What do ERP studies tell us about language processing by Chinese-Japanese bilinguals

中日双语者的语言加工过程——ERP研究的视角和发现

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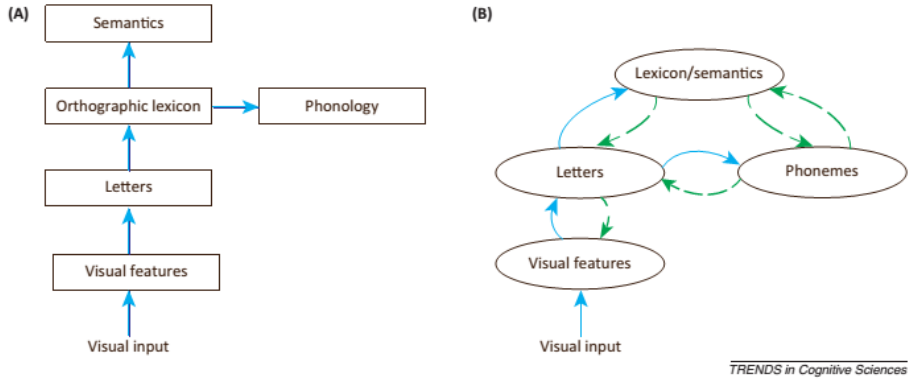
Outline

- Models of visual word recognition for bilinguals based on the previous findings.
- Why Chinese-Japanese bilinguals are important for bilingual research
- Why ERP
- Latest findings from our lab: L1 always activates!
  - The asymmetry of language switching costs
  - L1 activation at orthographical level

Visual word recognition

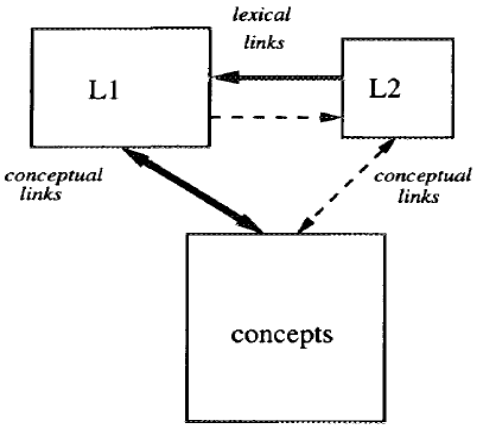


Carreiras et al., 2013
(Primarily based on alphabetic languages research)

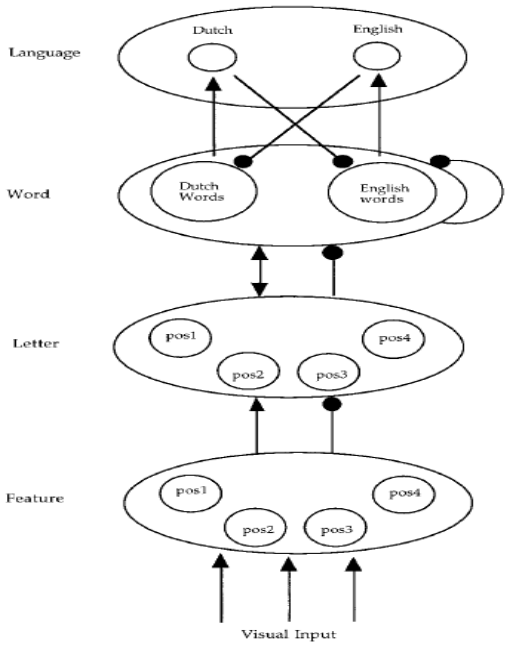
Models of word recognition in bilinguals

- Revised Hierarchical Model (RHM) vs. Concept Mediation Model (CMM)
  → RHM: Lexical reliance are stronger from L2 to L1, which is via lexical-level links, than L1 to L2, which is via slow and indirect conceptual links.
  → CMM: Direct access to concepts is available to all languages.

- Bilingual Interactive Activation (BIA)
  → Language Nodes: Global lexical activation of one language whereas inhibition of other languages.
  → Current language context is able to activate Language Nodes through bottom-up processing, and the activated Language Nodes will have top-down influence on the upcoming processing.



