Brain Science and Language
腦科學與語言研究

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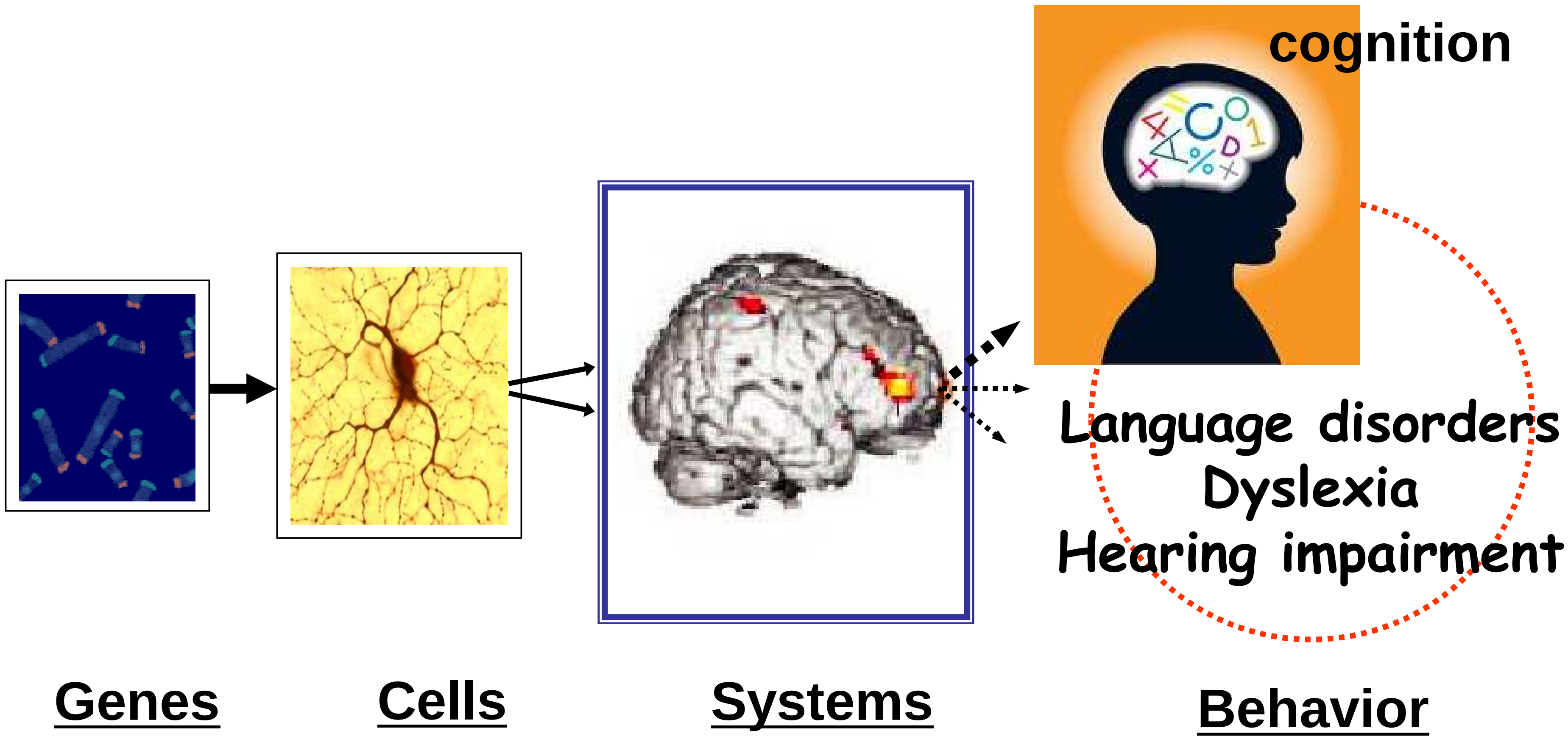
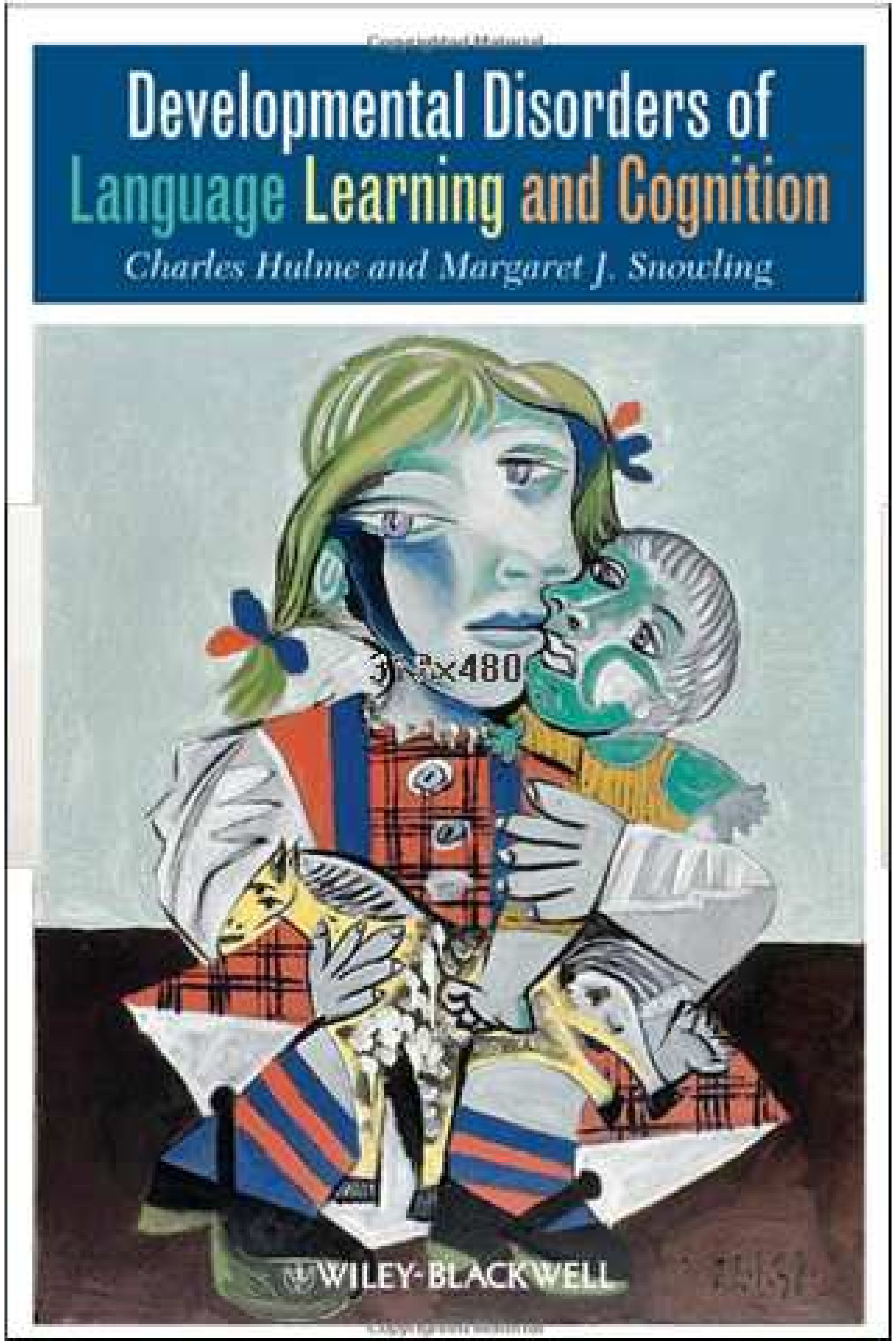
From Neuroscience to Behavior




Developmental Disorders of
Language Learning and Cognition
Charles Hulme and Margaret J. Snowling
WILEY-BLACKWELL

