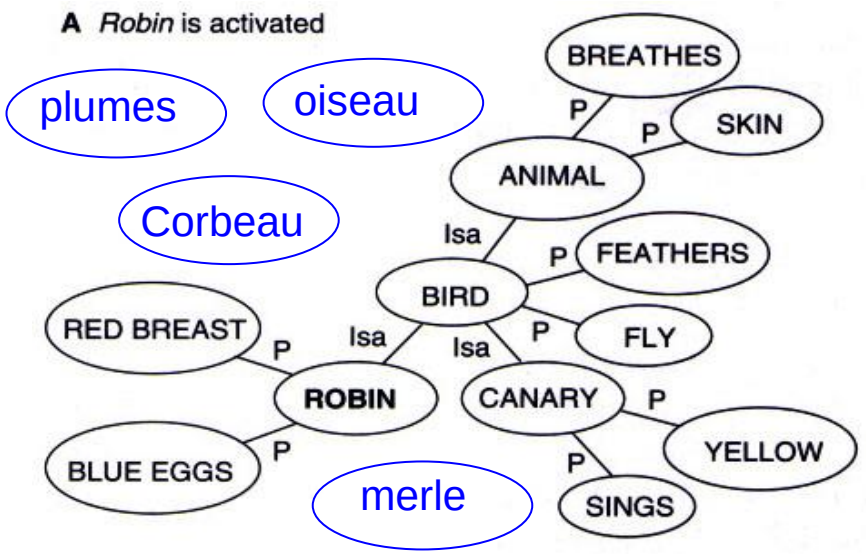
Cognitive control of language production in bilinguals involves a partly independent process within the domain-general cognitive control network: Evidence from task-switching and electrical brain activity

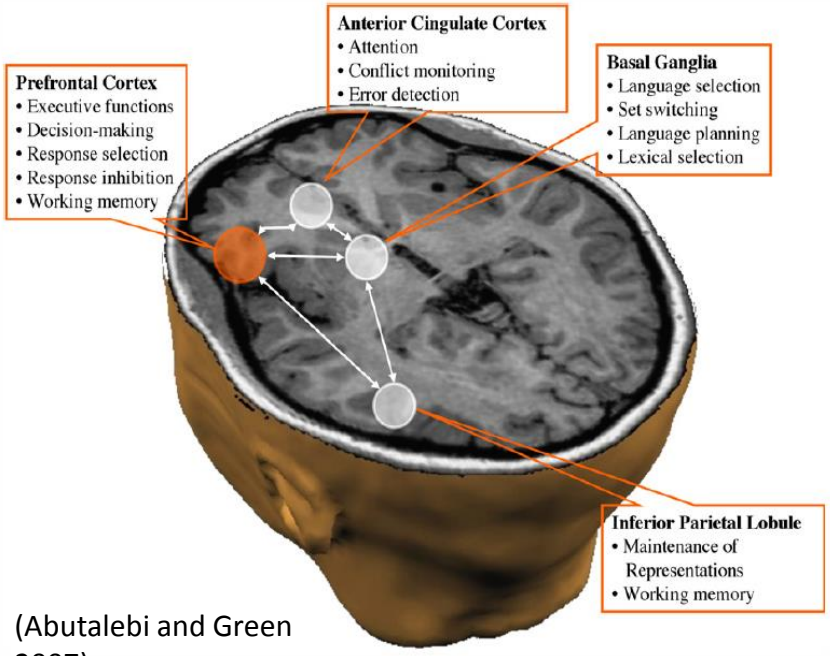
David A. Magezi [a,1], Asaid Khateb [b,c], Michael Mouthon [a,b], Lucas Spierer [a], Jean-Marie Annoni [a,b,d,*]



Je dois inhiber une langue quand je parle dans une autre

(J Kroll, F Grosjean, D Green, 2011, Abutalebi 2014)





(Abutalebi and Green 2007)

Les bilingues auraient développé un système inhibiteur plus expert

Bilingual children solve the Simon task one year before monolingual children

children (5 years)	**: +**
young adults (20–30 years)	**: =**
Middle aged (30–60 years)	**: +**
older adults (over 60 years)	**: +**

Bialystok et al 2009
Controversy : Paaps 2013,

Ceci donnerait aux bilingues une meilleure réserve cognitive

tia. However, monolinguals and bilinguals might have different baseline cognitive ability. We present the first study examining the effect of bilingualism on later-life cognition controlling for childhood intelligence. We studied 853 participants, first tested in 1947 (age = 11 years), and retested in 2008–2010. Bilinguals performed significantly better than predicted from their baseline cognitive abilities, with strongest effects on general intelligence and reading. Our results suggest a positive effect of bilingualism on later-life cognition, including in those who acquired their second language in adulthood.