Krall & Stwart, 1994



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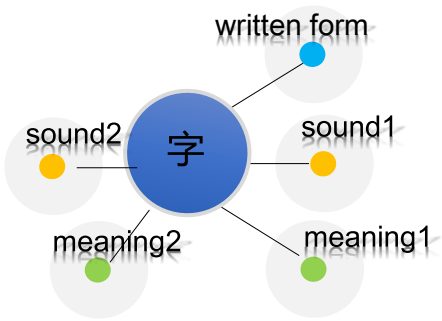
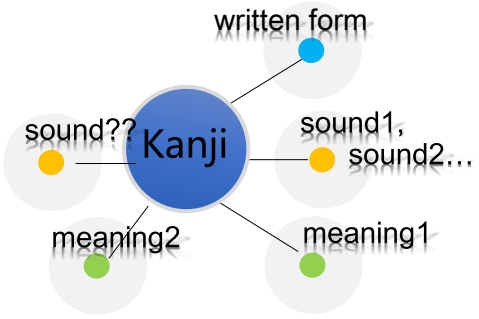
Dijkstra & van Heuven, 1998

How about logographic languages?

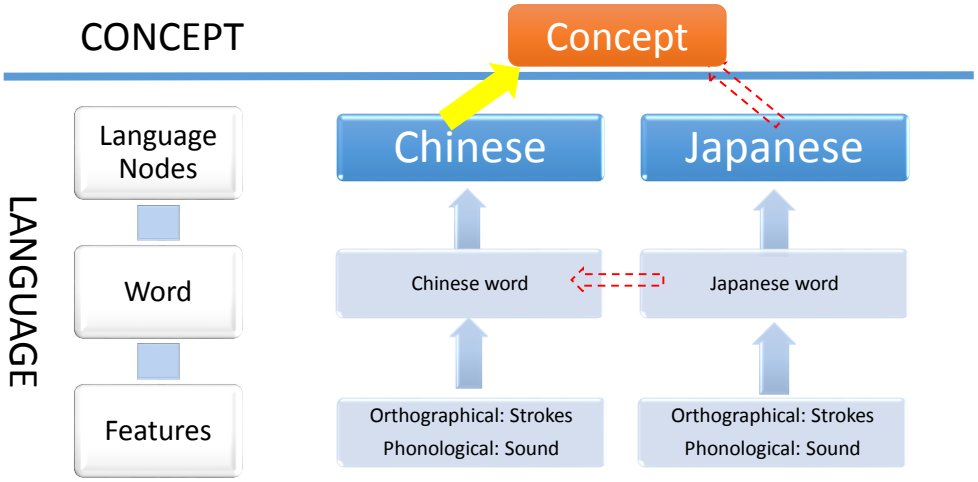


“行”
“行程”

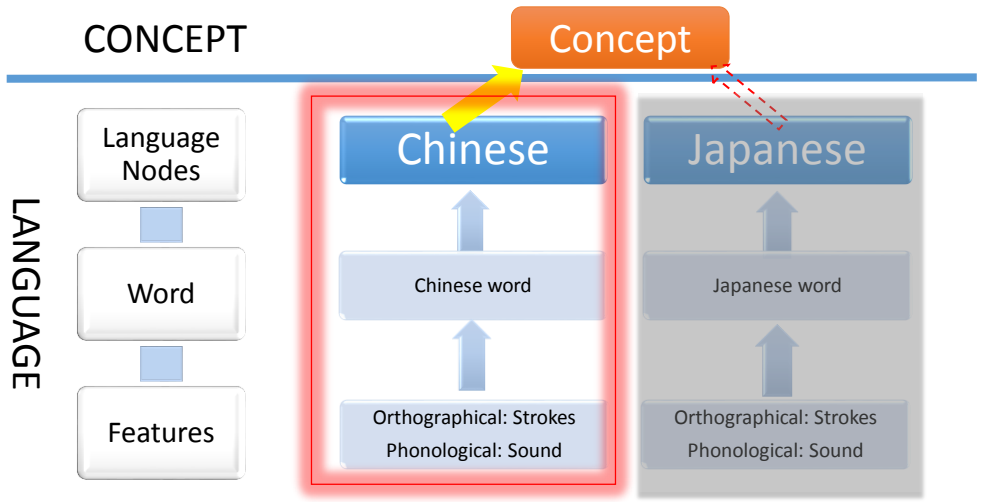


“木”
“木刀”

