The Psychological Foundations of Language Contact and Coevolution

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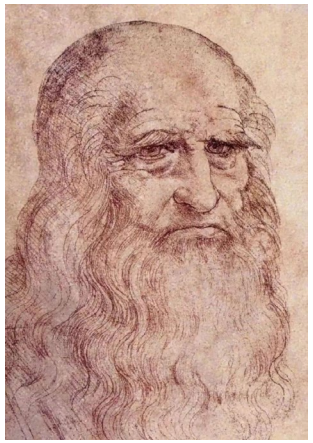


Leonardo da Vinci

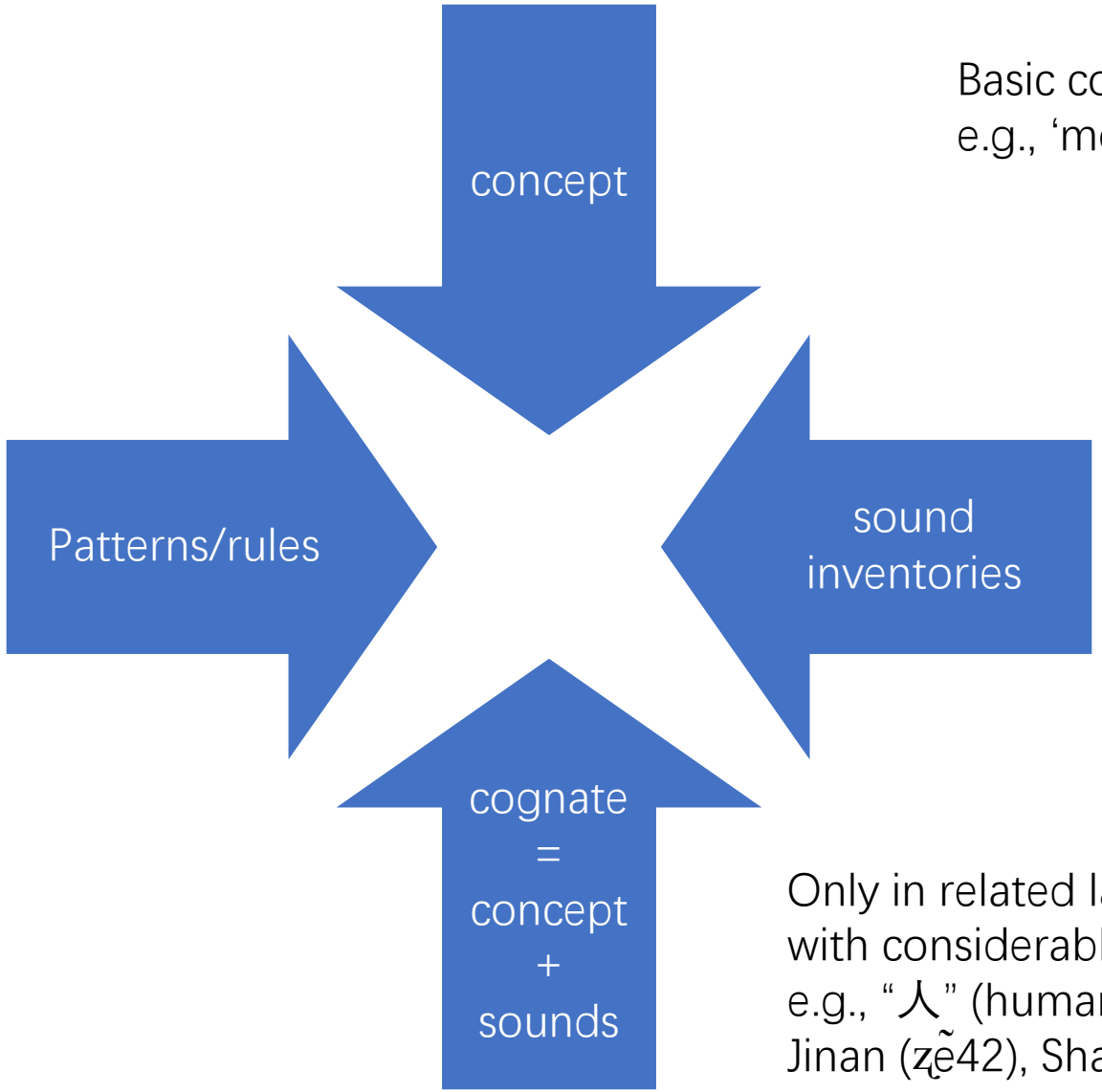
parody

达闻西

達聞西

聞閪？？

周星驰Stephen Chow’s movie国产凌凌漆

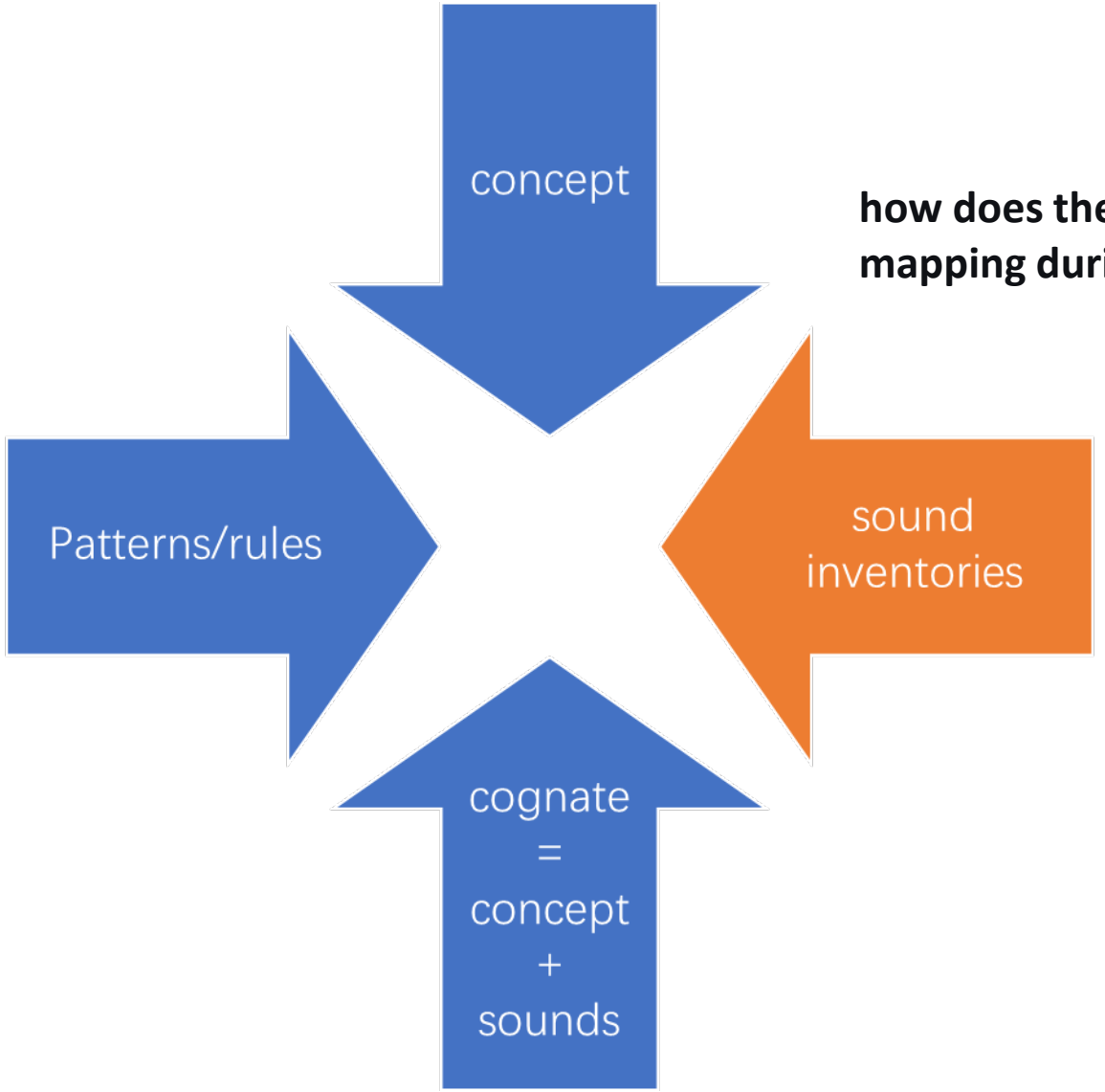


Basic concepts
e.g., ‘mother’, ‘water’, ‘sun’

e.g.,
common: sonorant form the nucleus of syllables
Distinctive: consonant clusters between syllables?

e.g., most language in the world have /p/

Only in related languages/dialects, or languages with considerable history of contact
e.g., “人” (human) in Standard Chinese (ʐən35) , Jinan (ʐɛ̃42), Shanghai,(ȵin24) Cantonese (jɐn21), Korean (In vs. Sa Ram)



how does the bilingual mind handle a two-to-one mapping during word recognition?

WU J et al.. Interlingual two-to-one mapping of tonal categories[J]. Bilingualism: Language and Cognition, 2017, 20(4): 813-833

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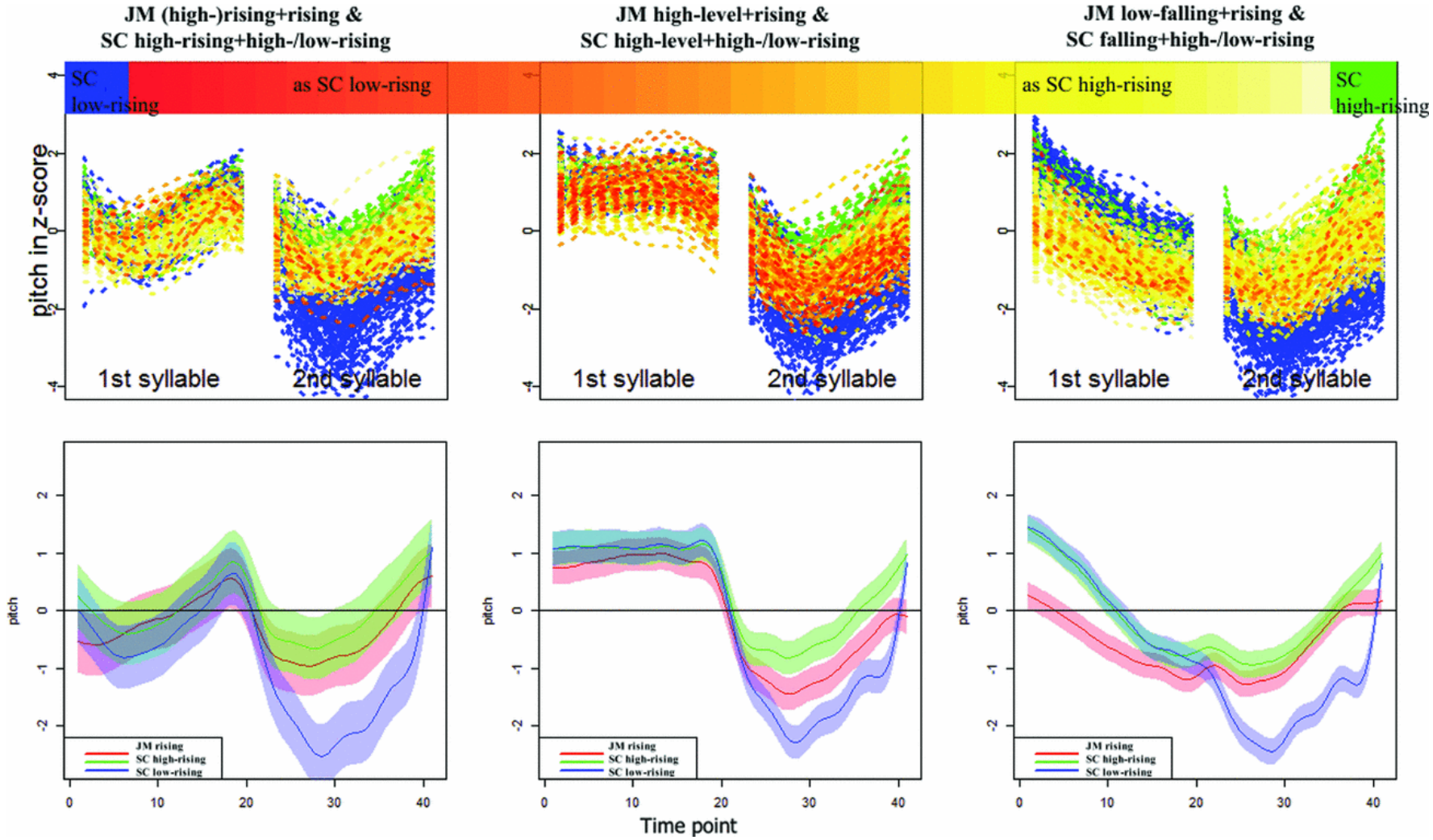

WU J et al.. Interlingual two-to-one mapping of tonal categories[J]. Bilingualism: Language and Cognition, 2017, 20(4): 813-833

how does the bilingual mind handle a two-to-one mapping during word recognition?

lexical identification
semantic priming

Prime			related target		unrelated target	
JM real word	SC high-rising pseudo-word	SC low-rising pseudo-word	JM word	relatedness	JM word	related
声音 sound /ʂəŋ in (r-r)/[a]	绳银 /ʂəŋ in (hr-hr)/	绳引 /ʂəŋ in (hr-lr)/	图像 video /tʰu ɕiɑŋ (hl-lf)/	3.95	结果 result /tɕiɛ kuo (l-hl)[b]/	1.80
飞机 airplane	肥集	肥挤	大炮 canon	3.80	各位 each person	1.65