DYSLEXIA:
word accuracy and fluency

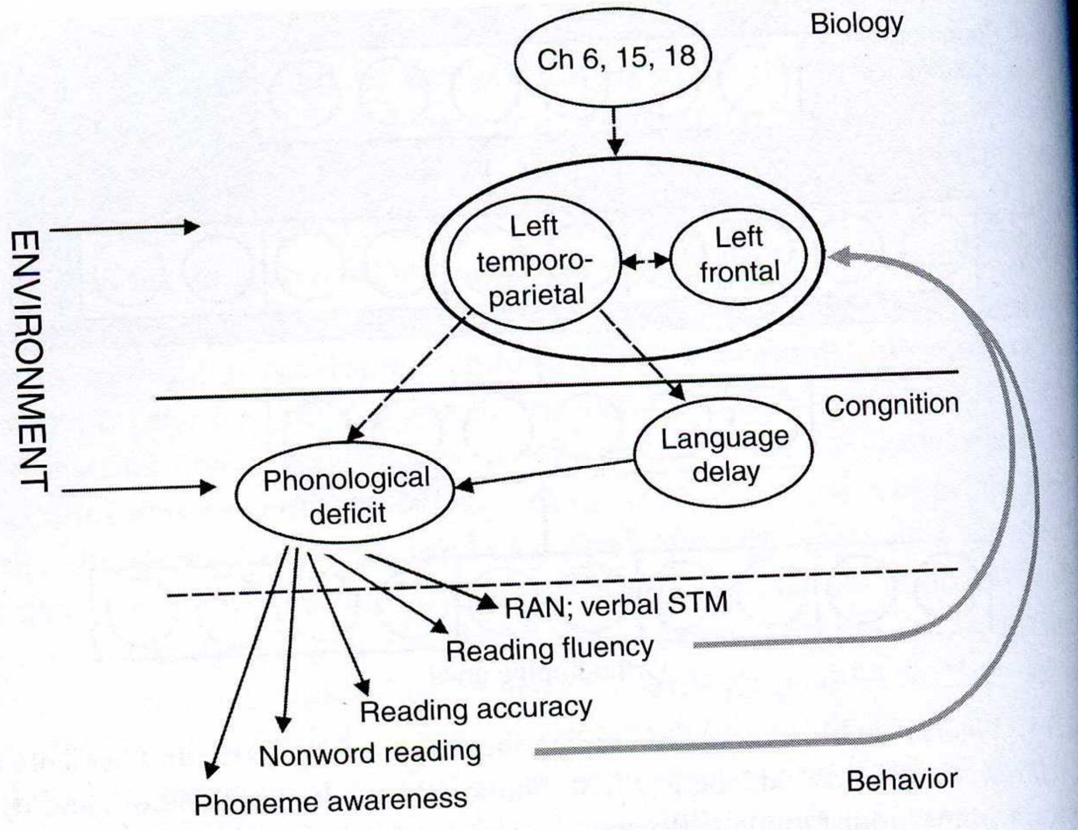


Figure 2.15 A path model of dyslexia showing a phonological deficit as the single pro
cause of a number of behavioral manifestations of dyslexia.

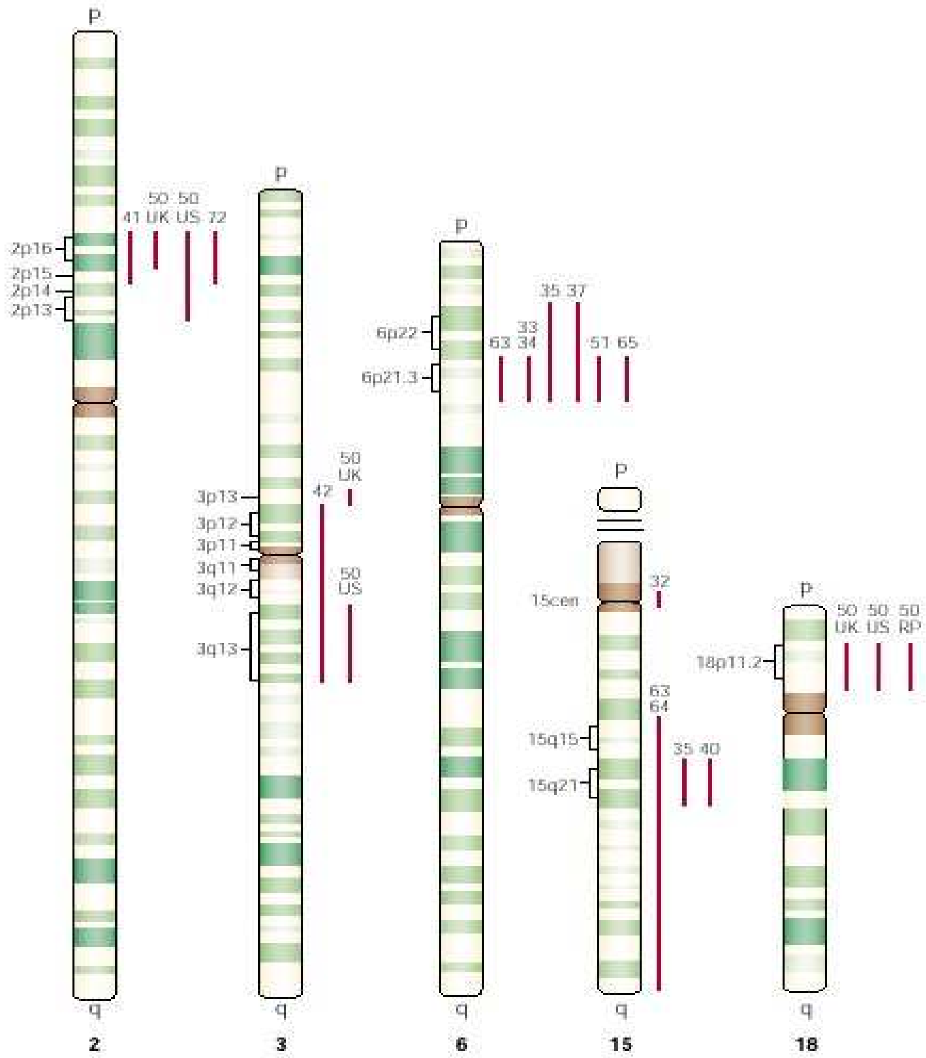


Figure 3 | **Replicated regions of chromosomes 2, 3, 6, 15 and 18 implicated by linkage studies of dyslexia.** Ideograms of each chromosome are shown with the cytogenetic bands of interest indicated. Each chromosome has a short (p) arm and a long (q) arm, which are separated by a centromere. Red bars indicate approximate positions of positive regions of linkage, with the relevant citation number of the study shown above. REF. 50 included two