A scheme of word recognition for Chinese-Japanese bilinguals



A scheme of word recognition for Chinese-Japanese bilinguals



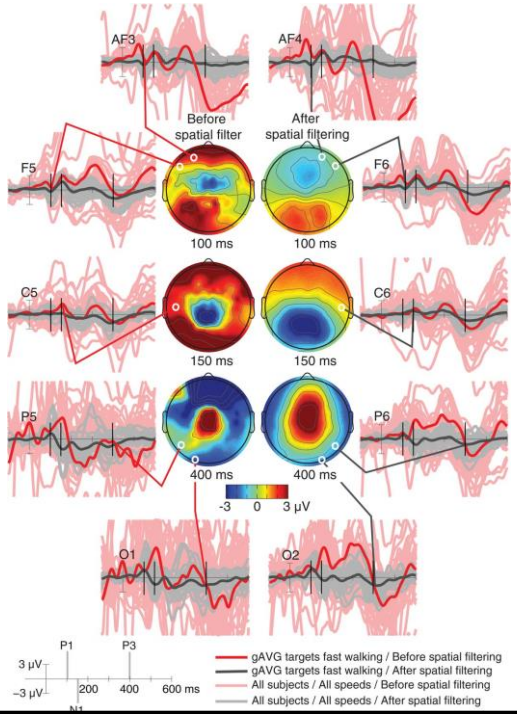
Cognates vs. non-cognates

- Cognate words in alphabetic languages
- → Words that share form as well as meaning across languages
- → Word identification is facilitated for cognates than for noncognates, suggesting the role of L1 in L2 learning.

- Cognate/non-cognate words for proficient Chinese learners of Japanese
- → Chinese words & Japanese kanji words: consist of characters/kanji that may convey meaning.
- → Cognate words: Sharing the same characters/kanji and also the meaning across the two languages
- → Non-cognate words: Sharing one or no character/kanji but possibly having semantic overlap. [NOT PURE]

Event-related potentials

Averaged ERP



From ERP responses:

- Time course: how fast the process occurs
  - Online evidence
- Components: what kind of process it could be
- Neural basis: scalp distribution

Study 1. The asymmetry of language switching costs

Research questions:

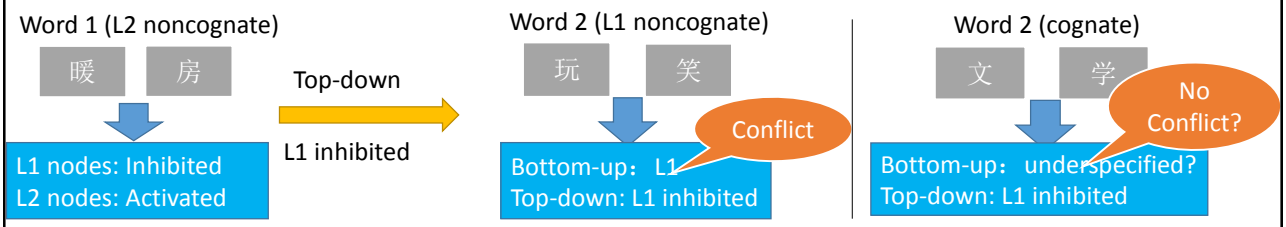
- How are cognate words represented for fluent bilinguals?

  → Are they linked to more than one language nodes?

  → When cognate words are identified, which language node would be activated/inhibited? (to be inhibited -> has been activated)
- Do cognate words lead to code-switching effects in the context of one language or the other?

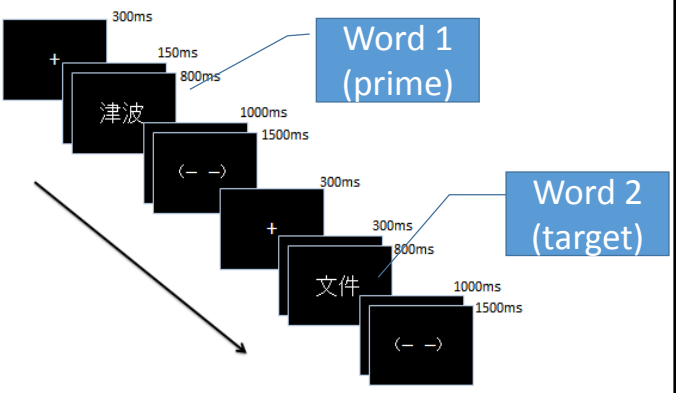
Study 1. The asymmetry of language switching costs

- Hypothesis & Predictions:
- Cognate words are separately represented for each language
- → Both directly linked to the concept.
- Recovery from Inhibiting L1 nodes is more difficult than that from inhibiting L2 nodes
- → Switching effect would be different for L2-L1 and L1-L2.