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lexical identification
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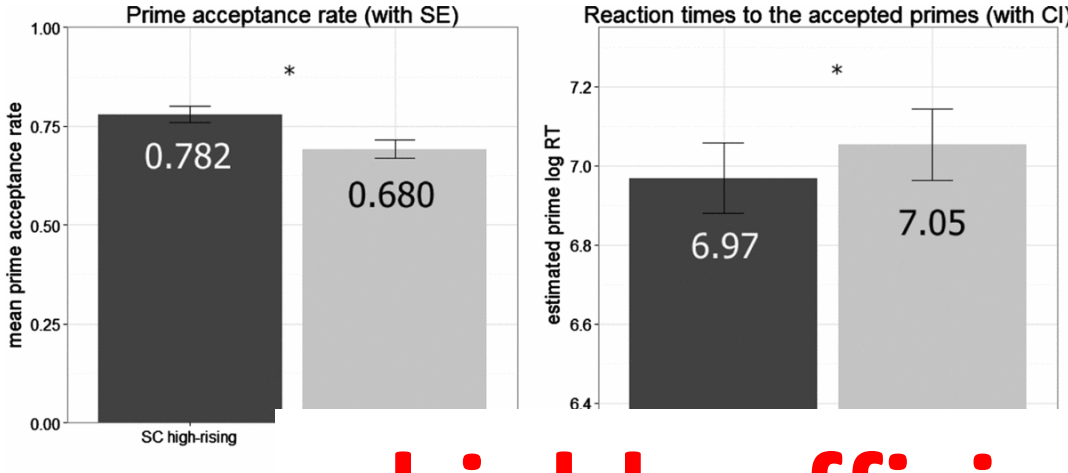
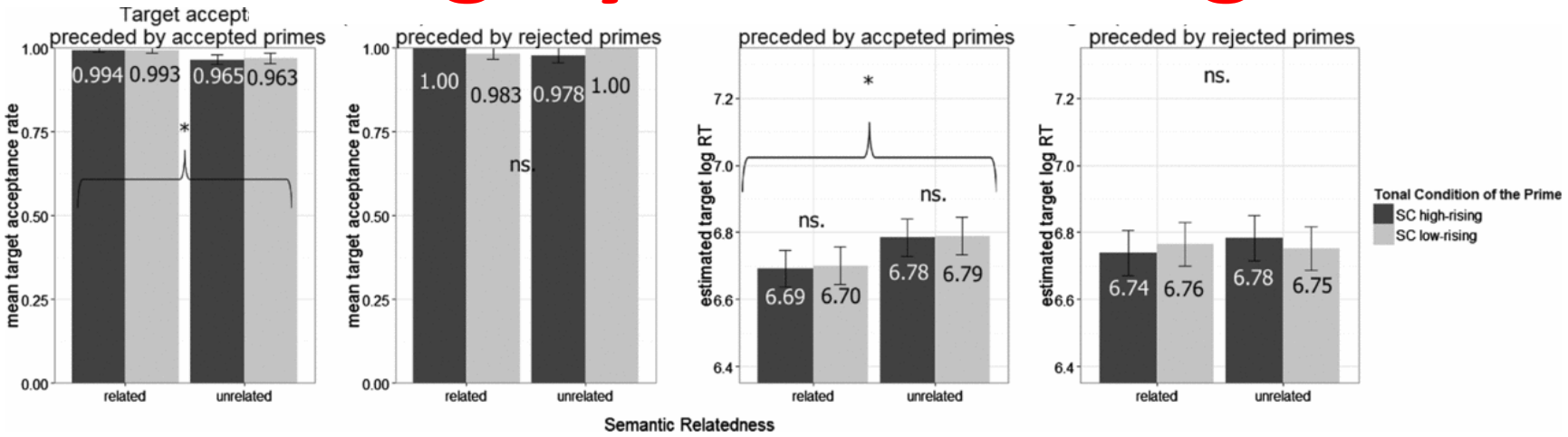


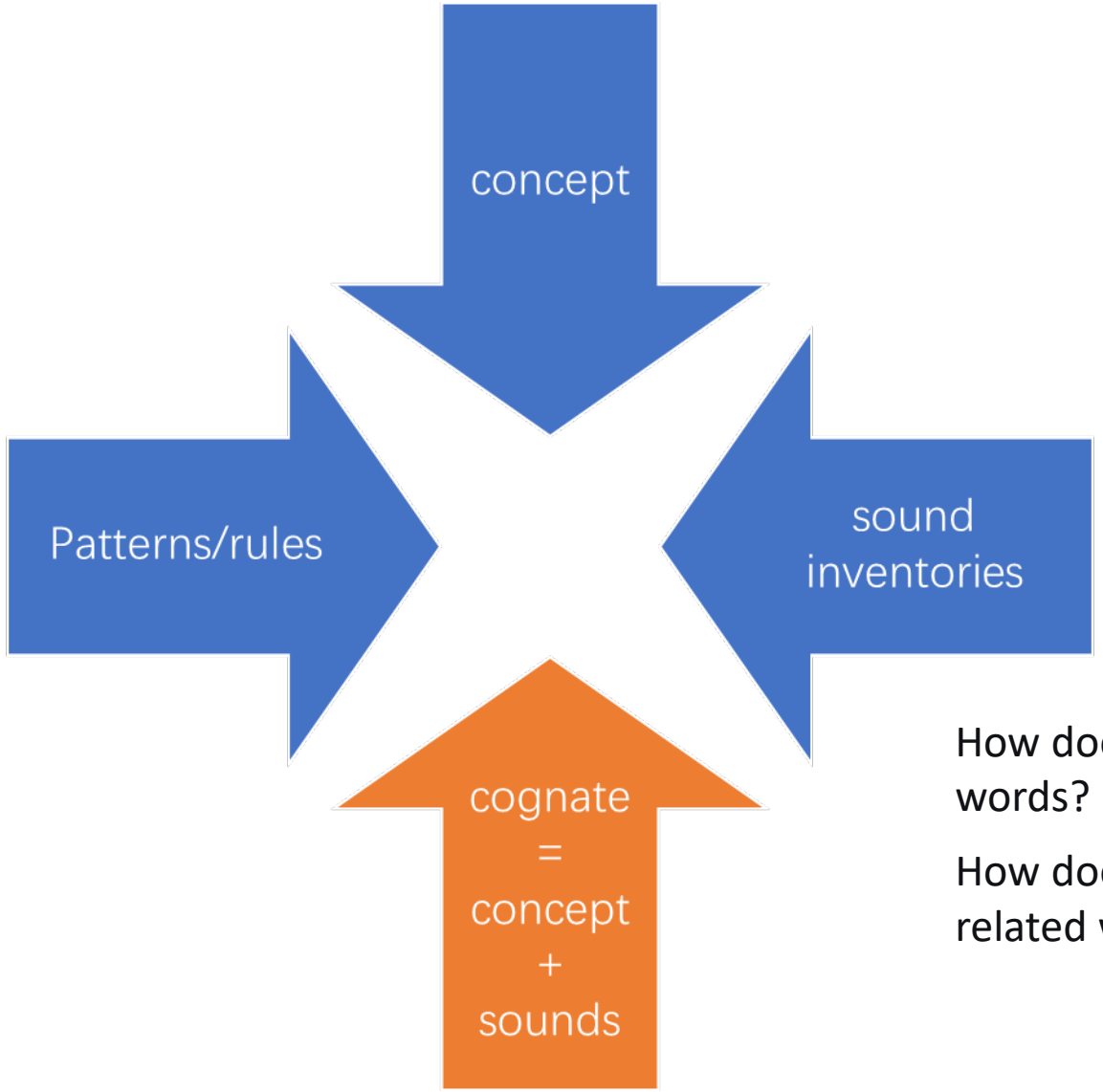
Word recognition
a clear preference ← goodness of mapping

a highly efficient cognitive flexibility



meaning access
Semantic priming √
×<-goodness of mapping

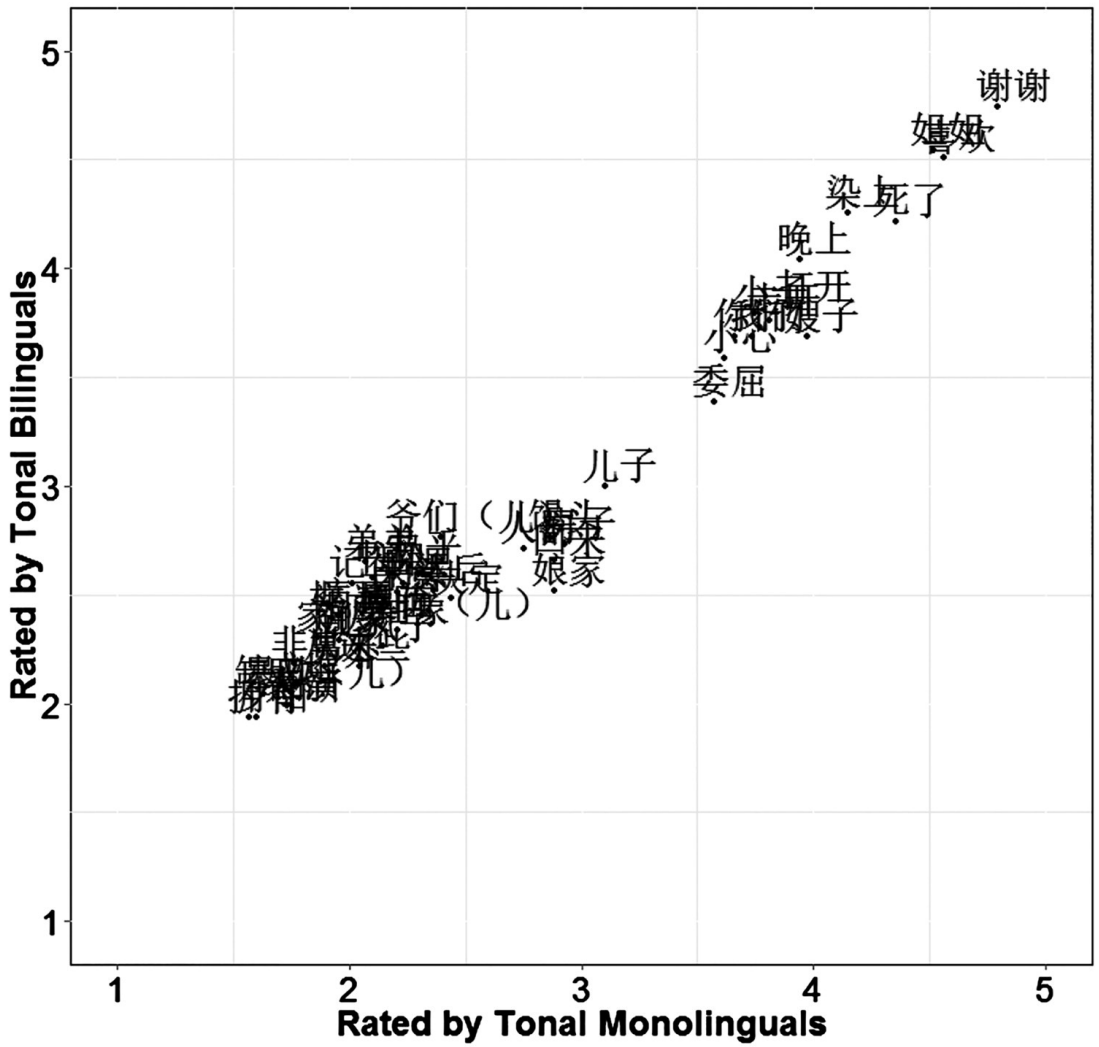
WU J et al.. Interlingual two-to-one mapping of tonal categories[J]. Bilingualism: Language and Cognition, 2017, 20(4): 813-833



How does the mind handle etymologically related words?

How does **tonal similarity** between these related words affects real-time processing

WU J et al.. Dynamic effect of tonal similarity in bilingual auditory lexical processing[J]. Language, Cognition and Neuroscience, 2019, 34(5).



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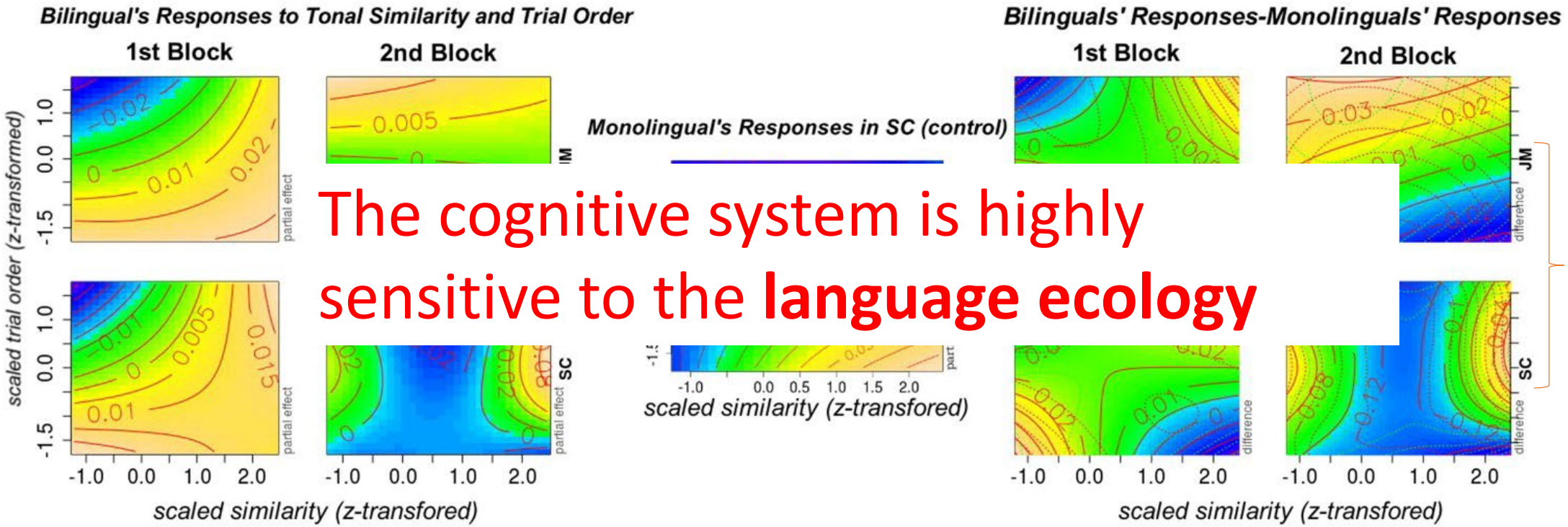
auditory lexical decision
GAM modelling

How does the mind handle etymologically related words?