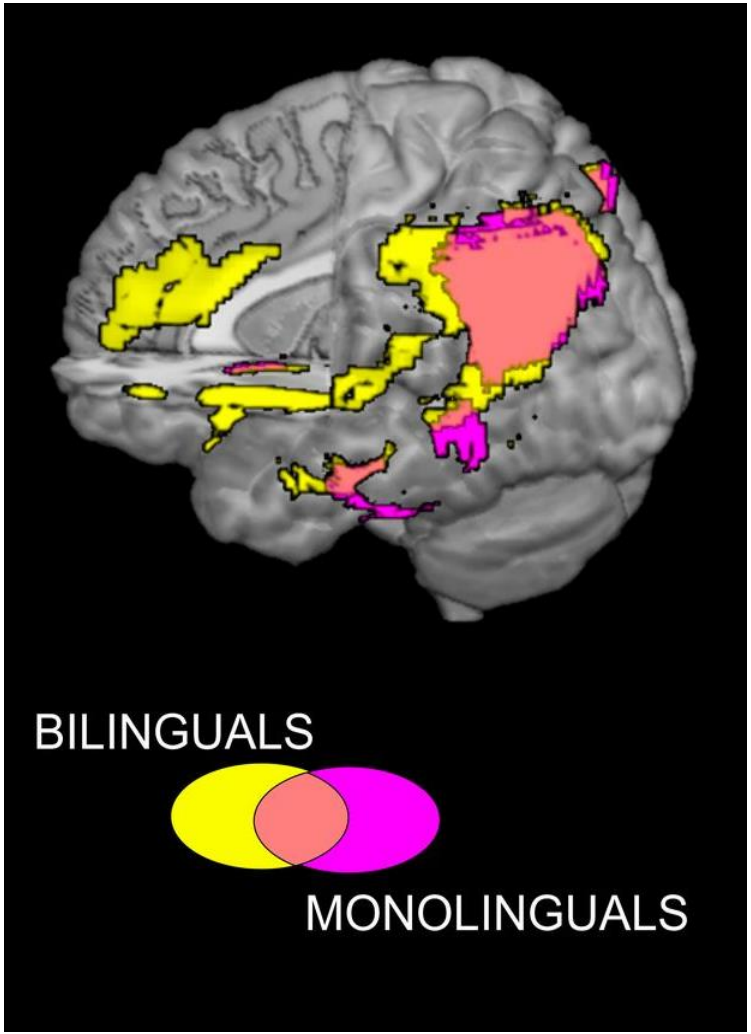
ANN NEUROL 2014;75:959–963

Back 2014

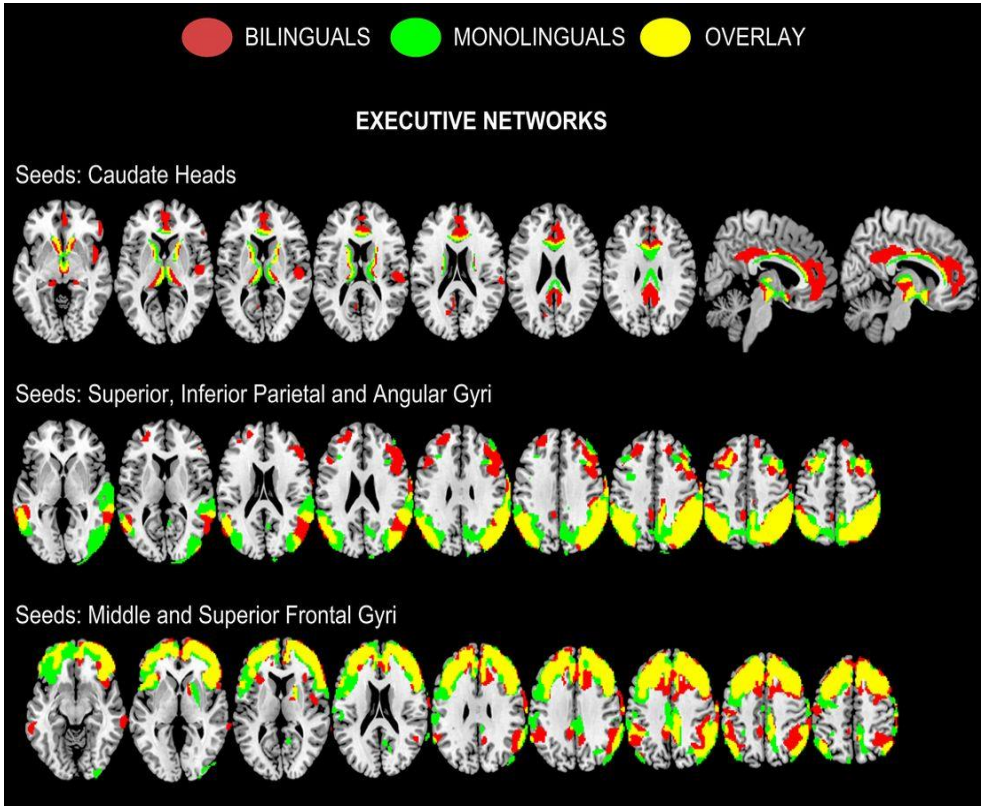
A MMSE égal, les bilingues avec une maladie d'Alzheimer ont un hypométabolisme frontal plus marqué

Brain hypometabolism in bilingual and monolingual patients with probable Alzheimer's dementia

Daniela Perani et al. PNAS 2017;114:7:1690-1695