Study 1. The asymmetry of language switching costs

- Method：
- Code-switching paradigm
- Lexical judgment task
- ERP recorded
- → 19 scalp locations
- Data analysis
- → Switching type
- → Electrodes: 9 electrodes
- → Repeated measures ANOVA: switching type * electrodes



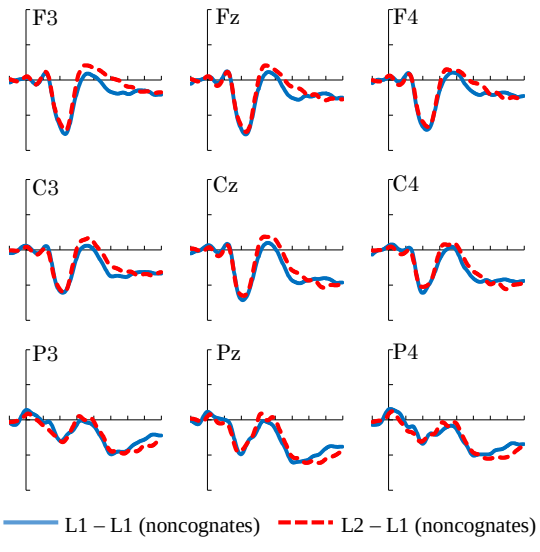
Study 1. The asymmetry of language switching costs

EXP. 1 NON-COGNATE WORDS

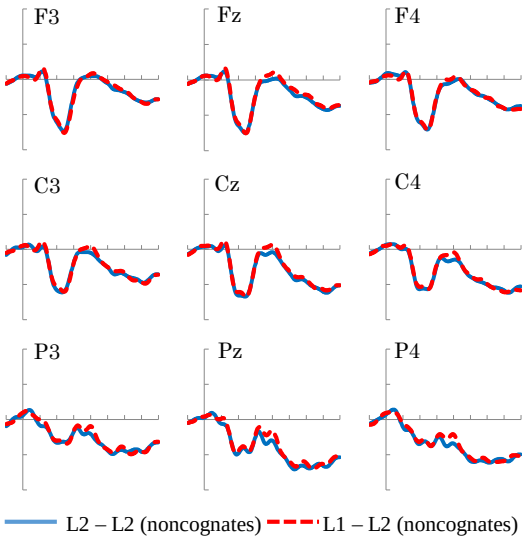
- Word 2 was targeted
- 100 Chinese words + 100 Japanese words + 80 fillers
- Switching types
  → word 1: L2 & word 2: L1
  word 1: L1 & word 2: L1
  → word 1: L1 & word 2: L2
  word 1: L2 & word 2: L2
- 14 subjects
  → The Japanese-Language Proficiency Test: Level 1

EXP. 2 COGNATE WORDS

- Word 2 and word 3 were targeted
- 100 Chinese words + 100 Japanese words + 100 Cognates + 100 fillers
- Switching types
  → word 1: L1 & word 2: cognates & word 3: L1
  word 1: L2 & word 2: cognates & word 3: L1
- 15 subjects
  → The Japanese-Language Proficiency Test: Level 1