Fisher & Defries (2002). Nature Review Neuroscience

nature neuroscience

From genes to behavior in developmental dyslexia

Albert M Galaburda, Joseph LoTurco, Franck Ramus, R Holly Fitch & Glenn D Rosen

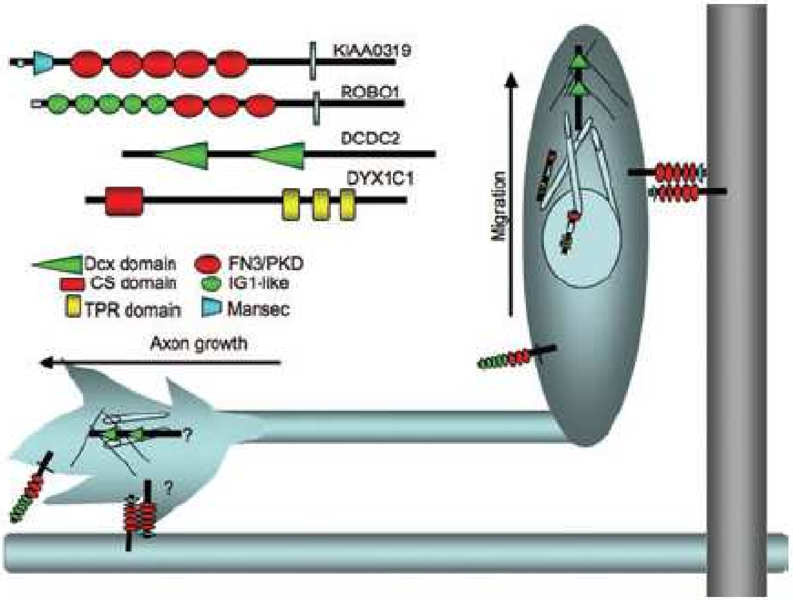


Figure 1 Protein domains and possible functions. KIAA0319 and ROBO1 serve as transmembrane adhesion molecules and receptors that guide axons to appropriate targets. DCDC2, and perhaps DYX1C1, are proposed to act as downstream targets that then serve to modulate changes in cytoskeletal dynamic processes involved in the motility of developing neurons. Critical future studies must now address whether there are links between the functions of these proteins in migration and axonal pathfinding.

Table 1. Summary of current dyslexia theories that have fueled commercial approaches to diagnosis and treatment

	Behavioral differences in dyslexia	Physiological differences in dyslexia	Commercial approaches to identification	Commercial approaches to treatment	Evaluated through research
Cognitive/Linguistic Theories:					
Phonological processing deficits: phonological segmentation, decoding from working memory and rapid phonological retrieval; non-word reading	(ref. 22) (ref. 24)	(ref. 7) (ref. 33) (ref. 8)	Comprehensive Test of Phonological Processing Fox in a Box Phonological Awareness Literacy Screening Phonological Awareness Test Test of Phonological Awareness Test of Word Reading Efficiency Texas Primary Reading Inventory	Lindamood-Bell, Phono-Graphix, Orton-Gillingham Wilson, Slingerland Language!	(ref. 24)
Sensorimotor Theories:					
Anomalous processing in the auditory system: rapid temporal processing deficit	(ref. 21)	(ref. 26)	—	Fast ForWord (modified speech)	(ref. 27)
Anomalous processing in the visual system: magnocellular deficit (ref. 32)	(ref. 31)	(ref. 34)	—	—	—
Anomalous processing in the motor system: rapid bimanual control deficit (ref. 12)	(ref. 12)		—	—	—

Eden and Moats (2002). Nature Neuroscience

Reading comprehension deficits

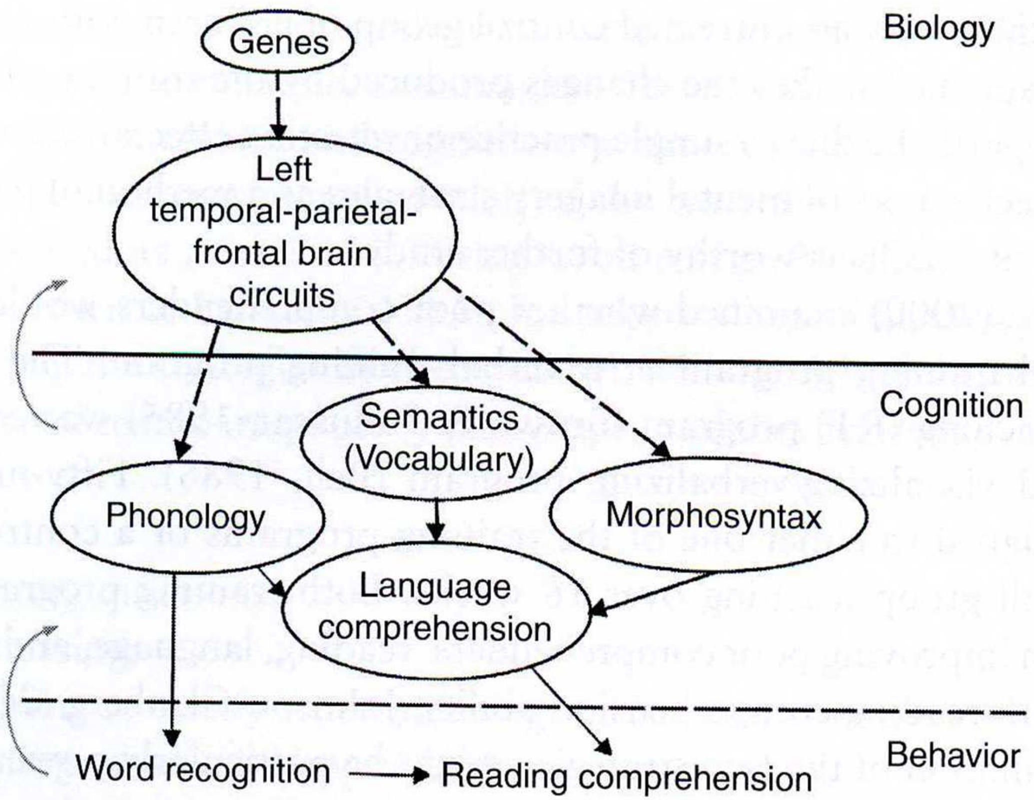


Figure 3.10 Path model showing possible sources of reading comprehension deficits.