Results of the metabolic connectivity analysis in the ECN and dorsal and anterior DMN. The seeds are indicated (Materials and Methods).



Daniela Perani et al. PNAS 2017;114:7:1690-1695

Plan

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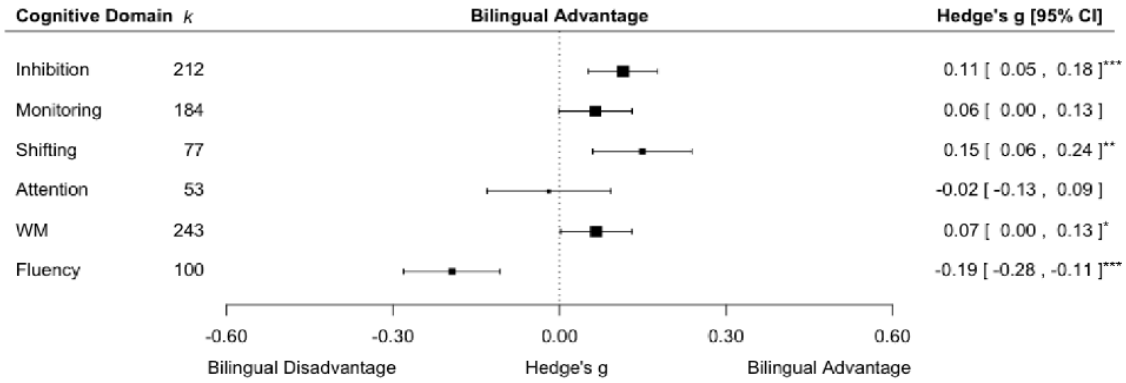
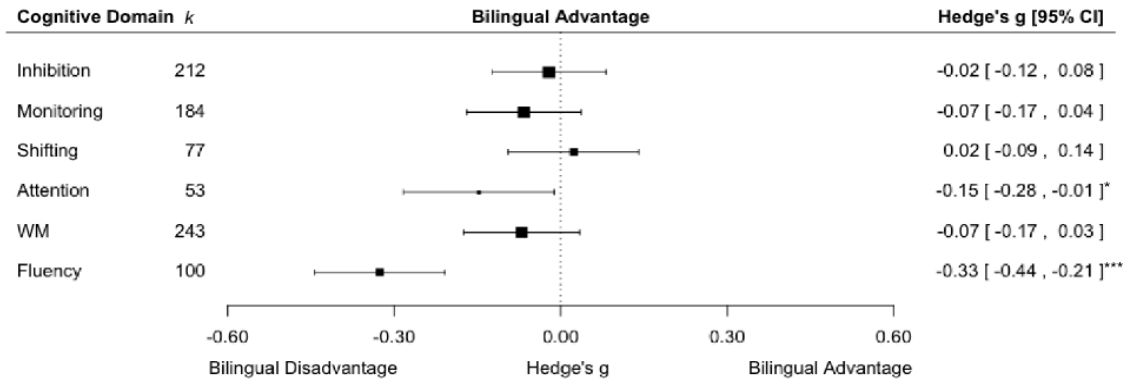
- **Bilinguisme et Alzheimer : Doutes et Situation actuelle**