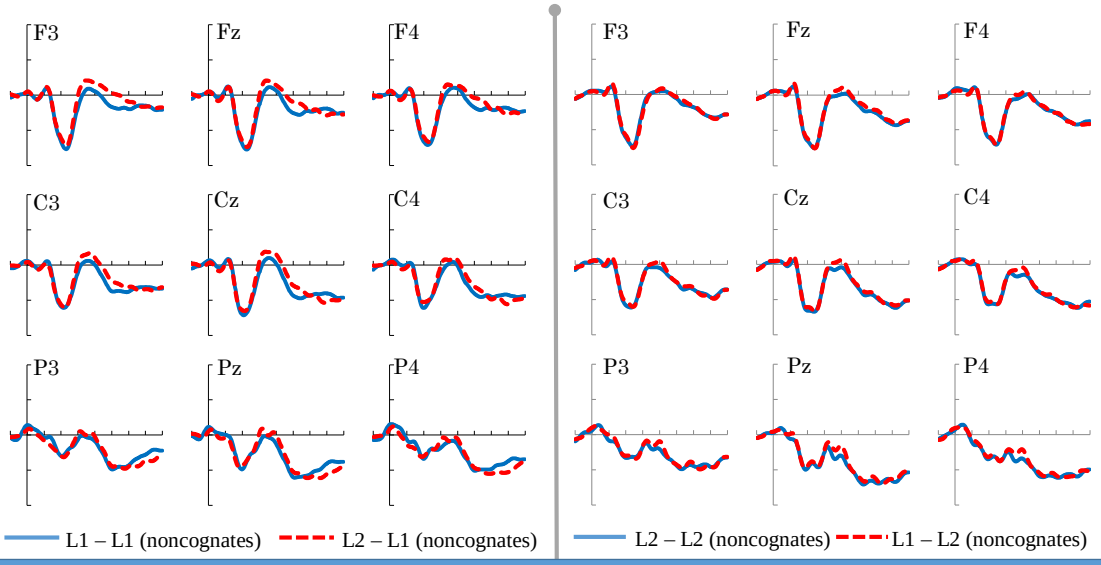


N400 (300-500 ms): L2-L1 > L1-L1
Late Positivity (600-800 ms): L2-L1 > L1-L1



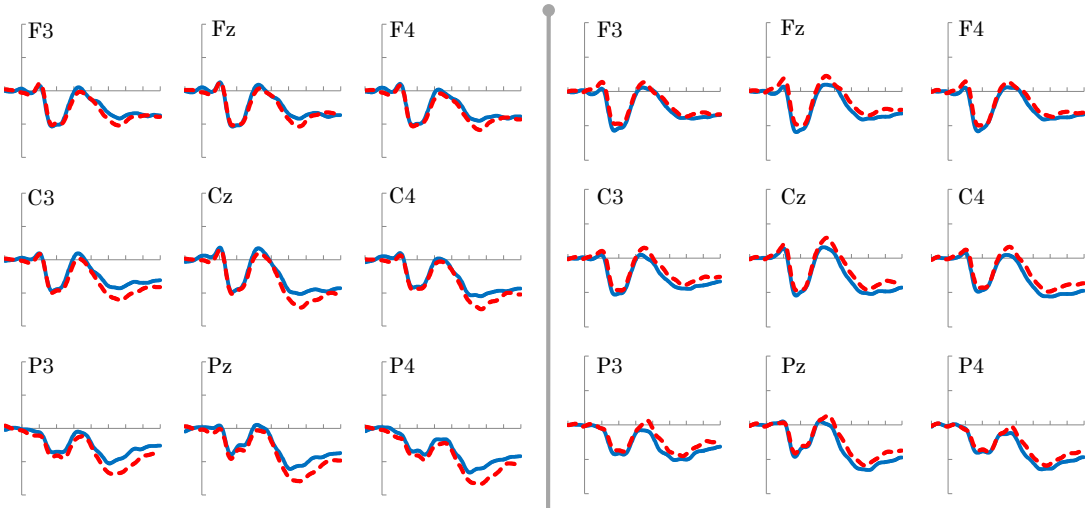
no significant results.

Exp.1 ERP responses to noncognate word 2 that followed a word from the same or different language.



- Switching effect was found in the switch from L2 to L1 (as compared with L1-L1), which is reflected as a N400-LP pattern.
- No switching effect was found for the switch from L1 to L2.
- The N400-LP switching effect suggests a larger processing difficulty when L1 is inhibited.

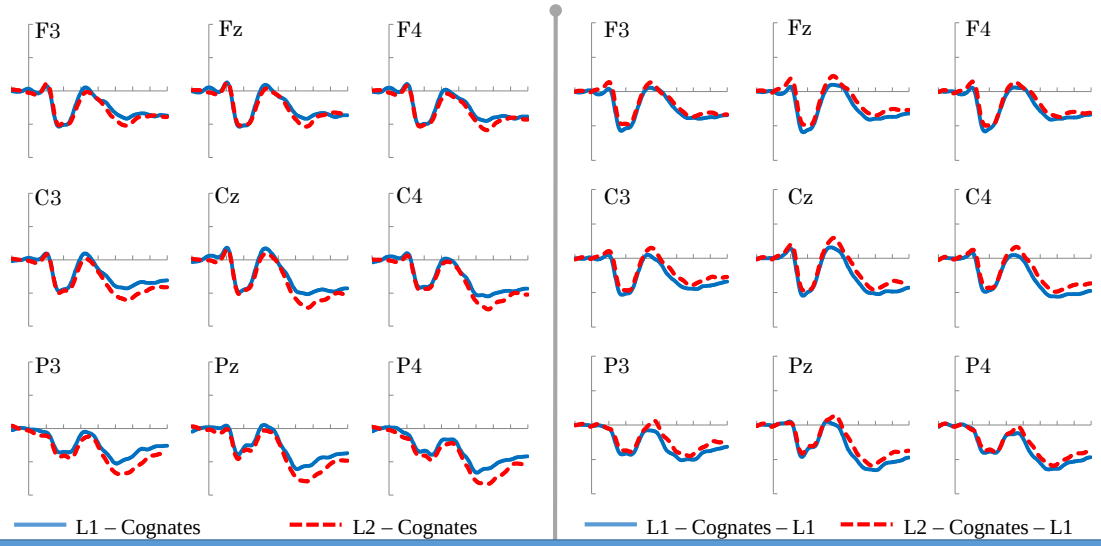
Ex



N400 (300-500 ms): no sig.
Late Positivity (500-800 ms):
L2-Cognates > L1-Cognates