Specific Language Impairment

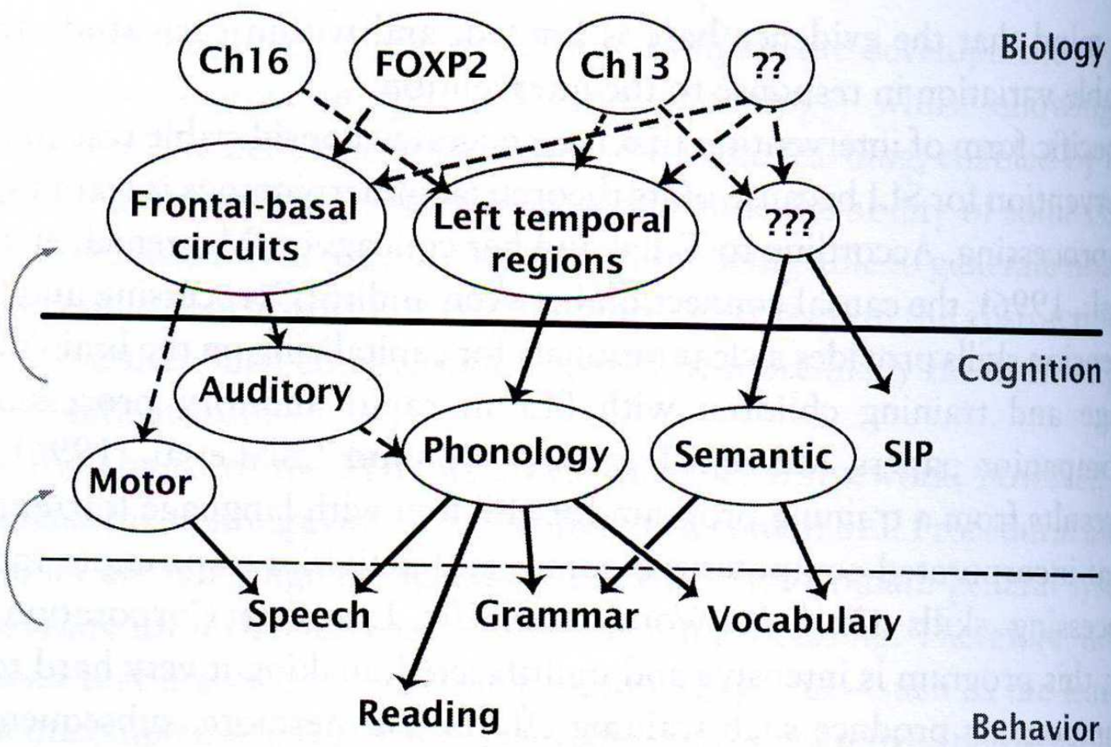
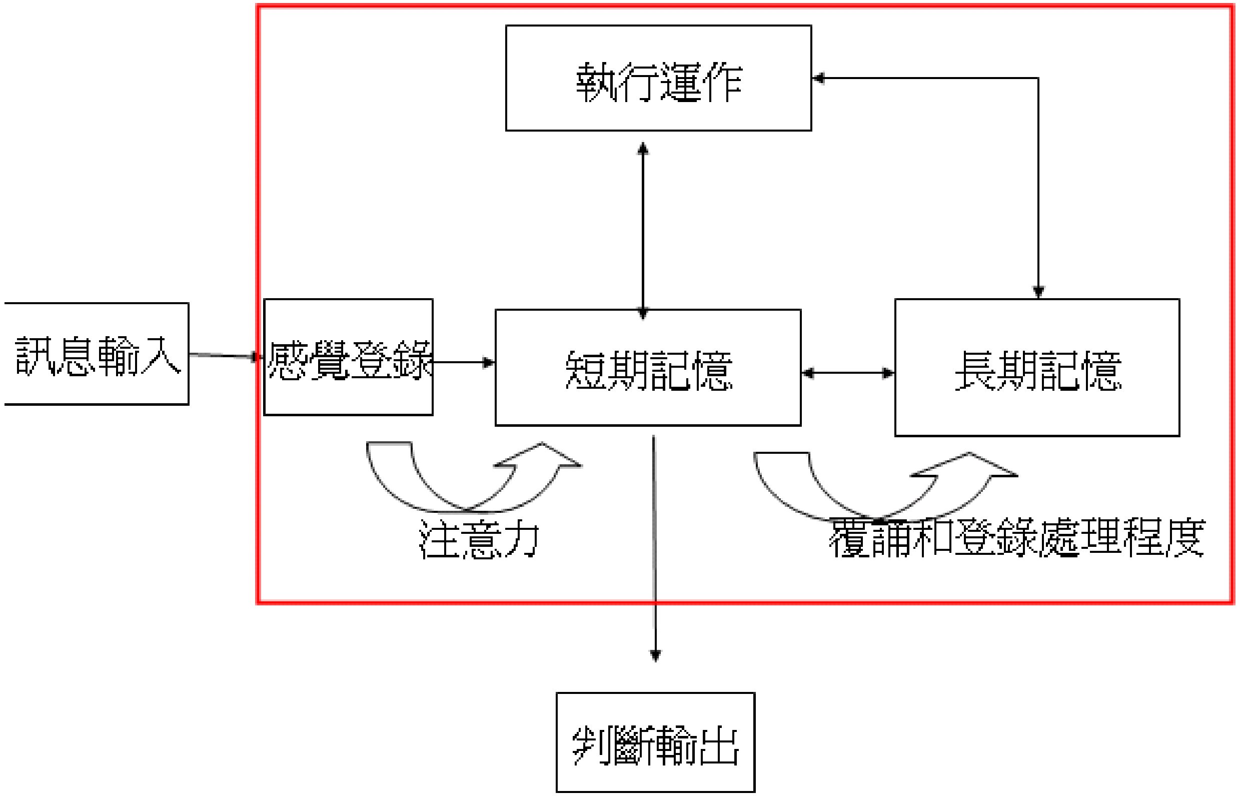
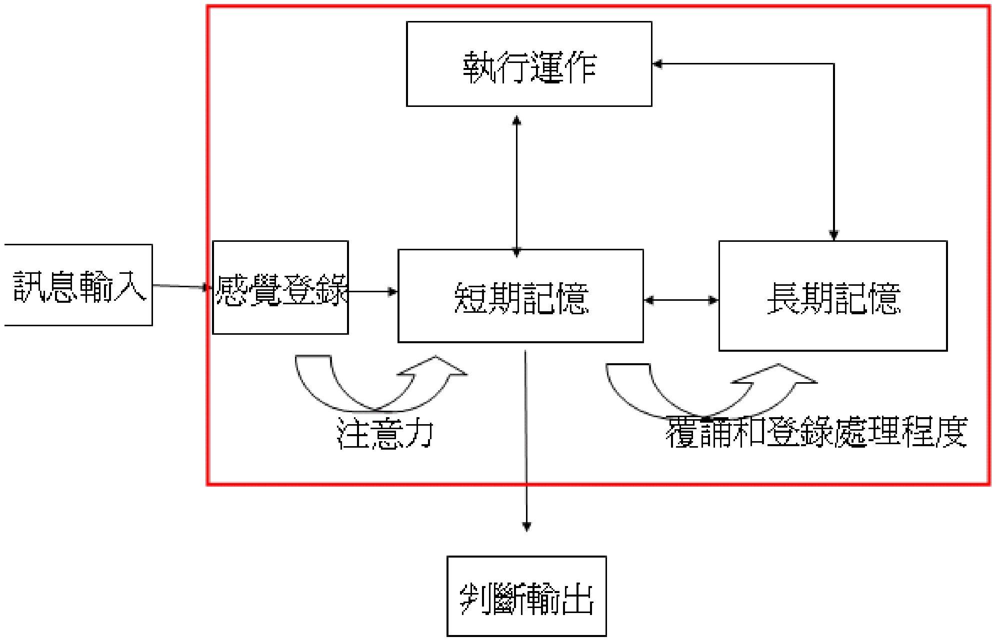


Figure 4.8 A path model for specific language impairment. (SIP = speed of information processing.)

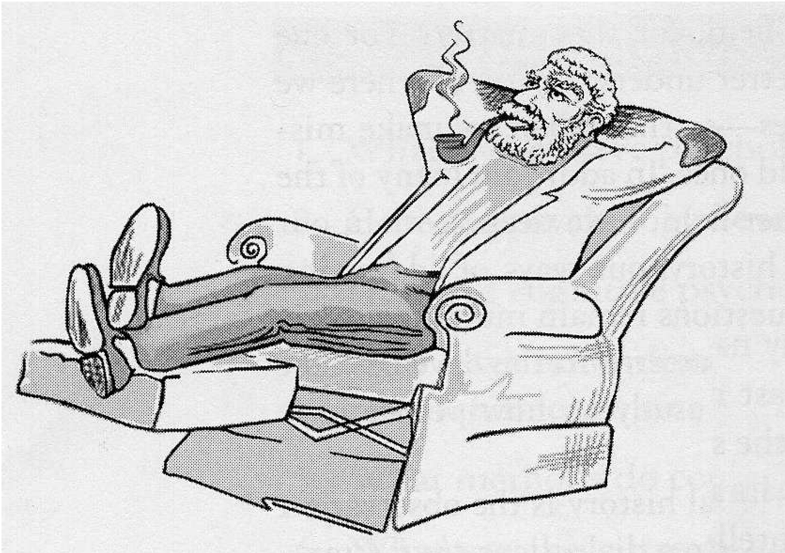
Information Processing approach
Cognitive Psychology/ Cognition