How does **tonal similarity** between these related words affects real-time processing

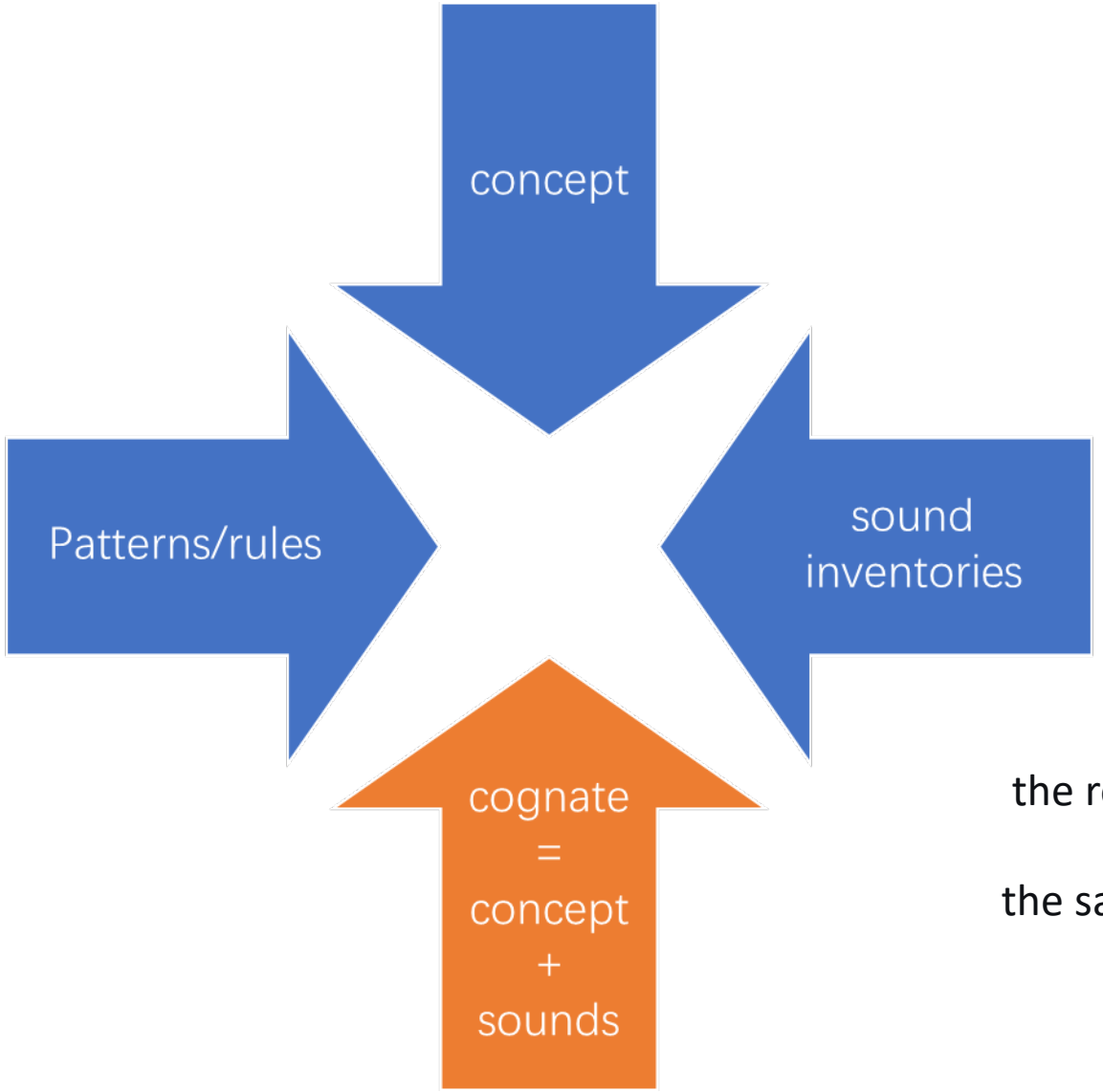
Bilingual lexical **advantage**!



language dominance effect

The cognitive system is highly sensitive to the **language ecology**

WU J et al.. Dynamic effect of tonal similarity in bilingual auditory lexical processing[J]. Language, Cognition and Neuroscience, 2019, 34(5).



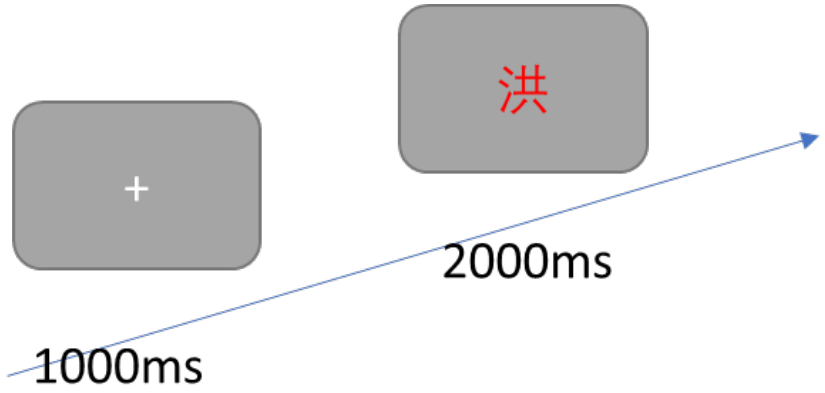
the role of a **logographic writing system**

the same character is read aloud in different dialects

WU J et al.. Recognizing two dialects in one written form: A Stroop study[J]. Bilingualism: Language and Cognition, 2024: 1-17.

the role of a **logographic writing system**
the same character is read aloud in different dialects

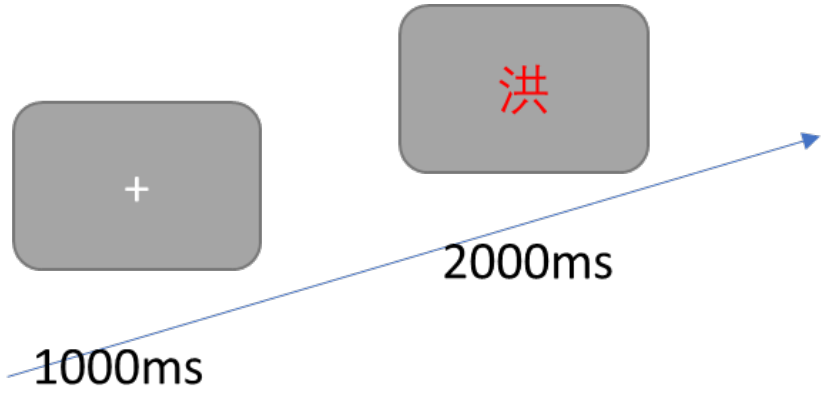
color-naming Stroop task



Group	N dialects mastered	Dialect mastered beside Standard Chinese	City of residence	Receptive dialect experience
BJ	1 (monolectal)	none*	Beijing	little
SC	1 (monolectal)	none	Shanghai	complex
JN	2 (bi-dialectal)	Jinan Mandarin (JM)	Jinan	local
SH	2 (bi-dialectal)	Shanghainese Wu (SH)	Shanghai	local
OD	2 (bi-dialectal)	other non-Wu dialect	Shanghai	complex

WU J et al.. Recognizing two dialects in one written form: A Stroop study[J]. Bilingualism: Language and Cognition, 2024: 1-17.

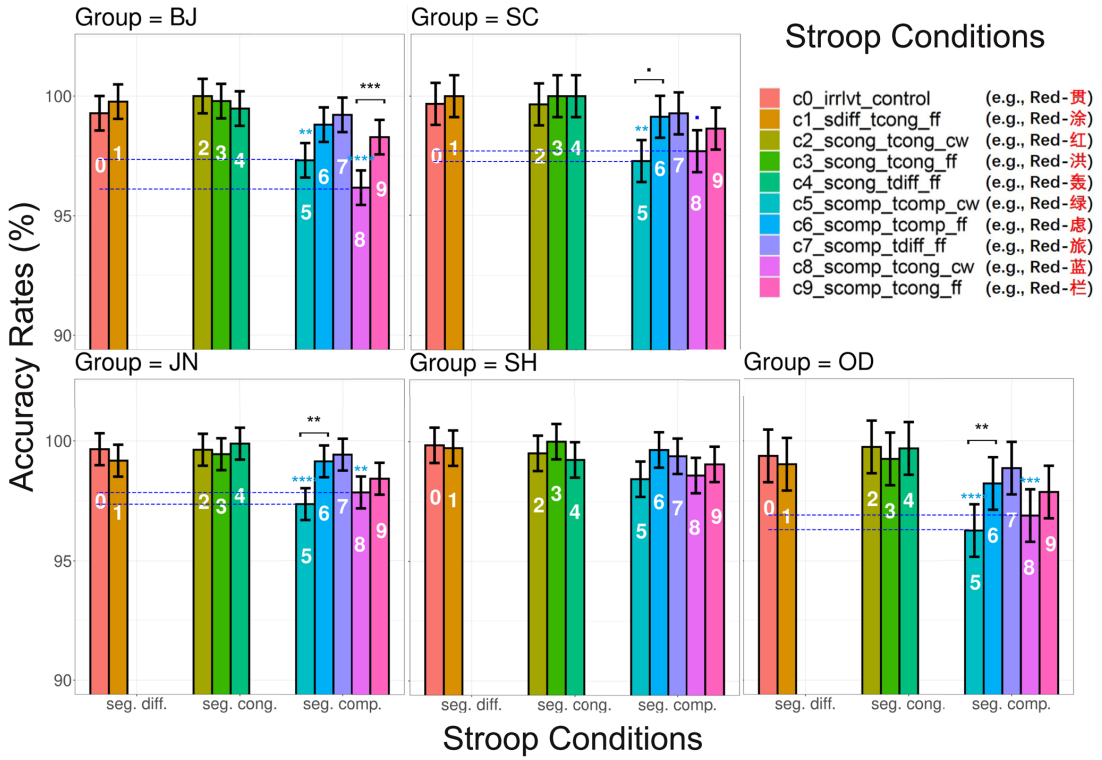
color-naming Stroop task

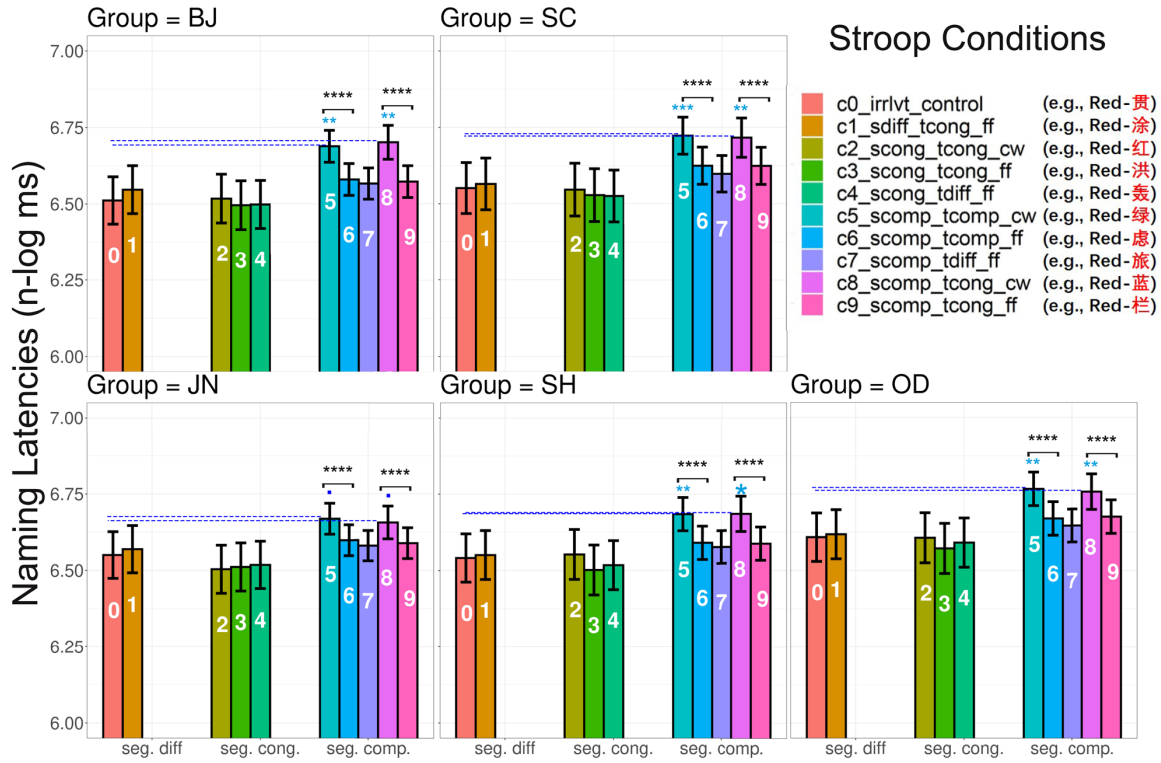


the role of a **logographic writing system**
the same character is read aloud in different dialects

Code	Domain			Example				
	Segm.	Tone	Semantic	Ink name		Character name[a]		
c0_irrlvt_control	diff	diff	diff	xuŋ(Hr)	'red'	贯	kuan(F)	'penetrate'
c1_sdiff_tcong_ff	diff	**same**	diff	xuŋ**(Hr)**	'red'	涂	t^hu**(Hr)**	'smear'
c2_scong_tcong_cw[b]	**same**	**same**	**same**	**xuŋ(Hr)**	**'red'**	红	**xuŋ(Hr)**	**'red'**
c3_scong_tcong_ff [c]	**same**	**same**	diff	**xuŋ(Hr)**	'red'	洪	**xuŋ(Hr)**	'flood'
c4_scong_tdiff_ff	**same**	diff	diff	**xuŋ**(Hr)	'red'	轰	**xuŋ**(Hl)	'boom'
c5_scomp_tcomp_cw	***comp***	***comp***	***comp***	***xuŋ(Hr)***	***'red'***	绿	***ly(F)***	***'green'***
c6_scomp_tcomp_ff	***comp***	***comp***	diff	***xuŋ(Hr)***	'red'	虑	***ly(F)***	'consider'
c7_scomp_tdiff_ff	***comp***	diff	diff	***xuŋ***(Hr)	'red'	旅	***ly***(Lr)	'travel'
c8_scomp_tcong_cw	***comp***	**same**	***comp***	***xuŋ*(Hr)**	***'red'***	蓝	***lan*(Hr)**	***'blue'***
c9_scomp_tcong_ff	***comp***	**same**	diff	***xuŋ*(Hr)**	'red'	栏	***lan*(Hr)**	'fence'

WU J et al.. Recognizing two dialects in one written form: A Stroop study[J]. Bilingualism: Language and Cognition, 2024: 1-17.