N400 (300-500 ms):
L2-Cognates-L1 > L1-Cognates-L1
Negativity (500-800 ms):
L2-Cognate-L1 > L1-Cognates-L1

Exp.2 ERP responses to cognate word 2 and L1 word 3 that followed word 2.



- The switching from L2 to a cognate elicited a larger LP than the switching from L1 to a cognate while no N400 effect was observed. LP-only pattern is considered to reflect a different process from the N400-LP patterns found in Exp.1.
- A cognate after L2 caused larger difficulty of lexical access on word 3, suggesting that the cognate is identified as a L2 word and activate the L2 nodes.

Study 1. The asymmetry of language switching costs

EXP. 1 NON-COGNATE WORDS

- Switching effect was found in the switch from L2 to L1 (as compared with L1-L1), which is reflected as a N400-LP pattern.
- No switching effect was found for the switch from L1 to L2.
- The N400-LP switching effect suggests a larger processing difficulty (for recovery) when L1 is inhibited.

EXP. 2 COGNATE WORDS

- The switching from L2 to a cognate elicited a larger LP than the switching from L1 to a cognate while no N400 effect was observed. LP-only pattern is considered to reflect a different process from the N400-LP patterns found in Exp.1.
- Cognate words can escape from inhibitory control upon lexical access since they are linked to more than one language nodes.
- A cognate after L2 caused larger difficulty of lexical access on word 3, suggesting that the cognate is identified as a L2 word and activate the L2 nodes.

Study 2. L1 activation at the orthographical level

Research questions:

- Is L1 activated for fluent bilinguals even when it is unnecessary?
  - → If yes, what types of information could be activated?
  - → How fast could it be?

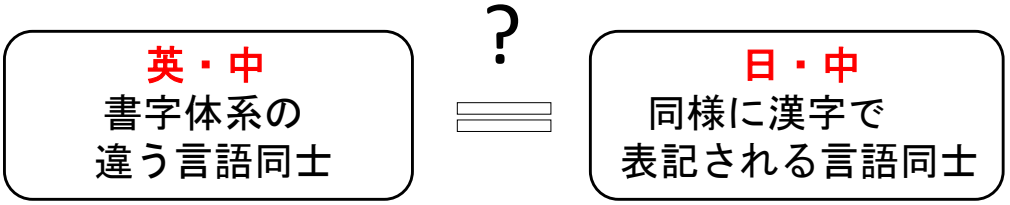
Study 2. L1 activation at the orthographical level

- Hypothesis & Predictions:

  H1: Like Chinese learners of English, Chinese learners of Japanese may undergo the implicit "translation" for lexical access.

  → Orthographical information is activated.

  H2: Unlike Chinese learners of English, Chinese learners of Japanese may not undergo the literal translation for lexical access.



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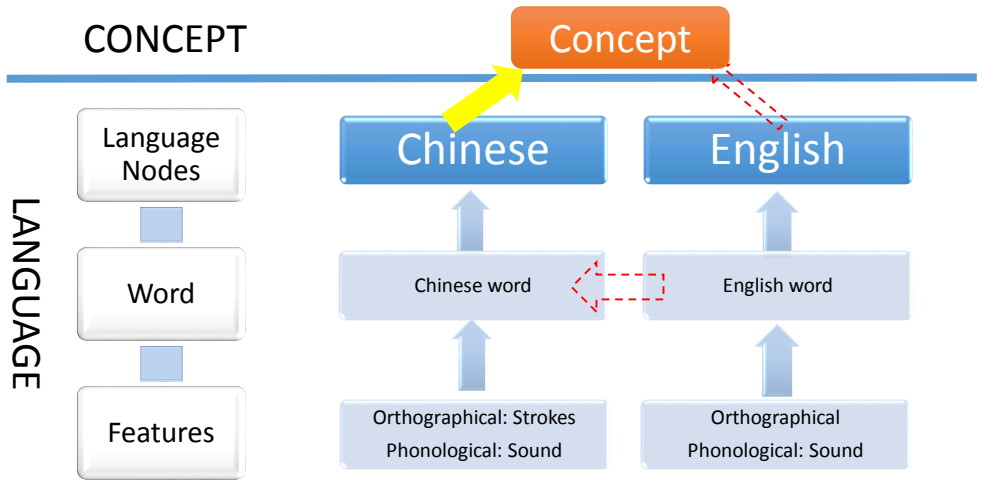

