

Neurociència cognitiva del llenguatge
(i d'altres funcions cognitives)

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Català Español English

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Research lines

SPPB	GAAP
<ul style="list-style-type: none"> • Speech Perception, Production and Bilingualism <ul style="list-style-type: none"> - Development - Perception - Production - Control - Individual differences 	<ul style="list-style-type: none"> • Attention, Action and Perception <ul style="list-style-type: none"> - Attention and Perception interaction - Visuo-Tactile integration - Integration in the time-domain - Perception of motion

Audiovisual integration of speech

SPPB

Speech Perception Production and Bilingualism

Language Development

- How do infants learn language?
 - Discovery of the very fundamental properties of language
 - Discovery of the very first words
- How do infants succeed in a bilingual environment?
 - Similar languages (Catalan-Spanish)
 - Dissimilar languages (Basque-Spanish)

Language Differentiation

- Prerequisite ⇔ To realize there is more than one language
- How many different languages can you distinguish?



Language Differentiation

- At birth newborn infants can differentiate some language pairs, but not others:



Non-nutritive sucking method:
Habituation-dishabituation paradigm

- English vs. French ✓
- French vs. Japanese ✓
- Japanese vs. English ✓
- Italian vs. Spanish ✗
- English vs. Dutch ✗
- Catalan vs. Spanish ✗

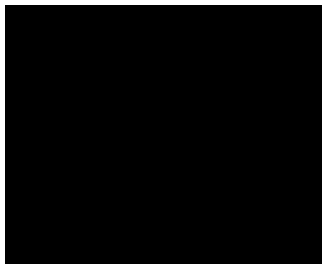
Language Differentiation

- Four and a half month-old bilingual infants:
 - Do not have difficulties in separating Spanish from Catalan (like monolingual infants)
 - Are marginally better than monolingual infants at distinguishing “similar” languages (Italian):

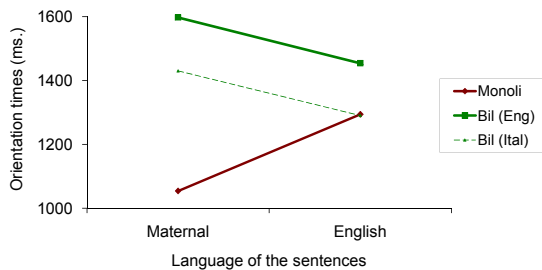
	Monol	Biling
Spanish-English	✓	✓
Spanish-Italian	✗	✓
Spanish-Catalan	✓	✓

Language Differentiation

- Orientation latencies procedure: Infants orient faster to familiar than to unfamiliar stimuli



Language Differentiation



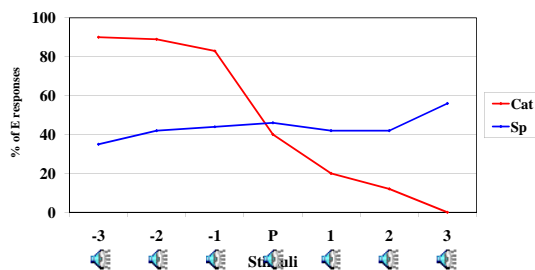
Bosch & Sebastián-Gallés, 1997

Speech perception (adults)

- Second language learning mechanisms
- Issues about brain plasticity
- Critical periods

Why some individuals born in Catalunya, in Spanish monolingual environments, show so many difficulties in perceiving the Catalan-specific /e-ɛ/ vowel contrast? What does this tell us about brain plasticity?

Vowel perception /e-ɛ/ Early bilinguals

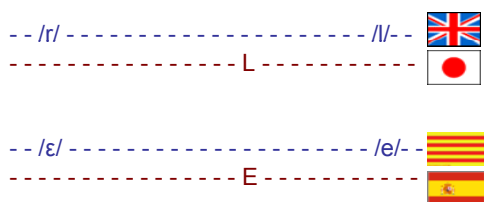


Approx 50% of the Sp- Cat participants fell within the range of Cat natives

Pallier, Bosch & Sebastián-Gallés (1997): identification task

The perception of the difficult cases

Most difficult case: when there is a single L1 phoneme falling roughly in between two L2 ones (PAM & SLM models)



Individual Differences

Language Production

- Lexical access in monolingual and bilingual individuals



Animal?
Gos?
Perro?
Tobi?
Fifi?



Cognate effect in L1 (production)

Picture naming task



750 ms.

"árbol"
"arbre"



<

800 ms.

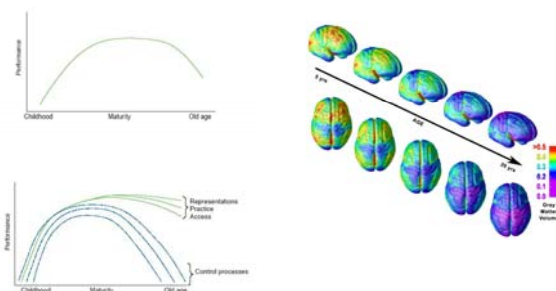
"mesa"
"taula"

Costa, Caramazza & Sebastián-Gallés (2000)

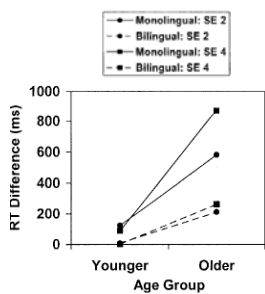
Simon Task

- Si el cercle es VERMELL ⇒ ESQUERRE
- Red circle ⇒ LEFT
- Si el cercle és BLAU ⇒ DRETA
- Blue circle ⇒ RIGHT