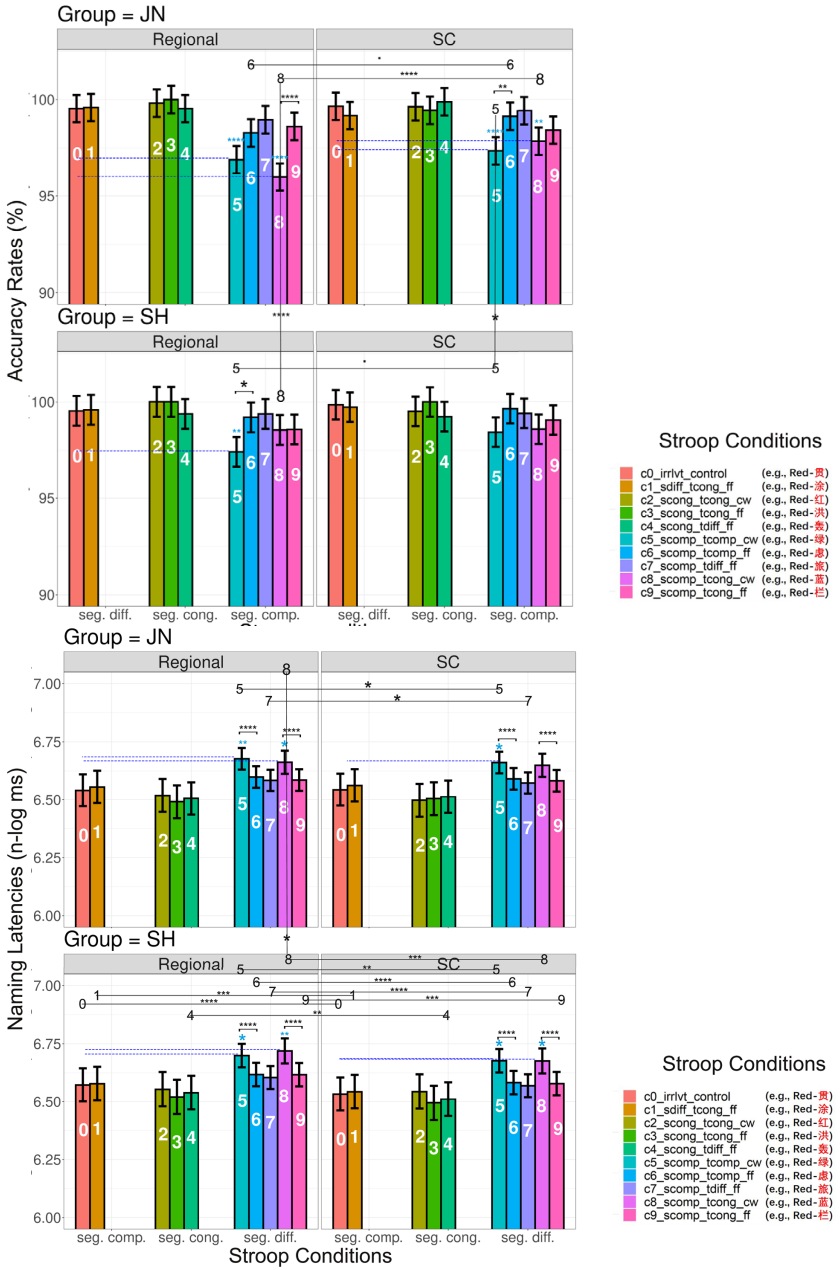


classical Stroop interference
semantic information of the Chinese characters is automatically activated during the Stroop task

bi-dialectal experiences benefit conflict resolution (Even **passive** understanding of a dialect)

Chinese characters **automatically activate words in both dialects** simultaneously

WU J et al.. Recognizing two dialects in one written form: A Stroop study[J]. Bilingualism: Language and Cognition, 2024: 1-17.



‘regional-dialect disadvantage →
Literacy creates a bias towards the standard pronunciation

The logographic script is an active force that **aligns cognitive processing** across dialects.

adaptive flexibility and a powerful cognitive grounding → **co-evolutionary convergence** of Chinese dialects

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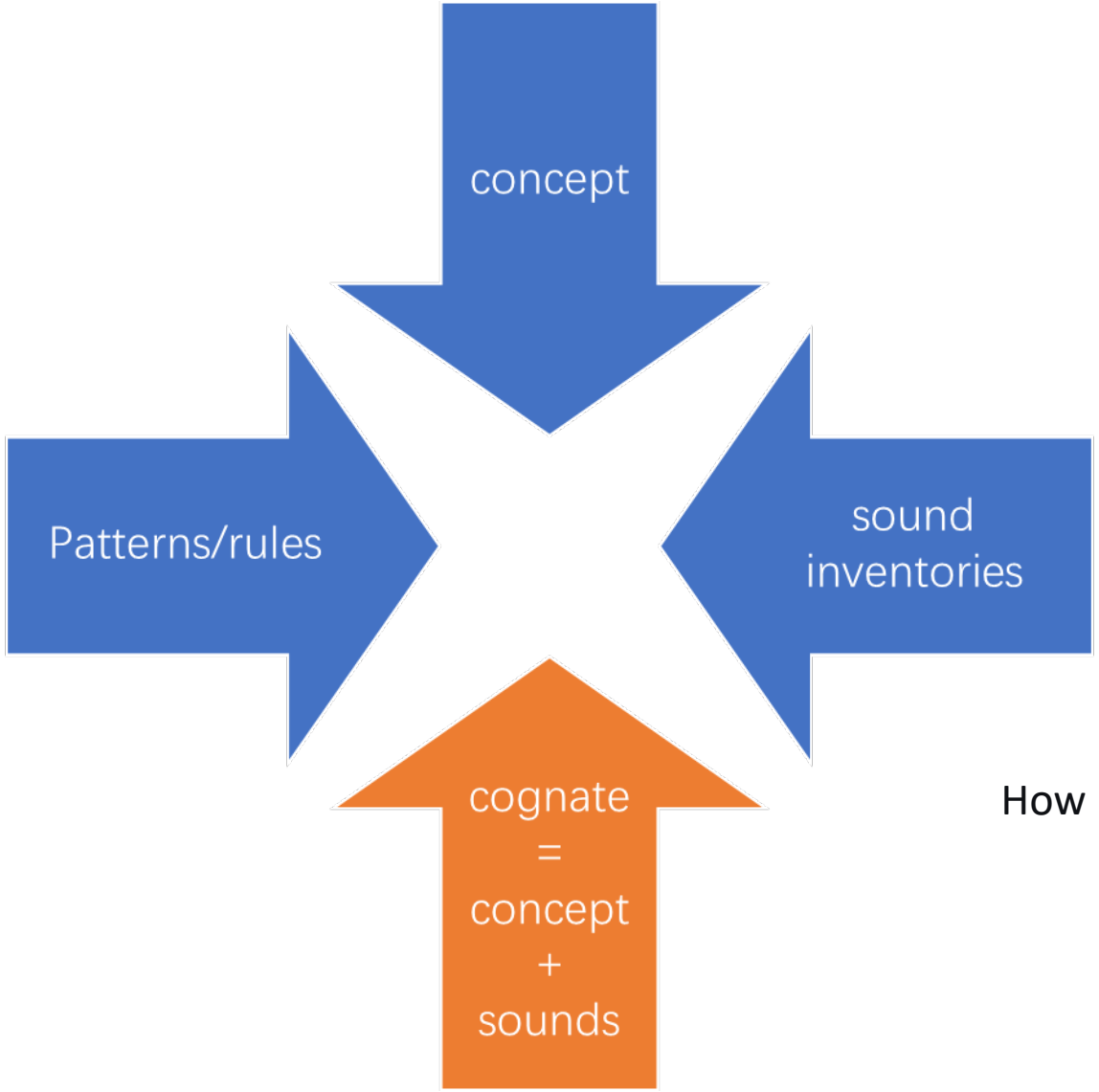


How related words are born?

WU J et al. Cross-dialectal novel word learning and borrowing[J]. Frontiers in Psychology, 2021, 12: 734527.

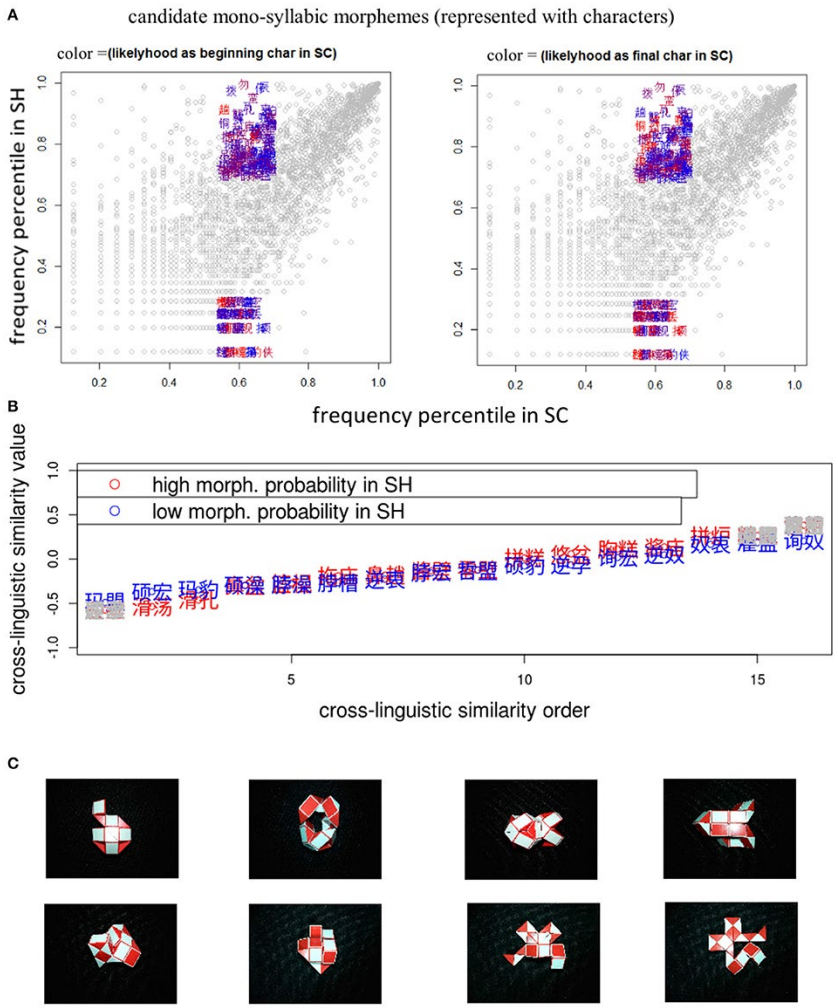
Teaching Standard Chinese new words to different groups

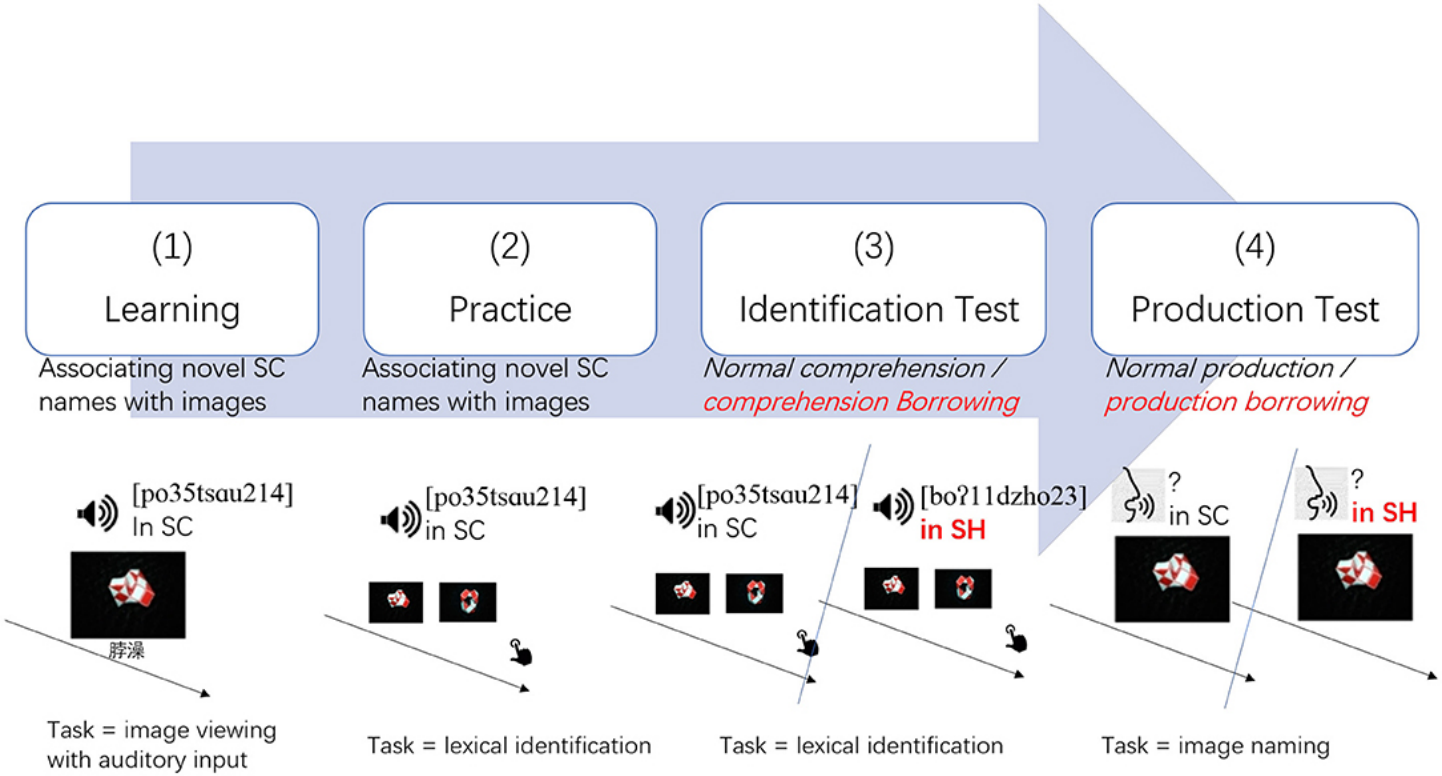
	Dial. background		
Long-term ling. Experience	**SC monolectals**	**SC-OD bi-dialectals**	**SC-SH bi-dialectals**
Long-term bi-dialectal exposure	No	Yes	Yes
Long-term recipient-dialect-specific experience	No	No	Yes
Lexical semantic experience to morphemes	Yes	Yes	Yes

WU J et al. Cross-dialectal novel word learning and borrowing[J]. Frontiers in Psychology, 2021, 12: 734527.