Bilingual advantages in executive functioning either do not exist or are restricted to very specific and undetermined circumstances



Corrected Effect Sizes



Paaps 2016
Lehtonen et al 2018
Filippi 2018

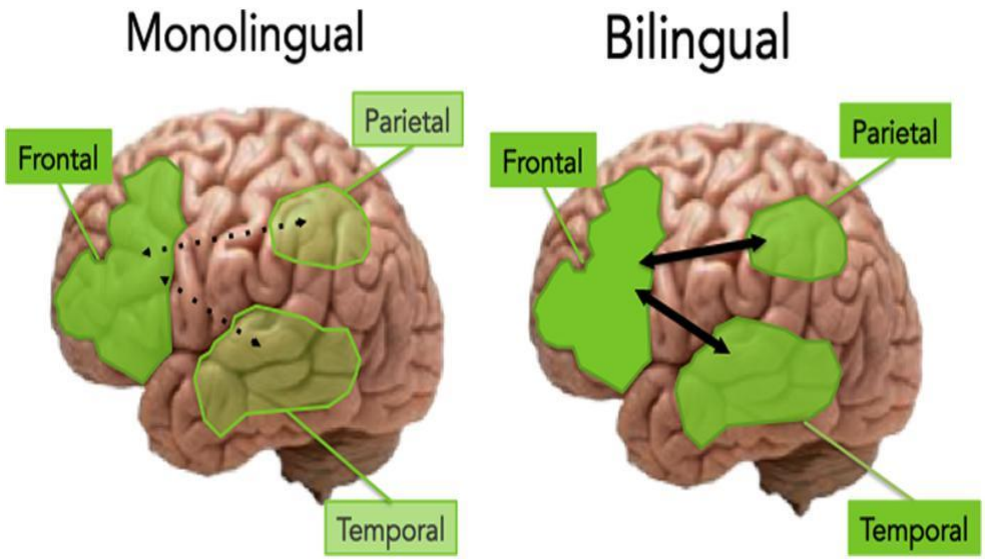
Hypothèses alternatives : plus globales ou structurelles ?

frontiers in PSYCHOLOGY

REVIEW ARTICLE
published: 03 December 2014
doi: 10.3389/fpsyg.2014.01401

Cognitive control, cognitive reserve, and memory in the aging bilingual brain

Angela Grant[1,2], *Nancy A. Dennis*[1,2] *and Ping Li*[1,2]*



Grant 2017

Situation actuelle : Bilinguisme et Alzheimer

1. **Effet protecteur du bilinguisme sur la démence : +**
   a. 18 études prospectives et rétrospectives : (11 +; 7 =)
   b. Meta- analyse prospectives (4 études) : =

2. **Effet du bilinguisme sur le cerveau (structure) : +**
   a. sur les réseaux exécutifs et langagiers : +

3. **Effet du bilinguisme sur les fonctions exécutives: ?**
   a. Pas clair : =

A commentary on

The Relationship of Bilingualism Compared to Monolingualism to the Risk of Cognitive Decline or Dementia: A Systematic Review and Meta-Analysis
by Mukadam, N., Sommerlad, A., and Livingston, G. (2017). J. Alzheimer's Dis. 58, 45–54. doi: 10.3233/JAD-170131

Merci