Control mechanisms

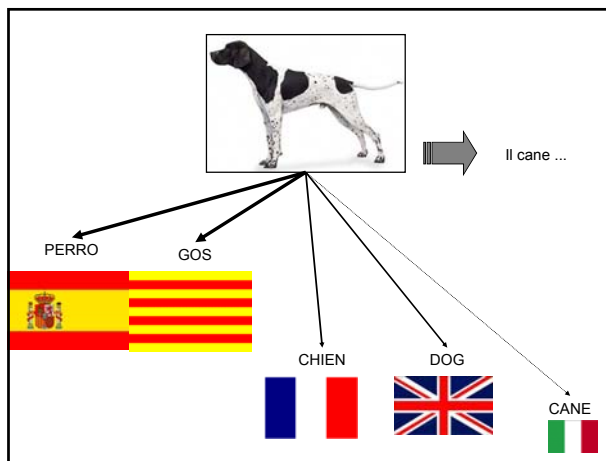


Control mechanisms and ageing



Bilingualism may have some beneficial effects on cognitive decline

Bialystok et al. 2004





Animal Cognition

- What is specifically human in language learning and processing?
- What “part” of a human language can animals

Animal capacities to learn:

tupiro?
pirooi?
where is the food?

tupirobidaku...

Phonetic categories
Statistical regularities
Language discrimination

Winners of the **Ig® Nobel Prize**

For achievements that first make people LAUGH
then make them THINK

"The Ig Nobel awards are arguably the highlight
of the scientific calendar." --[Nature](#)

LINGUISTICS: [Juan Manuel Toro](#), Josep B. Trobalon and [Núria Sebastián-Gallés](#), of Universitat de Barcelona, for showing that rats sometimes cannot tell the difference between a person speaking Japanese backwards and a person speaking Dutch backwards.

REFERENCE: "[Effects of Backward Speech and Speaker Variability in Language Discrimination by Rats](#)," Juan M. Toro, Josep B. Trobalon and Núria Sebastián-Gallés, Journal of Experimental Psychology: Animal Behavior Processes, vol. 31, no. 1, January 2005, pp 95-100.

GAAP

Multisensory integration

The mechanisms that integrate information from different sensory modalities (e.g., touch, vision, audition,...).

To address crossmodal interactions in perception and attention. These multisensory integration processes are crucial to build and maintain optimal representations of our sensory environment and help to plan adaptive behaviours.

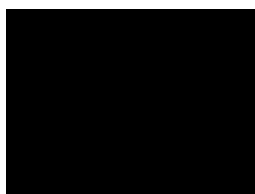
Action-Perception Compatibility and Visual Motion Perception

- How is visual movement processed? (Com es processa el moviment visual? (depth movement)
 - How information from different retinal regions integrates to give global perception and optical flow
 - How this visual information modulates motor control responses

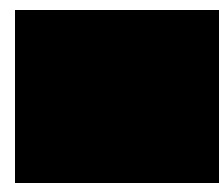
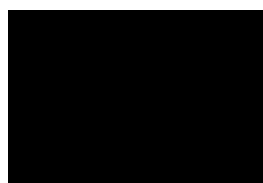
Where SPPB & GAAP meet

Audiovisual speech integration

- McGurk effect



Infant's ability to visually differentiate languages



Weikum et al. Science, 2007

Studies with patients

- Studies with both brain-lesioned patients and patients with neurodegenerative diseases

ELPAIS.com • Sociedad

Los enfermos de Alzheimer olvidan primero los objetos inanimados

Un estudio del Parc Científic, la Universidad de Barcelona y el Hospital de Bellvitge demuestra que la pérdida de la memoria es homogénea.

EP, Barcelona - 23/01/2008

Los enfermos de Alzheimer dejan de recordar primero los objetos inanimados y después sus seres vivos cercanos, según un estudio realizado por el Parc Científic de Barcelona (PCB) en colaboración con la Universidad de Barcelona y el Hospital Bellvitge, en L'Hospitalet de Llobregat.

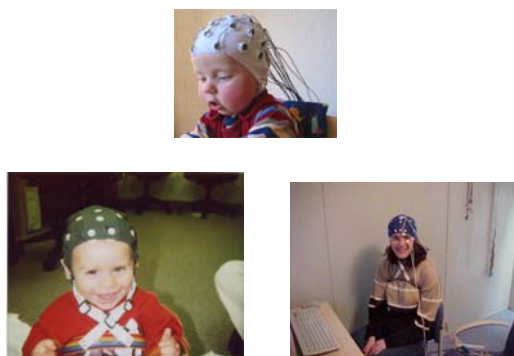
En la investigación han participado 36 enfermos de 72 años de edad de media y 21 adultos sanos de la misma edad y nivel escolar que los afectados de Alzheimer. Albert Costa, coautor del estudio e investigador en Neurociencia Cognitiva del PCB, ha explicado que los resultados de este trabajo también pueden contribuir a "conocer mejor cómo se organiza la información conceptual del cerebro".

Methods we use

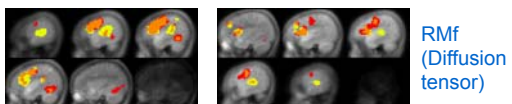
Behavioral



Electrophysiological recordings



Functional and structural neuroimaging



New methods

Eye tracking



TMS



People

SPPB

- Albert Costa
- Laura Bosch
- Pep Batista Trobalon
- Núria Sebastian

GAAP

- Salvador Soto
- Joan López Moliner

- Ferran Pons
- Juan Manuel Toro
- Angels Colomé

People

SPPB + GAAP