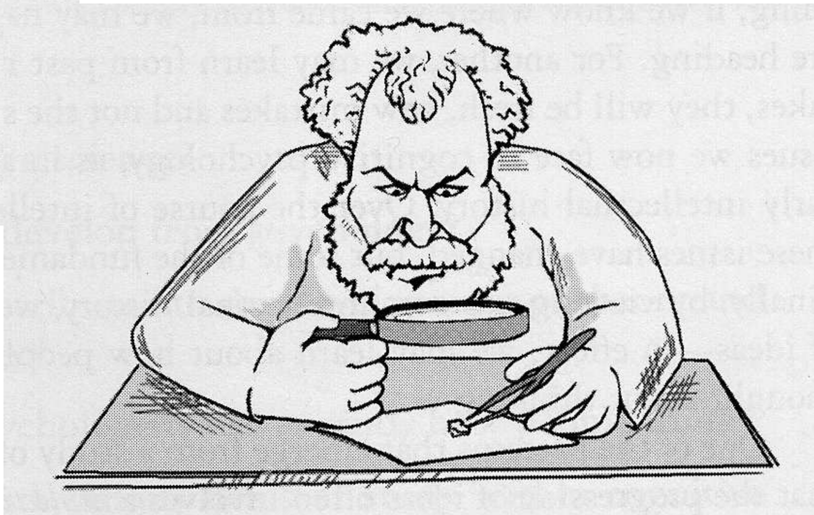


- Structure
- Function
- Processing/Mechanism



From Arm-chaired to scientific studies

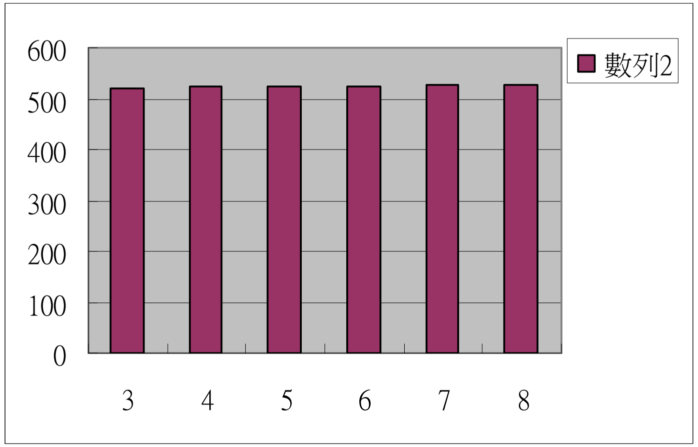


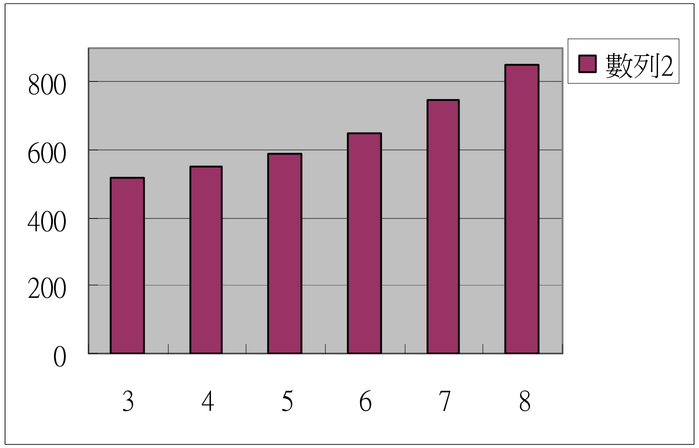


(b)

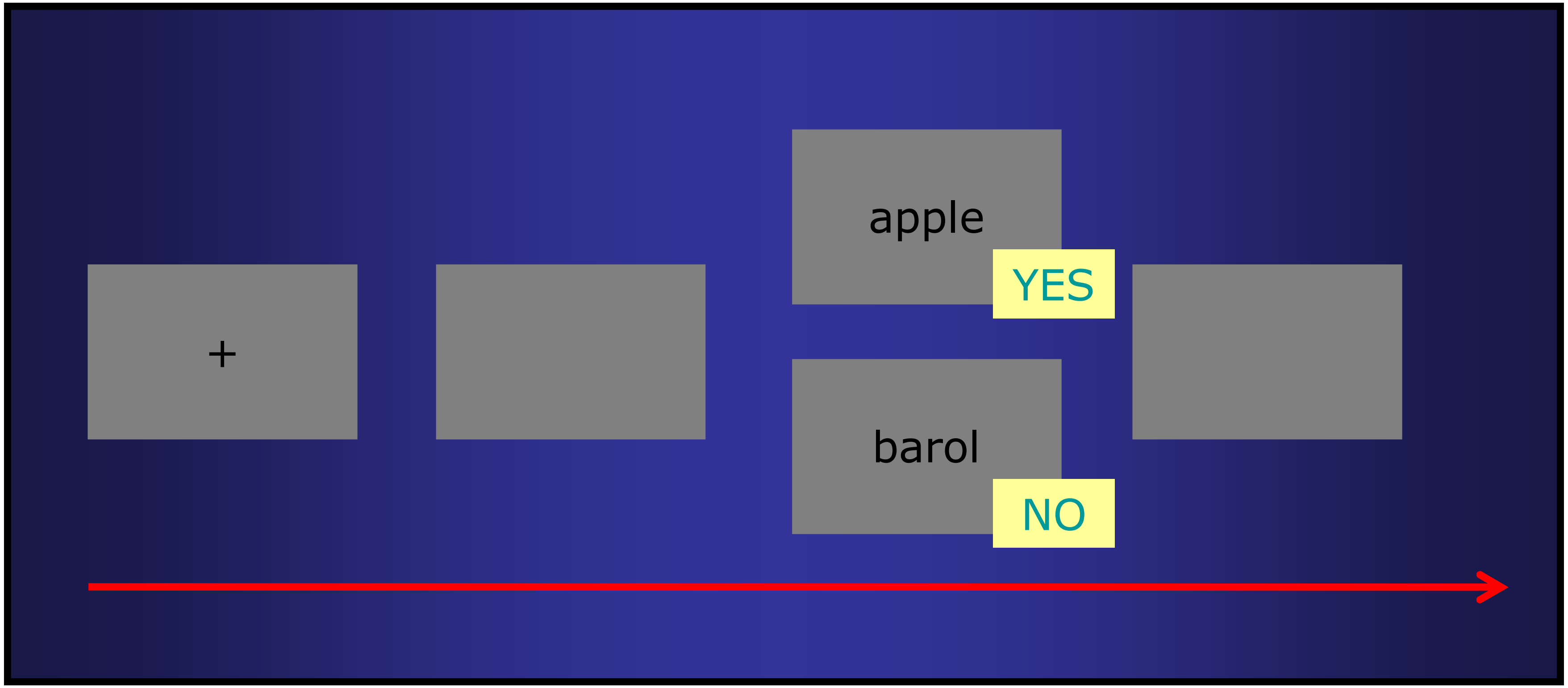
How do you retrieve English words?