How does the brain first learn and borrow a word from another dialect?

Teaching Standard Chinese new words to different groups





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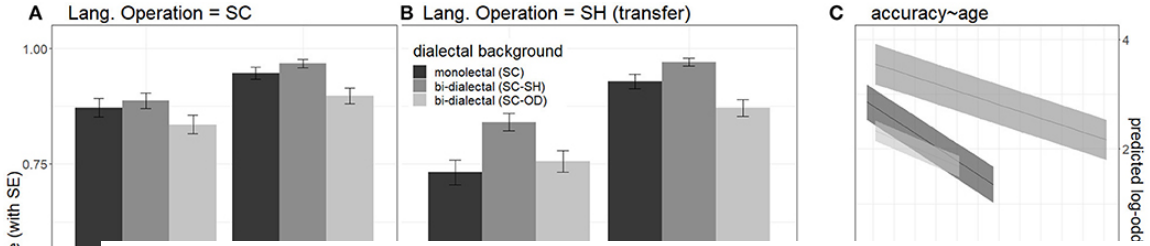
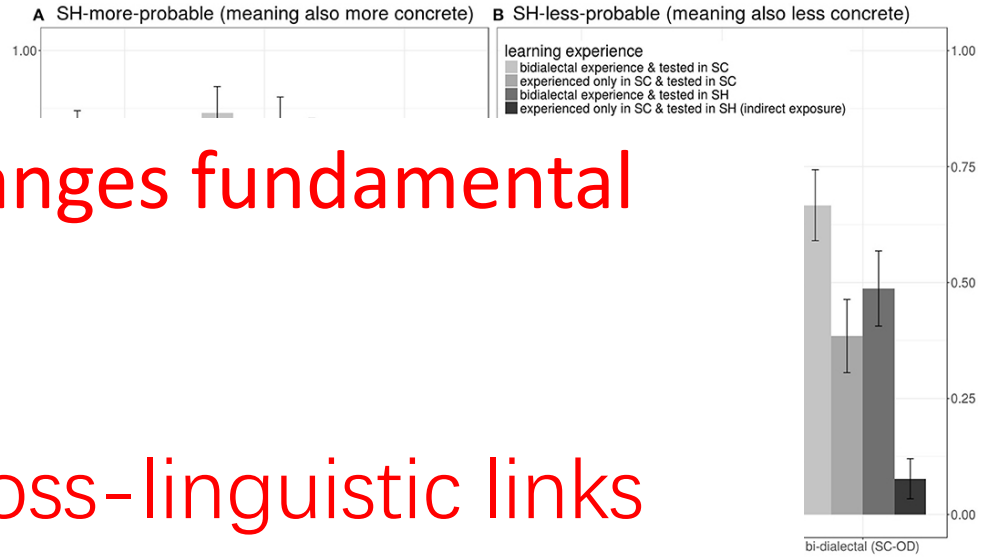
recognition

a fundamental difference in cognitive strategy



production



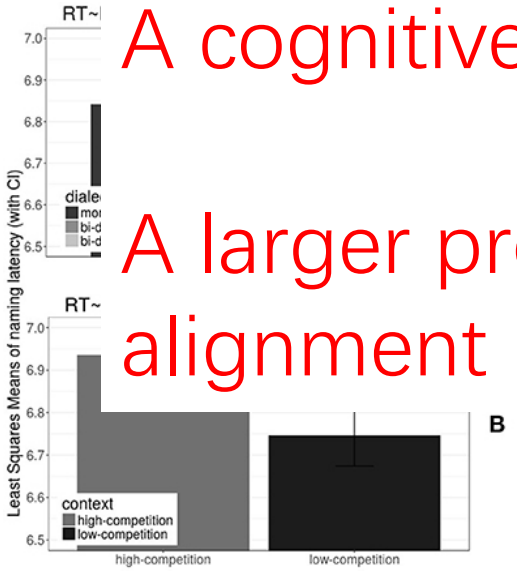
Long-term bi-dialectal experience changes fundamental approach to learning and borrowing

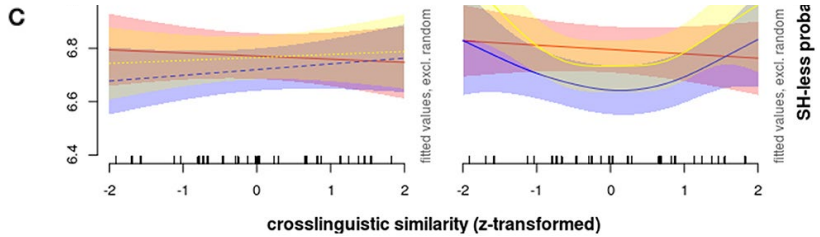
A cognitive toolkit for managing cross-linguistic links

ate.

A larger proportion of bi-dialectals may expedite lexical alignment

s to





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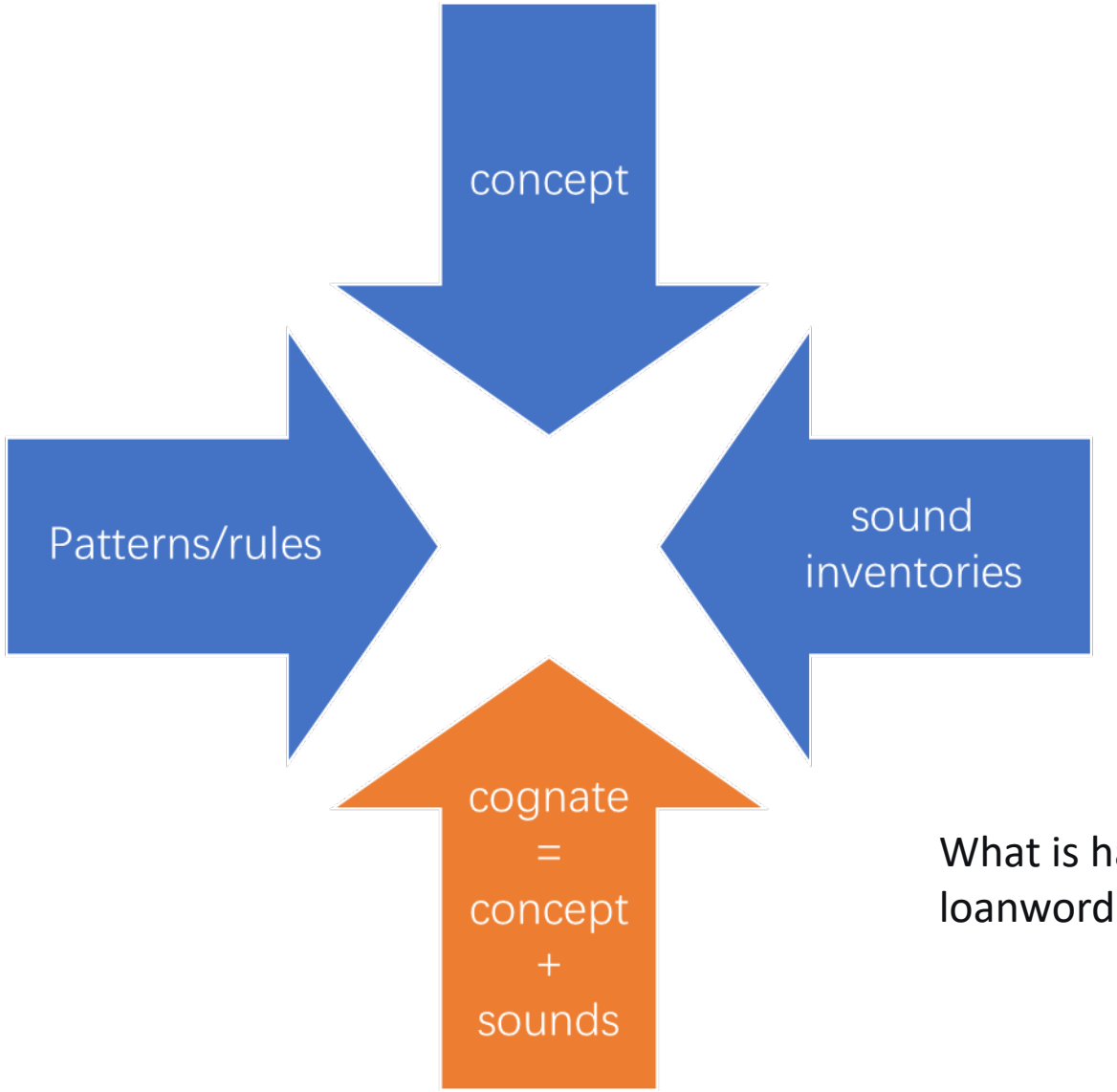

What is happening in the brain at the very moment of loanword comprehension?

WU J. et al. Neuro-cognitive correlates of lexical borrowing during sentence comprehension of bi-dialectal speakers[J]. Bilingualism: Language and Cognition, 2025: 1-14.

What is happening in the brain at the very moment of loanword comprehension?

EEG while participants listened to **full, natural Shanghainese sentences** for comprehension

伊讲 Target] xxx
/i55 gaŋ13/ '3rd-Person SAY

	Condition	Explanation	example
(1)	(a) Shanghainese-specific form	Shanghainese words that are not etymologically aligned with their SC translation equivalents — high-nativeness baseline	/kʰɛ55ɦiɑ̃ŋ21/ 开洋 "dried small shrimps"
	(b) Morpheme-based loan forms	Loan forms generated by combining Shanghainese morphemes that are etymologically related to their SC translation equivalents into new Shanghainese words	/hɷ53mi44/ 虾米 "dried small shrimps"
	(c) Holistically casted loan forms	Loan forms adapted to the Shanghainese sound system based on the similarity between the source SC lexical forms and their phonologically most-similar sounds in Shanghainese, which matches the phonemic inventory and phonotactic regulations of Shanghainese	/ʃia55mi21/ 虾米 "dried small shrimps"
	(d) Code-switched forms	The source SC lexical forms	/ɕiA55mi2/ 虾米"dried small shrimps"
(2)	Pre-existing ETEs	Naturally pre-existing Shanghainese compounds that are etymologically related to their Standard-Chinese equivalents and have no well-known Shanghainese-specific alternatives	朋友 "friend" / bɑ̃ŋ22iɤ44/ (SC ETE = /pʰəŋ35iʊ214/)

WU J. et al. Neuro-cognitive correlates of lexical borrowing during sentence comprehension of bi-dialectal speakers[J]. Bilingualism: Language and Cognition, 2025: 1-14.

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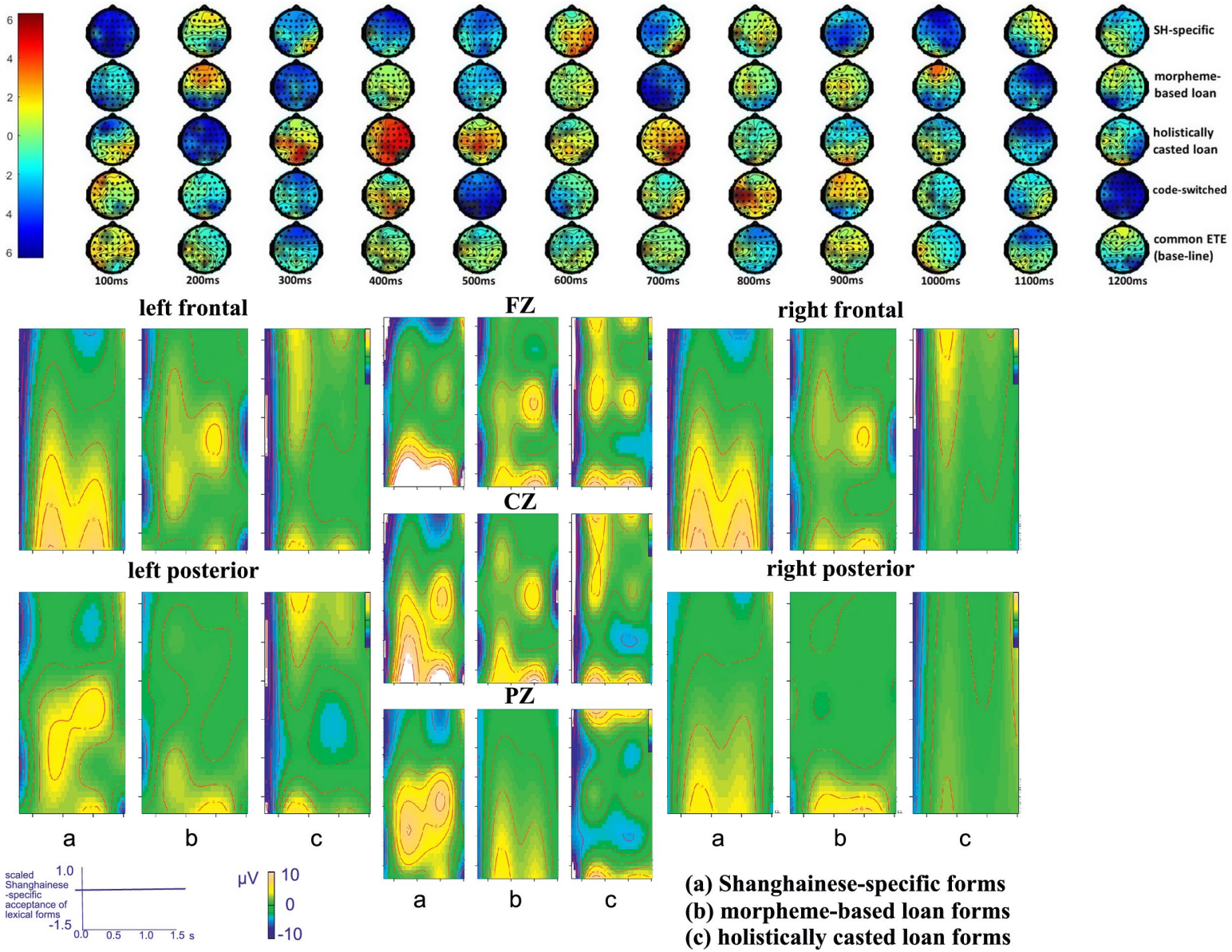

fine-tuning to native expectations

reduced acceptance ~ positive shifts in ERPs

holistic loanwords~**P300-like response**

the morpheme-based loanwords **~N400, LPC**

Primacy Effect (Sam, Reference Sam2013)