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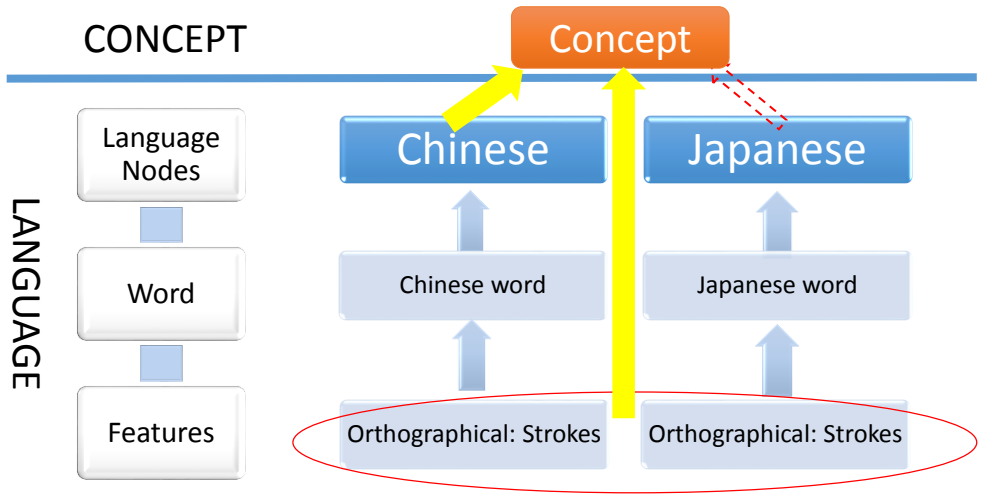
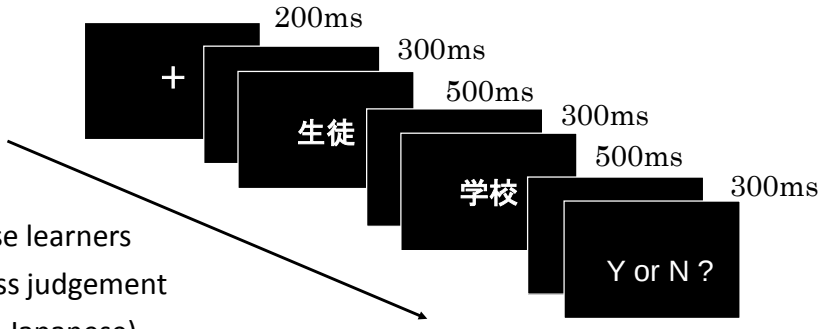


	条件		baseline	
①	S＋R＋		irrelevant	
例	日本語 (中国語) English	生徒　－　学校 (学生　－　学校) Student -- School	日本語 (中国語) English	花嫁　－　学校 (新娘　－　学校) Bridal -- School
②	S＋R－		irrelevant	
例	日本語 (中国語) English	会社　－　職員 (公司　－　职员) Company -- Employee	日本語 (中国語) English	津波　－　職員 (海啸　－　职员) Tsunami -- Employee
③	S－R＋		irrelevant	
例	日本語 (中国語) English	荷物　－　行為 (行李　－　行为) Luggage -- Behavior	日本語 (中国語) English	汽車　－　行為 (汽车　－　行为) Auto -- Behavior