- Holistically
- Serially

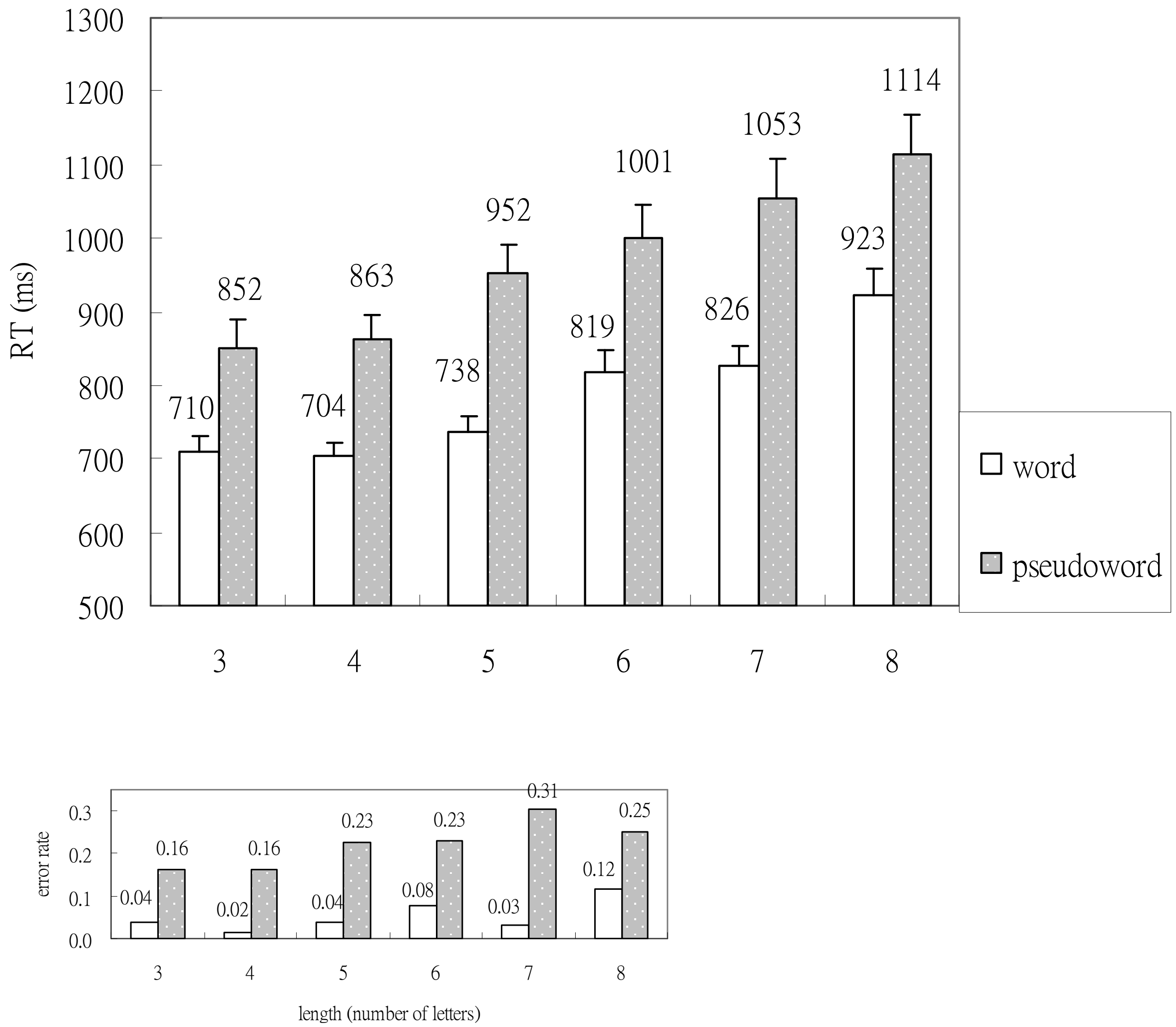




Lexical decision task



Pseudowords as No responses



Speech perception and language development

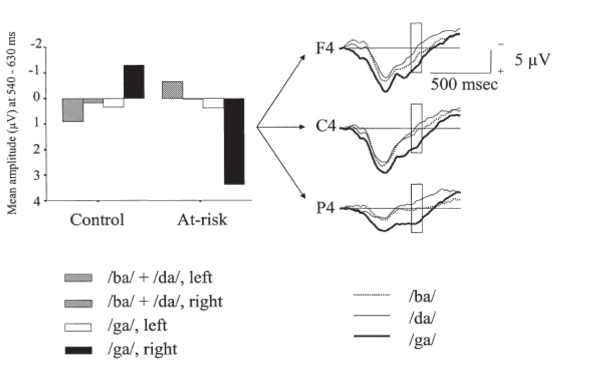


Fig. 1 – *Left panel: Mean amplitudes of the event-related potentials to consonant-vowel syllables /ba/ and /da/ (combined responses) and /ga/ in the left and right hemisphere of the at-risk group (N = 26) and control group (N = 23) at the latency between 540 and 630 msec. Right panel: ERPs from the right hemisphere of the at-risk group. The marker box denotes the latency of 540-630 msec. The time window is – 50-940 msec, and the calibration marker is 5 μV (with negativity up).*

One week new born baby
Recording while they were in silent sleep

TABLE III

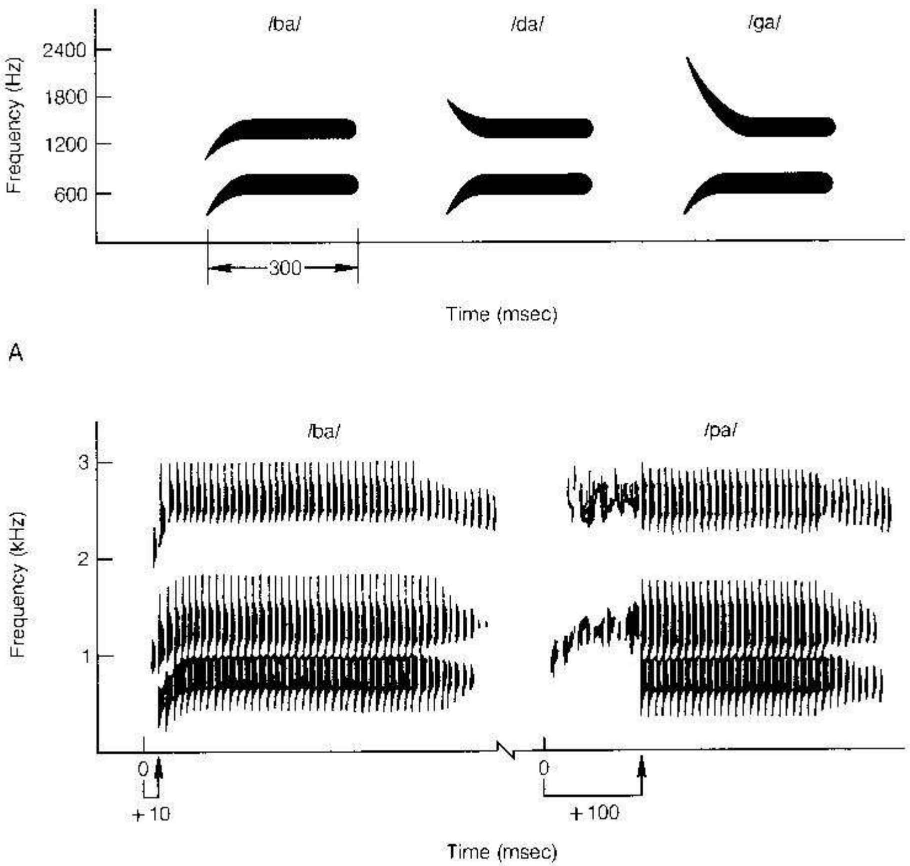
Results from Regression Analyses

Criterion measure/Predictors	R^2	Adj R^2	ΔR^2	df	F Change	β
Receptive language at 2.5 years:						
Step 1: Group	.053	.028	.053	1, 38	2.130	.053
Step 2: /ga/ at right hemisphere	.183	.139	.130	1, 37	5.902*	– .402*
Model	F (2, 37) = 4.153*					
Receptive language at 5 years:						
Step 1: Group	.088	.065	.088	1, 39	3.786[a]	.157
Step 2: Receptive at 3.5 years	.324	.288	.235	1, 38	13.210***	.462***
Step 3: /ga/ at right hemisphere	.389	.340	.066	1, 37	3.992[a]	– .286[a]
Model	F (3, 37) = 7.868***					
Memory at 5 years:						
Step 1: Group	.001	– .024	.001	1, 40	.021	.049
Step 2: Memory at 3.5 years	.317	.282	.316	1, 39	18.053***	.449**
Step 3: /ga/ at left hemisphere	.394	.346	.077	1, 38	4.818*	– .300*
Model	F (3, 38) = 8.224***					