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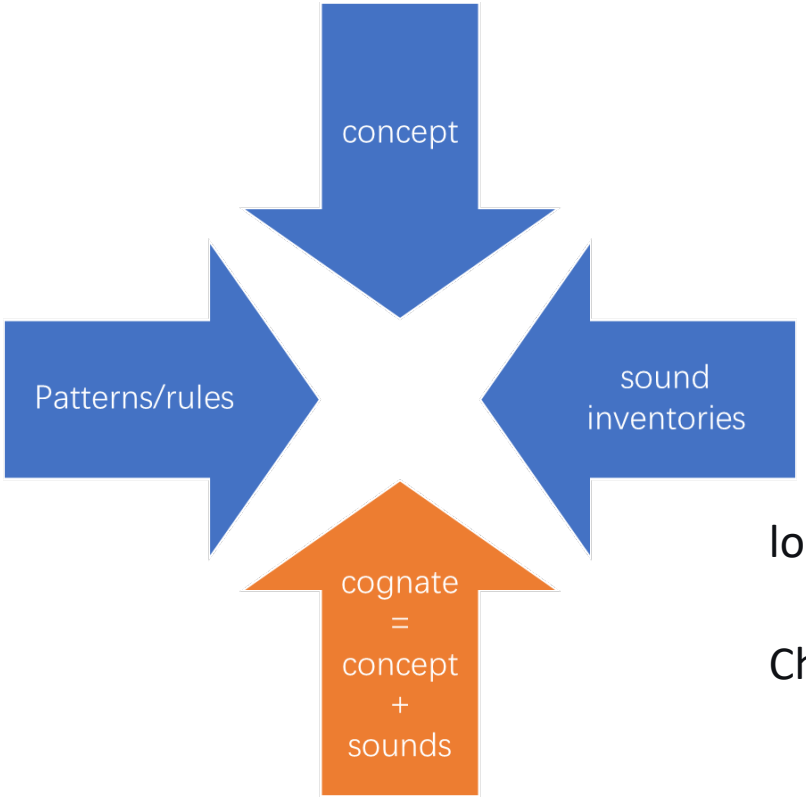

long-term, large-scale outcome

Chinese-originated elements in the Korean core vocabulary

吴君如, 柳志惠. 与韩语核心词表相关的汉源语素与汉源词——兼论词汇“首因效应”在借贷中的作用[J]. 语言学论丛, 2025(01 vo): 105-117.

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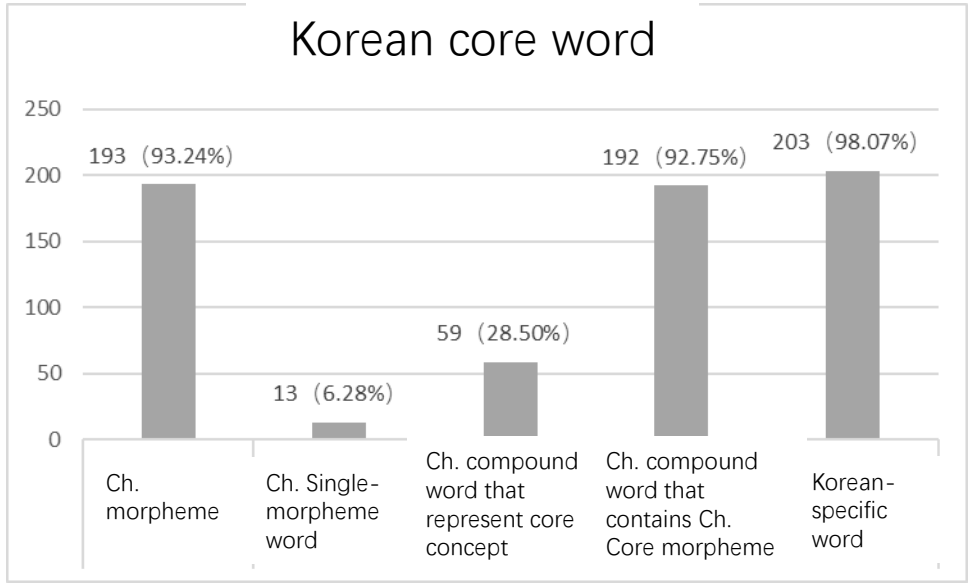
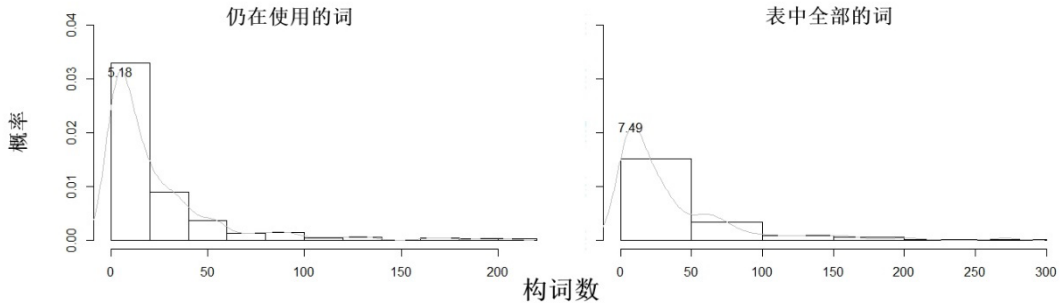


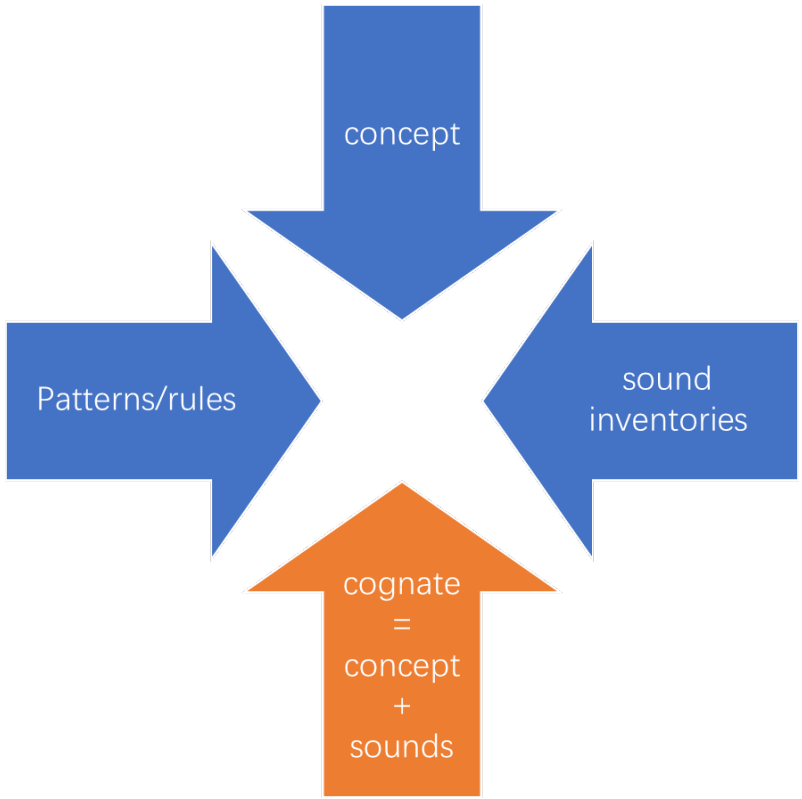


a massive number of Chinese-originated *morphemes*
Vs.
very few Chinese-originated *words* for core concepts

contact is boundless.
But it is also hierarchical.

the cognitive cost of lexical competition ultimately shapes the historical trajectory of languages on a grand scale

吴君如, 柳志惠. 与韩语核心词表相关的汉源语素与汉源词——兼论词汇“首因效应”在借贷中的作用[J]. 语言学论丛, 2025(01 vo): 105-117.

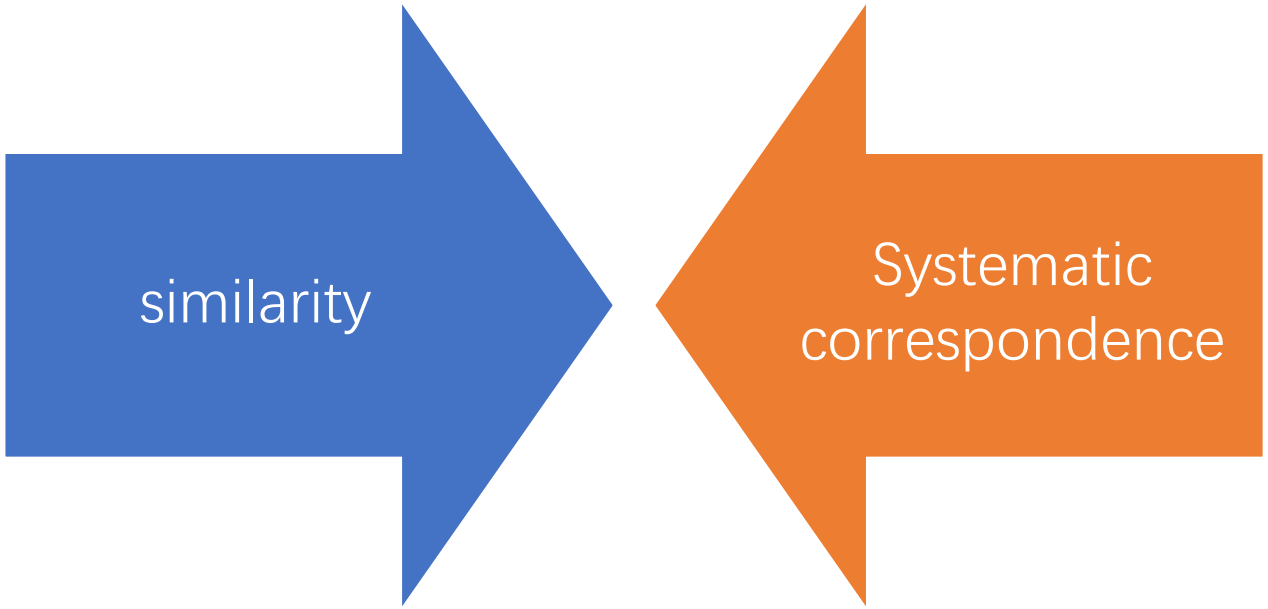


similarity

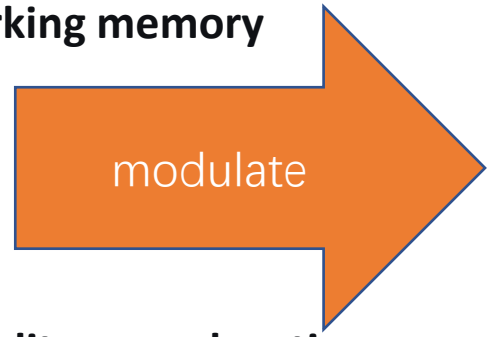
Vs.

Systematic correspondence

WU J, CHEN Y, VAN HEUVEN V J, 等. Predicting tonal realizations in one Chinese dialect from another[J]. Speech Communication, 2016, 76: 1-27.



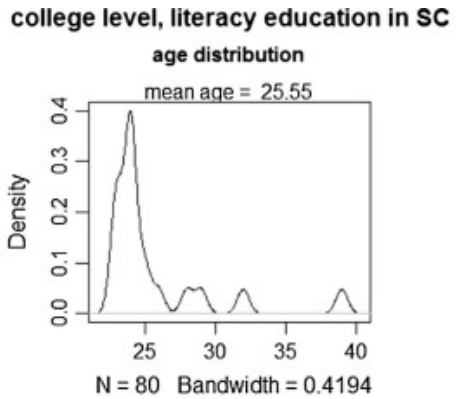
auditory working memory

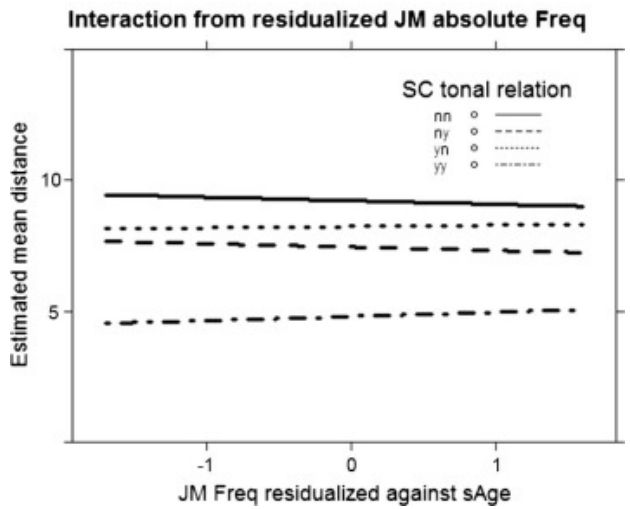


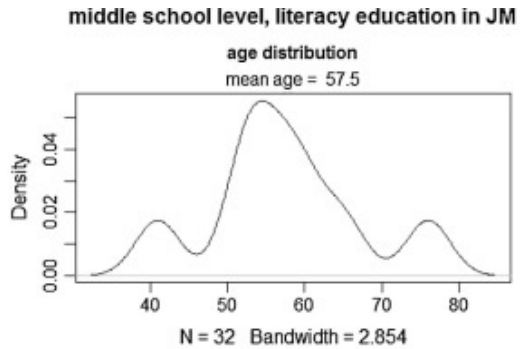
experiences with literacy education.