（「S」意味的関連性；「R」漢字の重複；「+」ある；「－」なし）

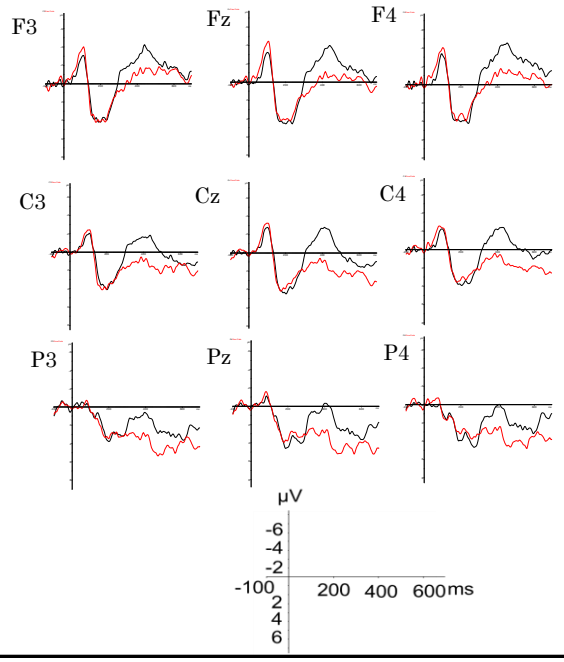
Study 2. L1 activation at the orthographical level



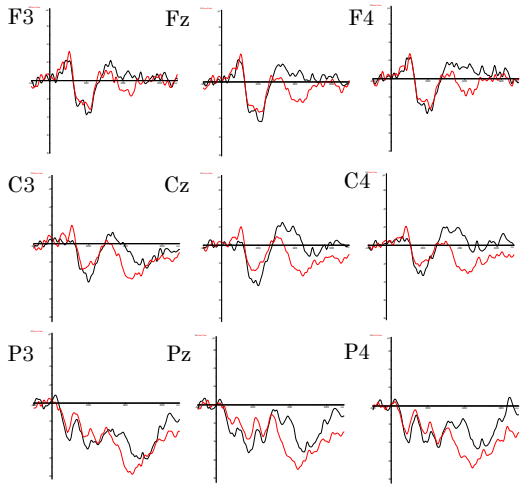
Method：

- Native Japanese vs. Chinese learners
- Task：semantic relatedness judgement
- Data analysis (Chinese and Japanese)
- → Semantic relatedness
- → Character repetition
- → scalp distribution

Native speakers



Chinese learners

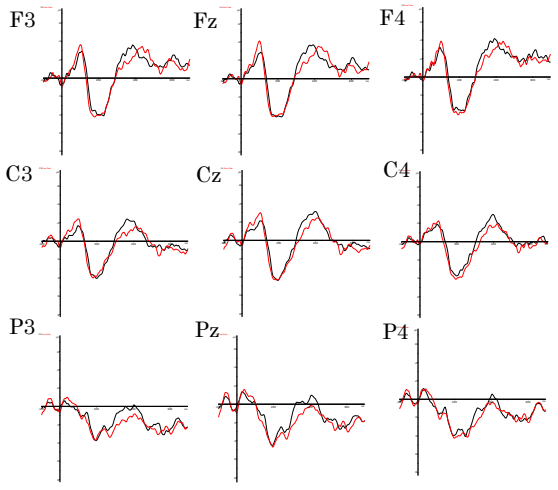


S+R−

baseline

Effect of semantic relatedness:
Similar for both groups

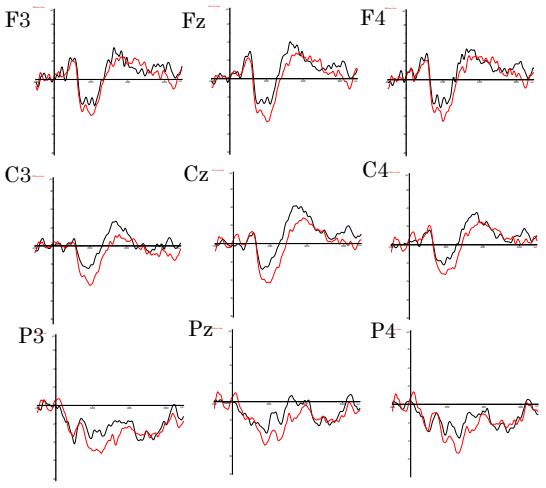
Native speakers



S−R+

baseline

Chinese learners



Effect of character repetition:

- Only for Chinese learners
- Early positivity effect

Study 2. L1 activation at the orthographical level

NATIVE SPEAKERS	CHINESE LEARNERS

• Priming effect of semantic relatedness
  • N400 effect
• No effect of Chinese character repetition
	• Similar priming effect of semantic relatedness
	  • N400 effect
	• Significant effect of character repetition
	  • Chinese system is activated under irrelevant task!
	  • P200 Effect is early!
	  • Orthographic form, rather than meaning (lexical/ morphemic level), activates!
	  • Larger P200!
	  • Interference rather than facilitation!

Conclusions for our studies

- Chinese learners of Japanese activate Chinese when reading Japanese regardless of the task demand.