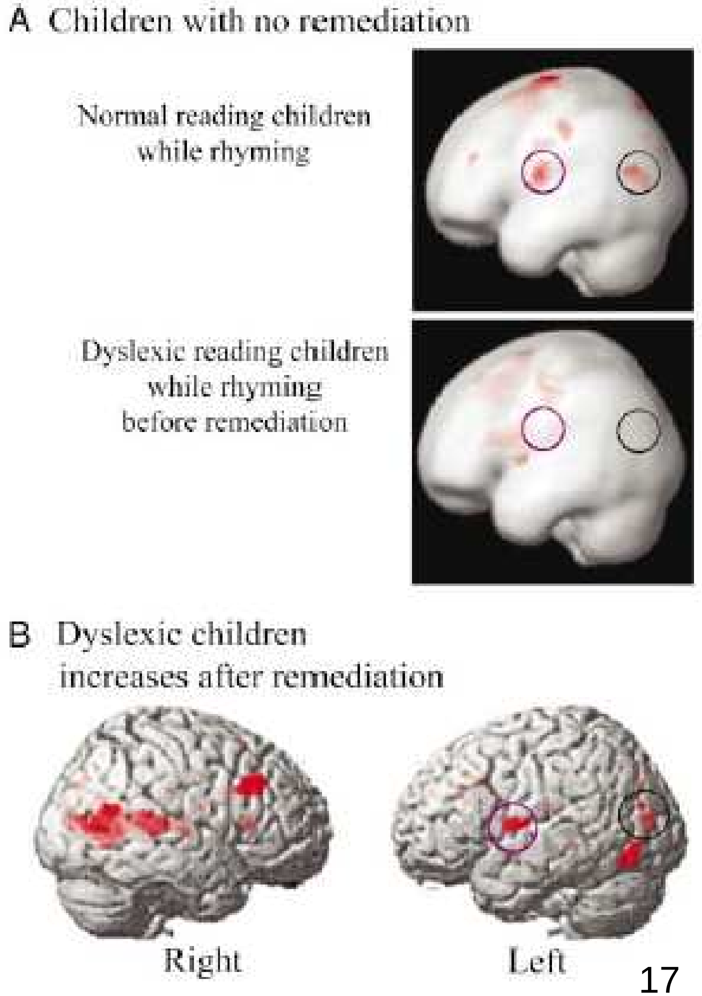
* p < .05. ** p < .01. *** p < .001. [a] p < .06.

Guttorm et al. (2003) Cortex

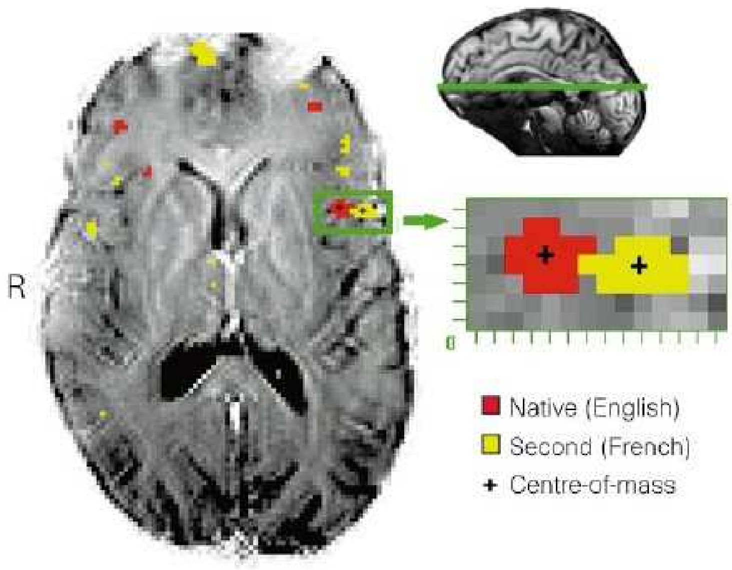
Remediation(fast forword program)（http://www.scilearn.com



Temple et al. , 2003, PNAS



Kim, 1997



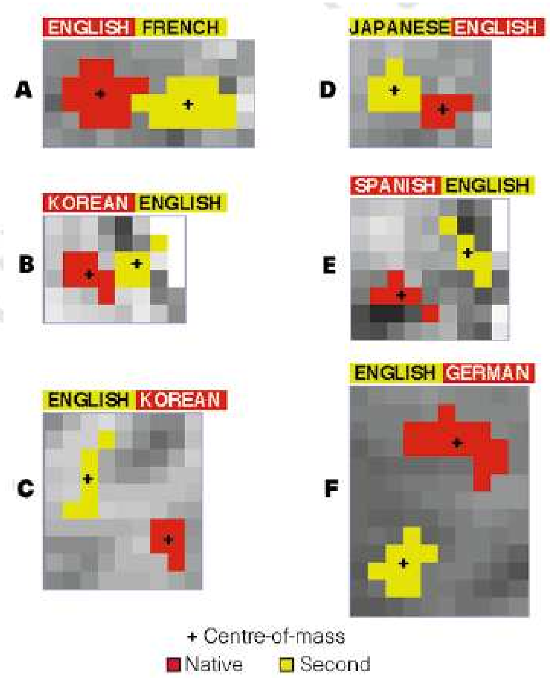
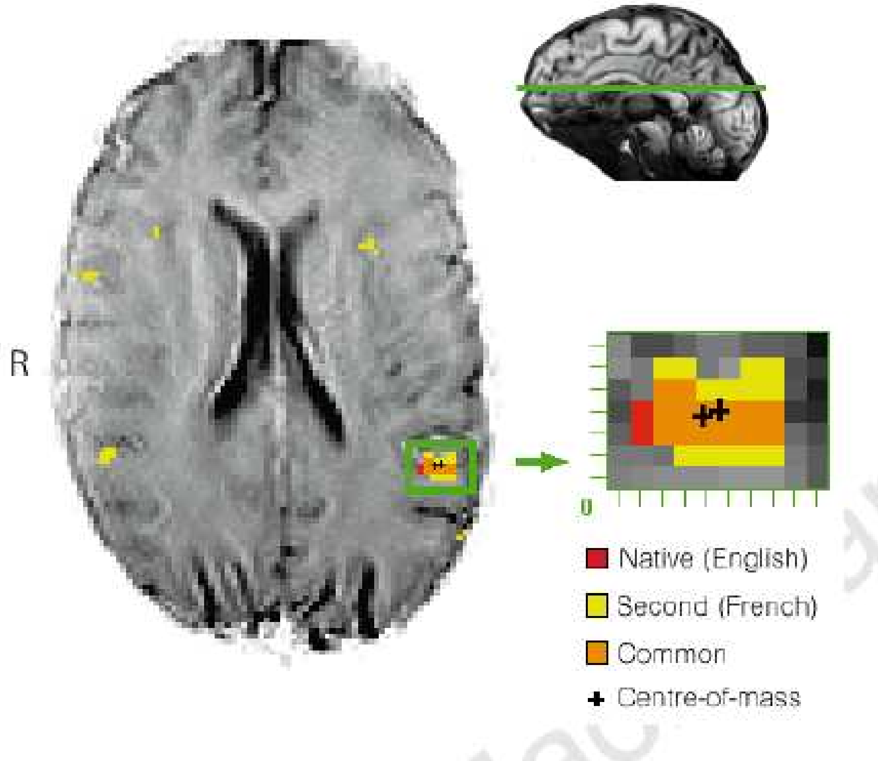


Figure 3 Expanded views of the activity patterns within Brodman's area 44 (and 46 (refs 2, 3, 18), subject B) for each 'late' bilingual subjects (A–F) indicate the active regions during the native language task (red) and the second acquired language task (yellow). The level of statistical stringency (probability of a false positive

的確有些證據顯示，晚學跟早學，在大腦的某些運作部位不同。Broca 不同，Wernicke 相同。


R
Native (English)
Second (French)
Common
Centre-of-mass

Pallier et al. (2003). Cerebral Cortex

- 8名自小(3.3-8)收養到法國的韓國人，自此沒有接觸韓文，與法國人作比較。
- 在大腦的運作上，以fMRI研究，並沒有發現到這些被收養的韓裔法人與一般法國人對韓文、法文的處理有何不同。
- 顯示大腦對語言學習的可塑性。
- 但請注意語言學習的環境。
- 其實，更重要的問題是，如果說，讓它們從新學韓文呢？Implicit learning (see Tees & Werker, 1984; but Ventureyra et al, 2004)