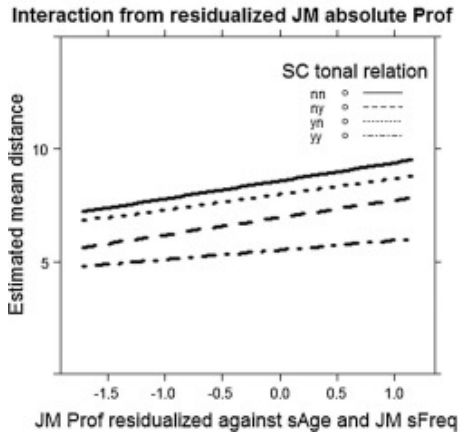
BM		**Tone 1 high-level**	**Tone 2 high-rising**	**Tone 3 low-rising or dipping**	**Tone 4 high-falling**	**Total**
JM	≈	81% (low-)rising	76% high-falling	70% high-level	75% low-falling	76%

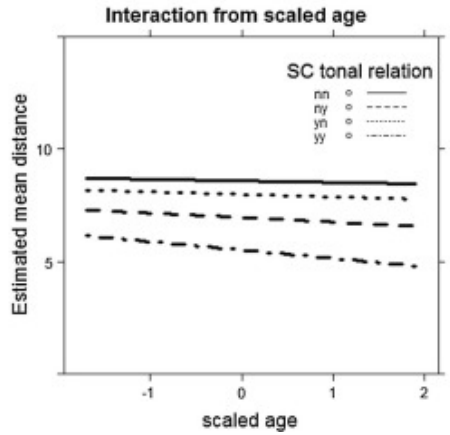
WU J, CHEN Y, VAN HEUVEN V J, 等. Predicting tonal realizations in one Chinese dialect from another[J]. Speech Communication, 2016, 76: 1-27.

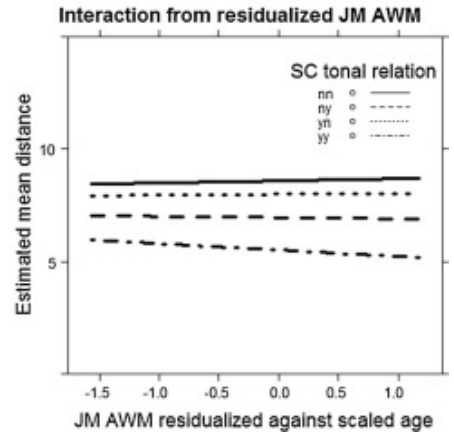

college level, literacy education in SC
age distribution
mean age = 25.55
Density
0.0
0.1
0.2
0.3
0.4
25
30
35
40
N = 80 Bandwidth = 0.4194

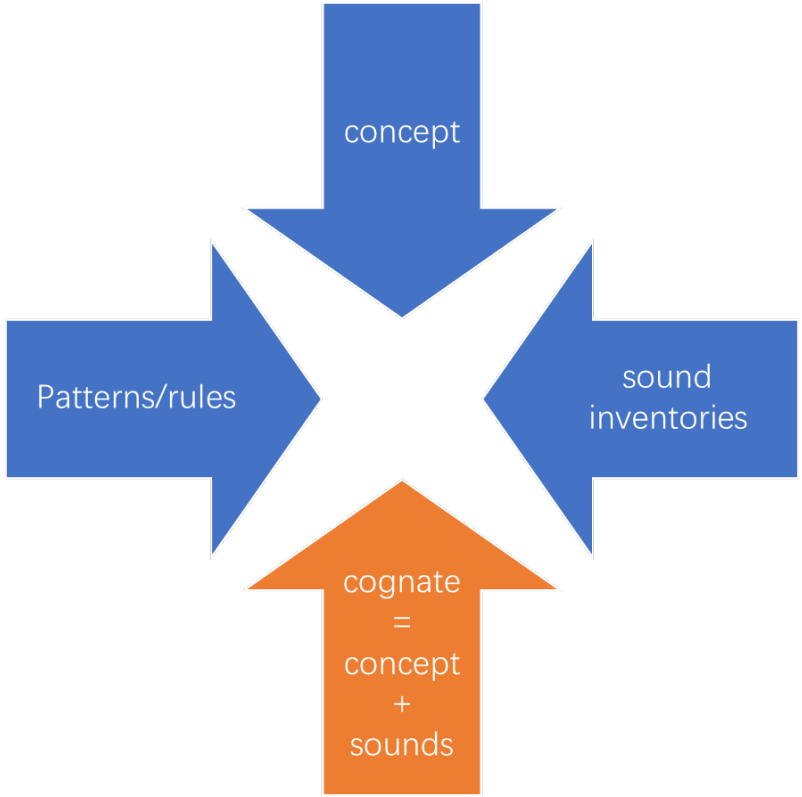

Interaction from residualized JM absolute Freq
SC tonal relation
nn
ny
yn
yy
Estimated mean distance
5
10
-1
0
1
JM Freq residualized against sAge


middle school level, literacy education in JM
age distribution
mean age = 57.5
Density
0.00
0.02
0.04
40
50
60
70
80
N = 32 Bandwidth = 2.854


Interaction from residualized JM absolute Prof
SC tonal relation
nn
ny
yn
yy
Estimated mean distance
5
10
-1.5
-1.0
-0.5
0.0
0.5
1.0
JM Prof residualized against sAge and JM sFreq


Interaction from scaled age
SC tonal relation
nn
ny
yn
yy
Estimated mean distance
5
10
-1
0
1
2
scaled age


Interaction from residualized JM AWM
SC tonal relation
nn
ny
yn
yy
Estimated mean distance
5
10
-1.5
-1.0
-0.5
0.0
0.5
1.0
JM AWM residualized against scaled age



long-term relationship between socially independent languages

Vs.

long-term relationship between socially independent languages

WU J, ZHAO J. Systematic correspondence in co-evolving languages[J]. Humanities and Social Sciences Communications, 2023, 10(1): 469.

long-term relationship between socially independent languages

English and German

a stable equilibrium/drift apart

Vs.

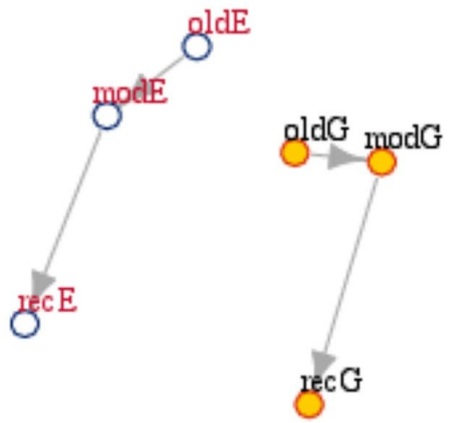
the rapid convergence of dialects within a single society

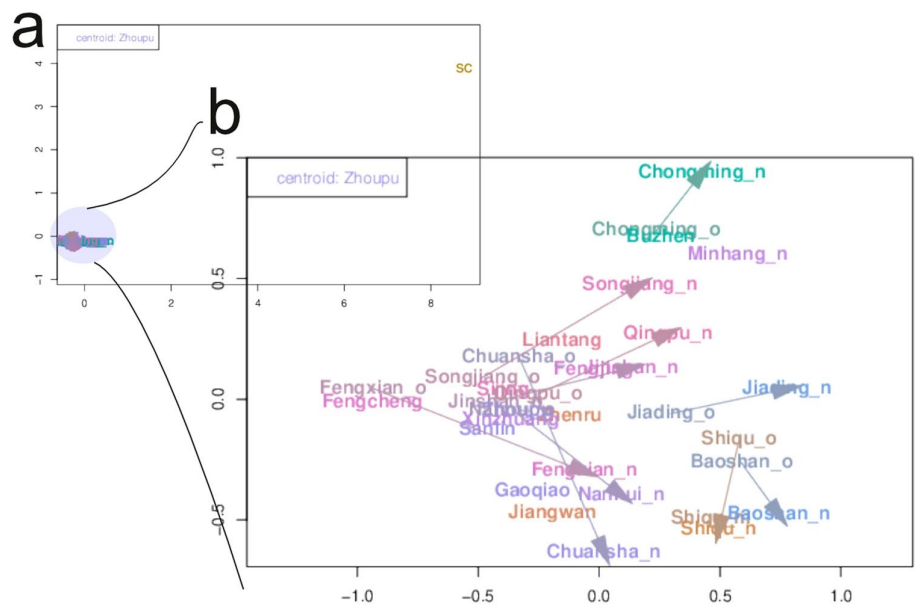
the Chinese dialects in Shanghai

rapidly converge toward a standard variety

Lexical similarity

c





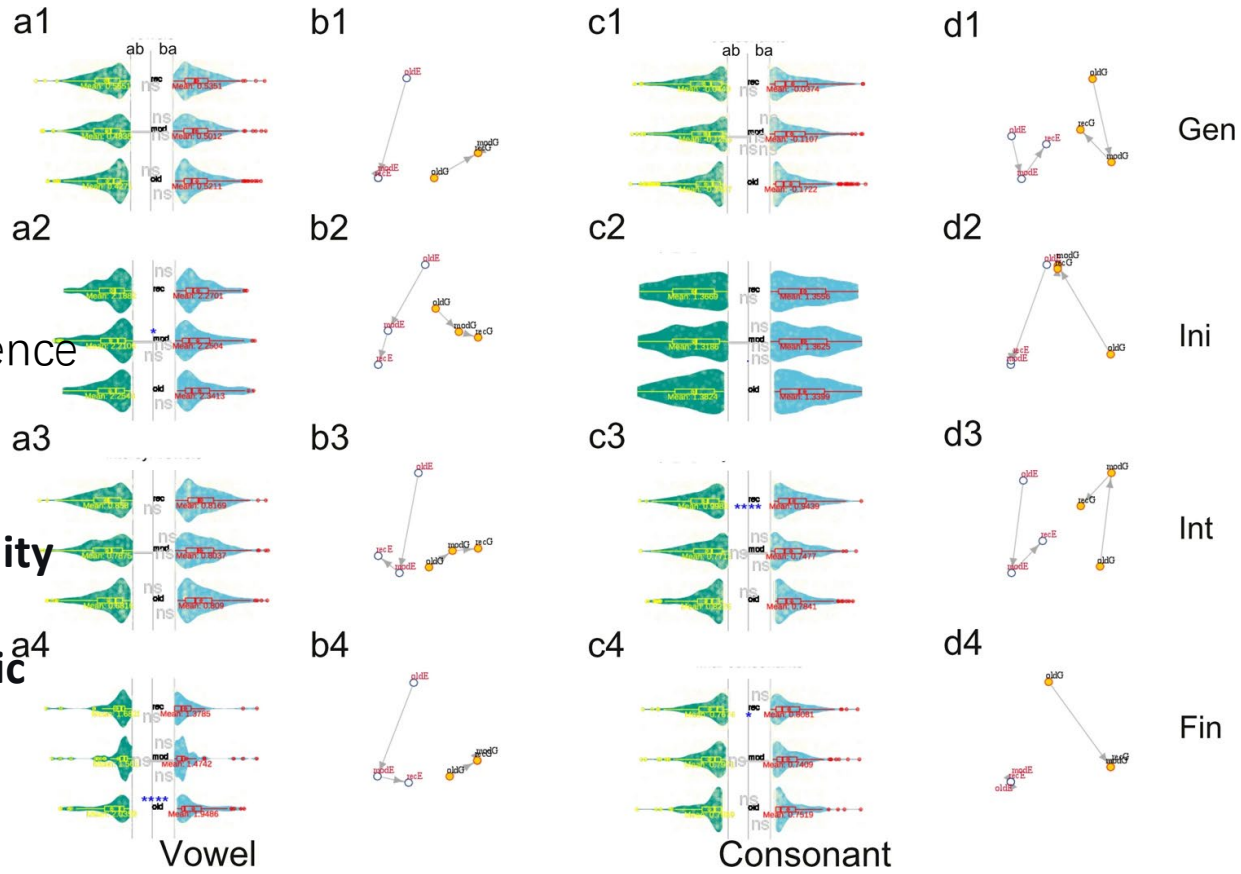
WU J, ZHAO J. Systematic correspondence in co-evolving languages[J]. Humanities and Social Sciences Communications, 2023, 10(1): 469.