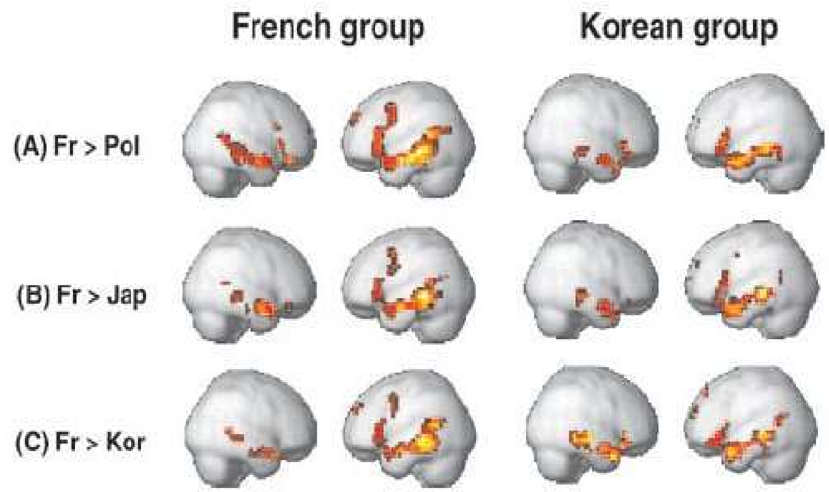


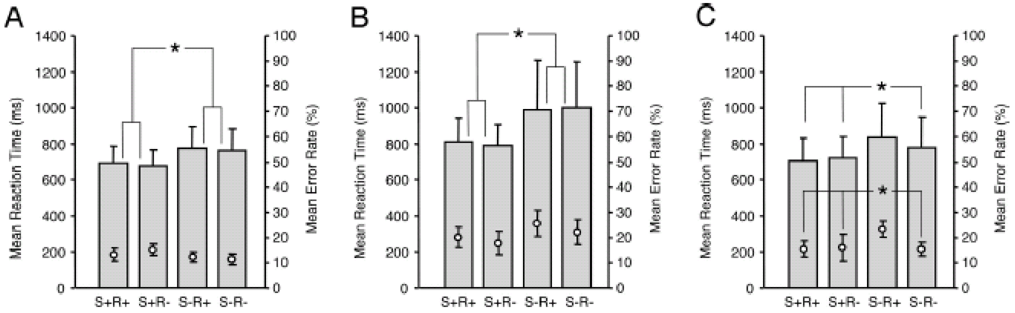
Figure 2. Brain renderings displaying the results in the group analyses of the three contrasts comparing French stimuli versus Polish stimuli (*A*), Japanese stimuli (*B*) and Korean stimuli (*C*).

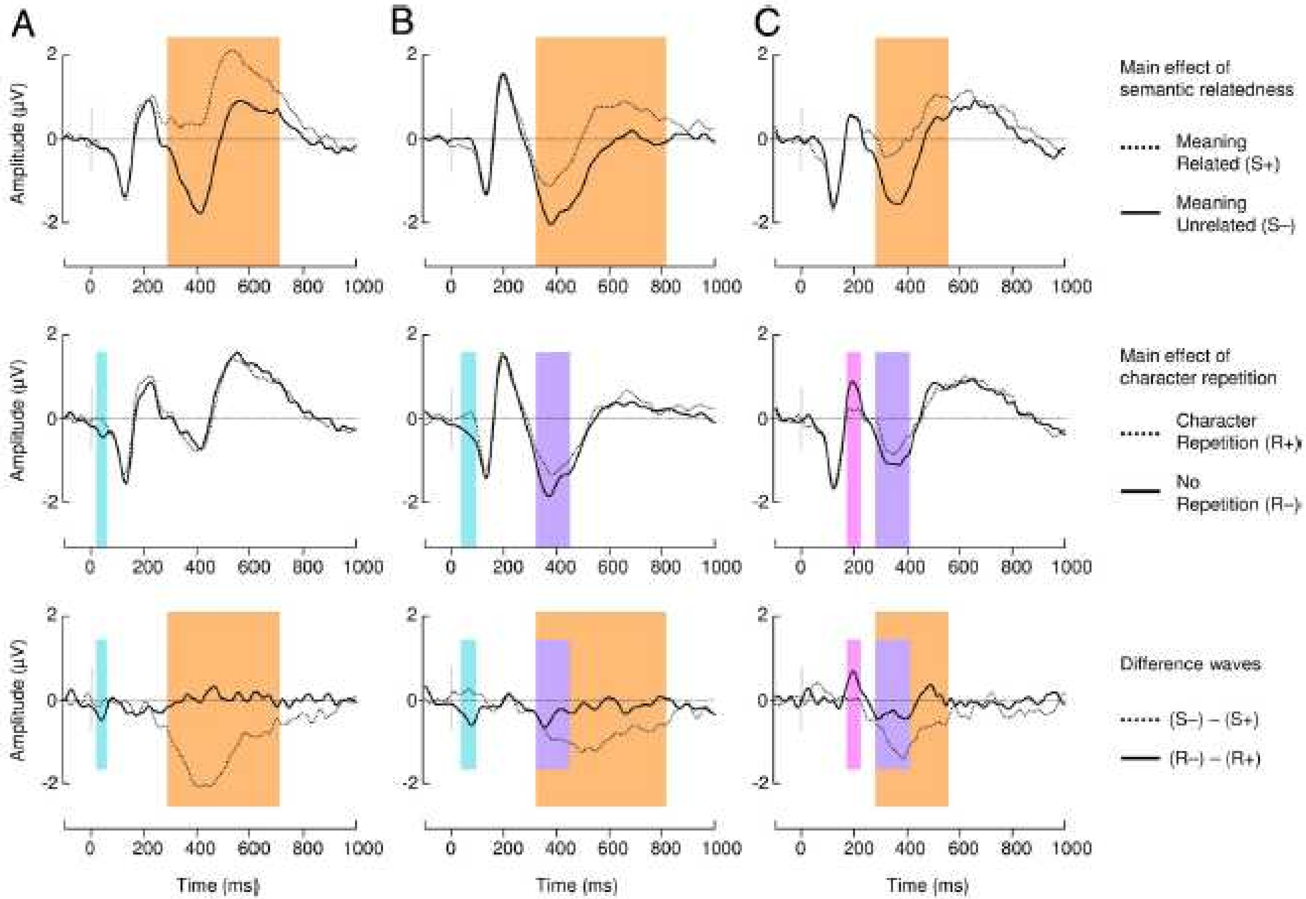
Thierry & Wu (2007). PNAS;

Table 1. Experimental design and stimulus examples

Chinese character repetition (implicit factor)	Semantic relatedness (explicit factor)	
	Semantically related (S+)	Semantically unrelated (S−)
Repetition (R+)	Post–Mail You Zheng–You Jian 邮政 – 邮件 SRE 4.34 (±0.40) SRC 4.03 (±0.64)	Train–Ham Huo Che–Huo Tui 火车 – 火腿 SRE 1.50 (±0.35) SRC 1.27 (±0.26)
No repetition (R−)	Wife–Husband Qi Zi–Zhang Fu 妻子 – 丈夫 SRE 4.28 (±0.47) SRC 3.93 (±0.65)	Apple–Table Ping Guo–Zhuo Zi 苹果 – 桌子 SRE 1.37 (±0.44) SRC 1.26 (±0.24)

Thierry & Wu (2007). PNAS





- Many Thanks.