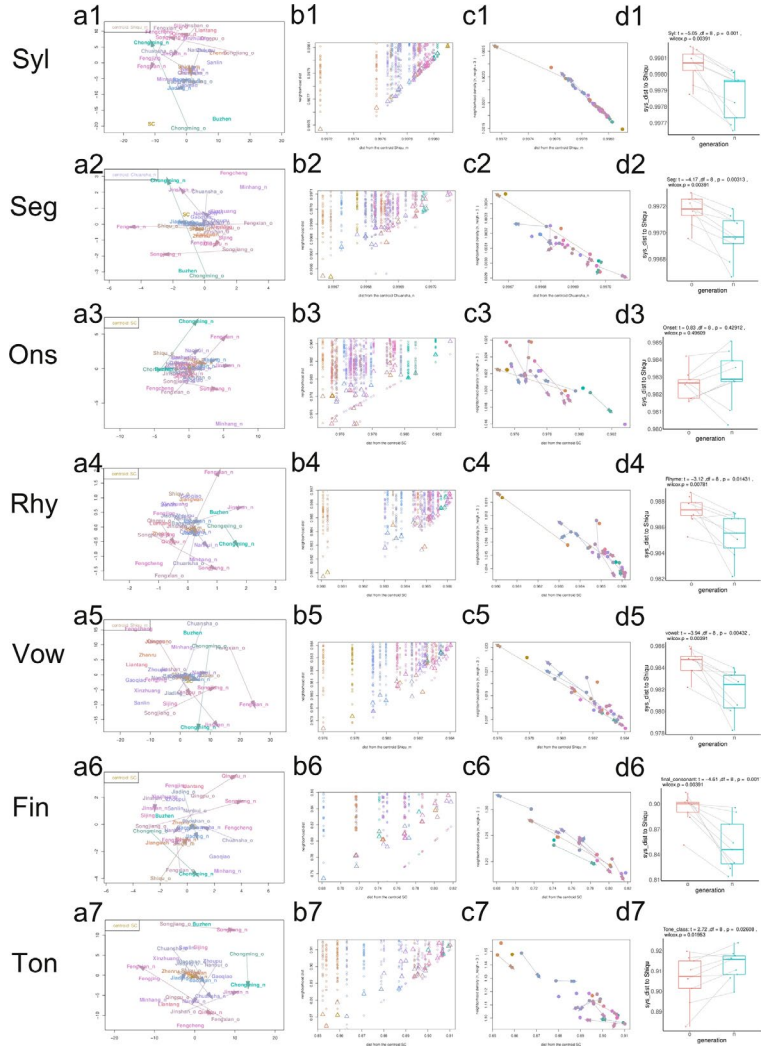
English and German

the Chinese dialects in Shanghai

Systematic correspondence

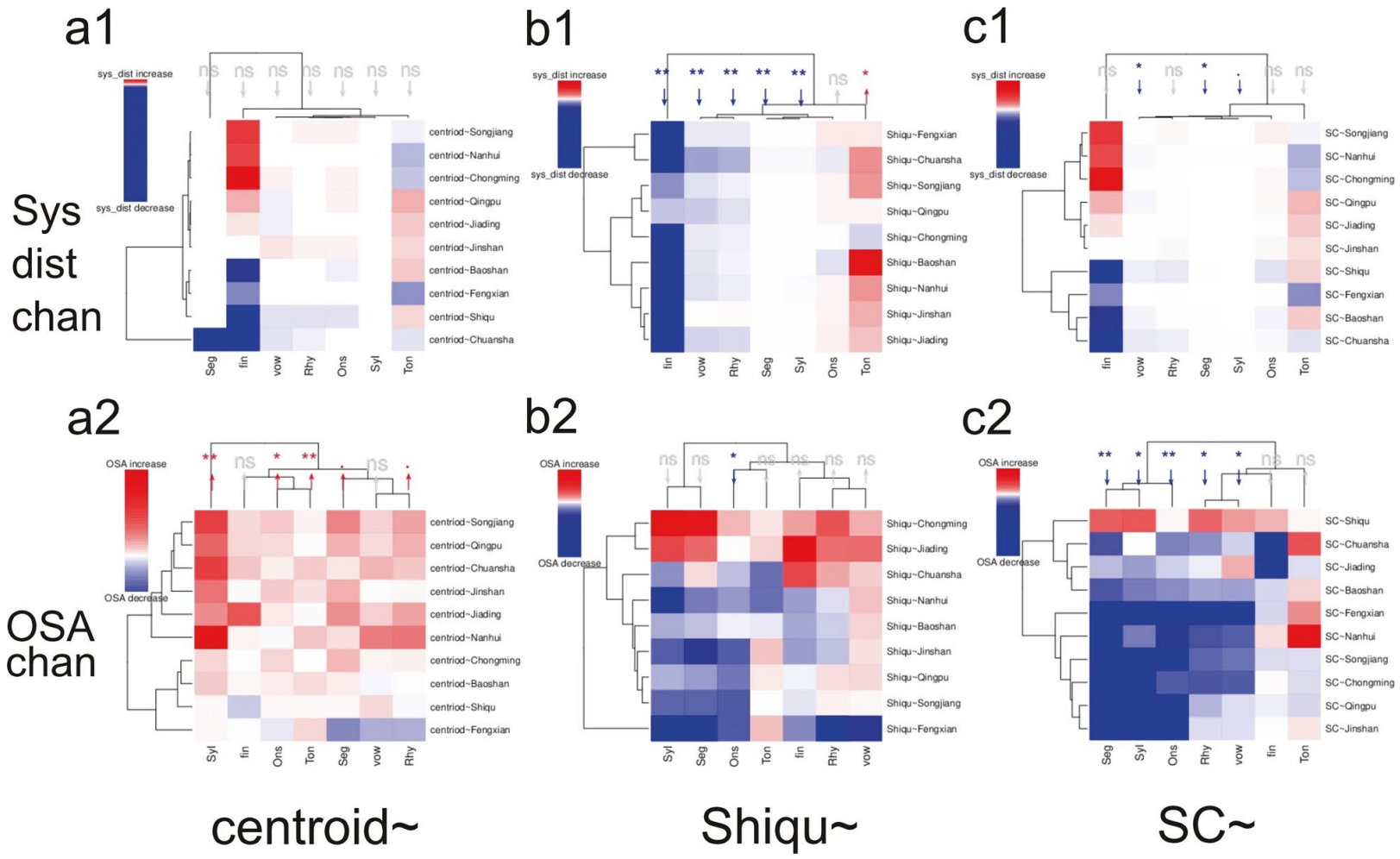
the brain's ability to detect and align systematic patterns





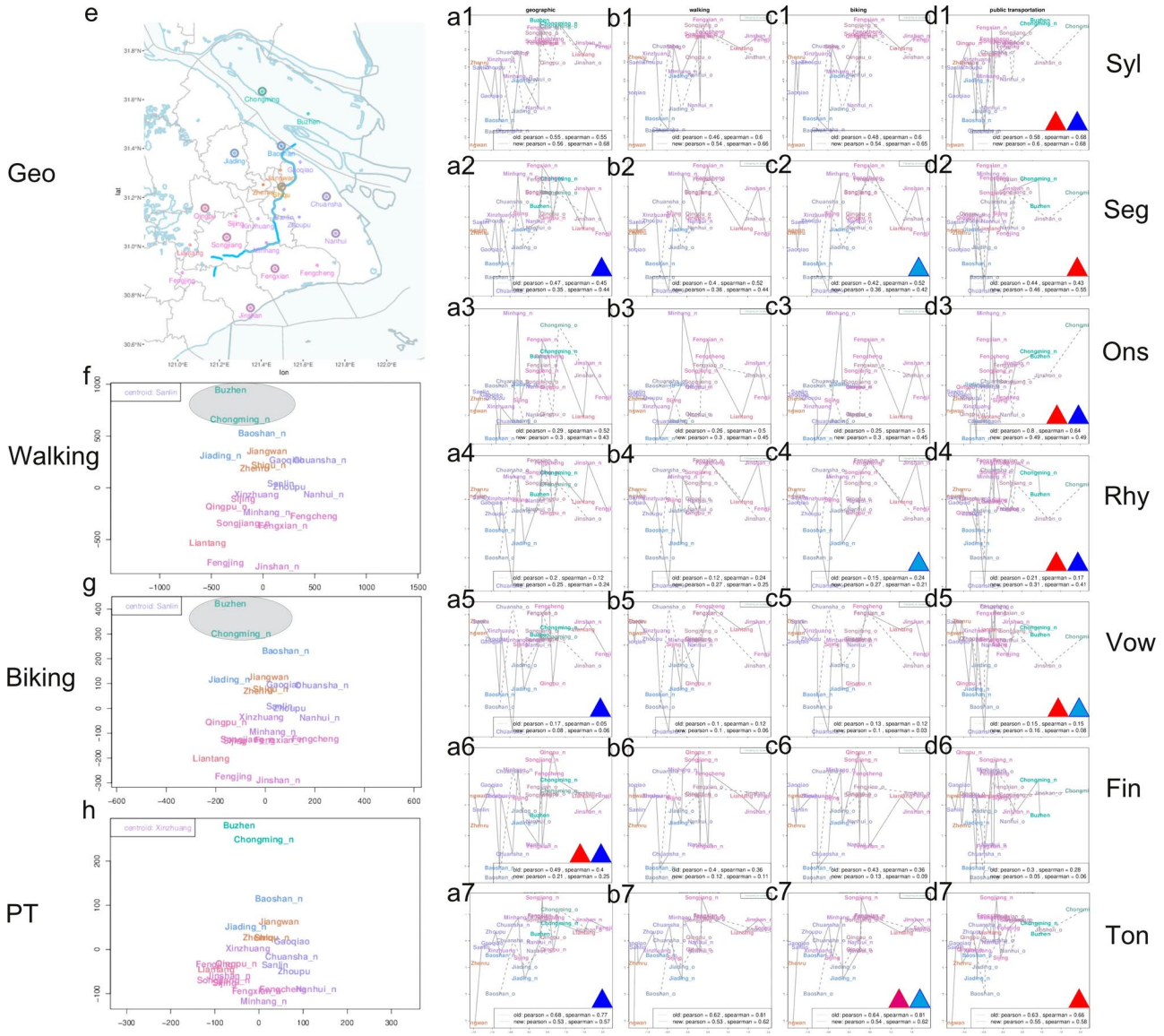
WU J, ZHAO J. Systematic correspondence in co-evolving languages[J]. Humanities and Social Sciences Communications, 2023, 10(1): 469.

Co-evolution is a self-organizing process
Joined cognitive choices by individuals fine-tune the underlying rules of language



WU J, ZHAO J. Systematic correspondence in co-evolving languages[J]. Humanities and Social Sciences Communications, 2023, 10(1): 469.

systematic distances strongly correlated with **geography and travel times**



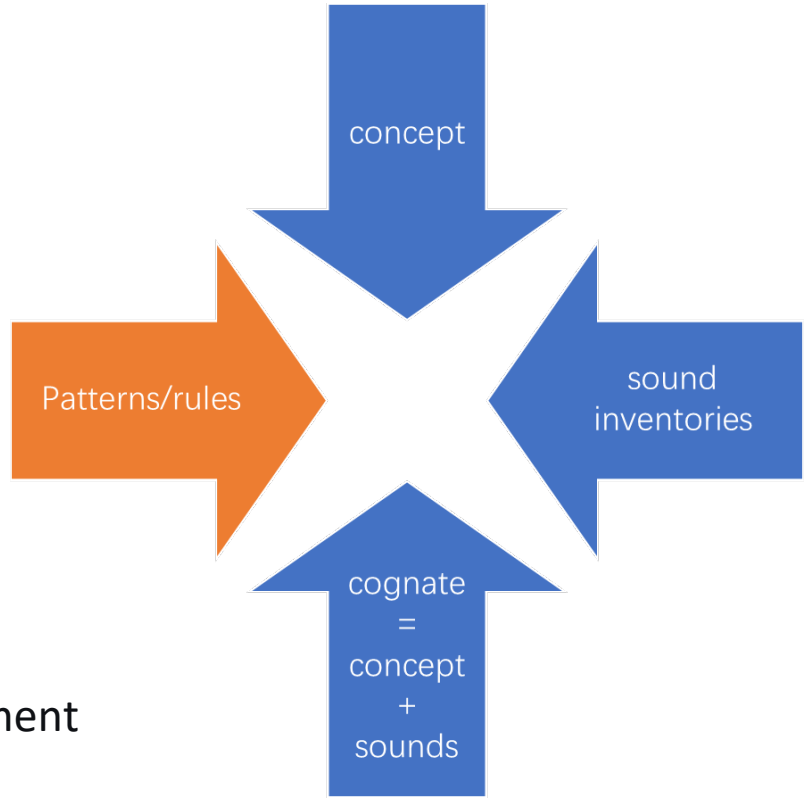
The cognitive process of building systematic sound correspondences is deeply grounded in the changing patterns of human interaction and community

WU J, ZHAO J. Systematic correspondence in co-evolving languages[J]. Humanities and Social Sciences Communications, 2023, 10(1): 469.

the role of phonotactics

- how English consonant clusters are adapted into Mandarin Standard Chinese

a controlled language contact experiment



吴君如. 重音对英语音节间双辅音在普通话中匹配的影响[J]. 语言学论丛, 2013, 47.

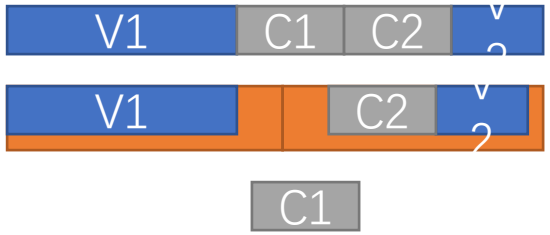
a controlled language contact experiment

e.g.,
Kaplan -卡普兰

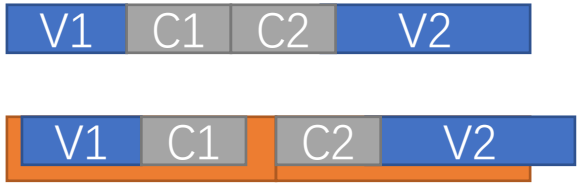
*　　*　　ns

	平均成音节数 MSylC	平均从前系数 MFC	平均从后系数 MLC
trochaic	0.7667	0.4706	1.0634
iambic	0.6993	0.5176	1.0654

trochaic



iambic



Atlantis 艾兰特斯

Universal phonological principles interact with the native template to guide how new sounds are mapped.

a **probabilistic** process

吴君如. 重音对英语音节间双辅音在普通话中匹配的影响[J]. 语言学论丛, 2013, 47.

Take home messages

- 1. The Mind is the Engine
- 2. A Multi-Layered Cognitive Toolkit
- 3. Cognitive Costs Shape Evolutionary Paths
- 4. From Individual Minds to Collective Evolution. .

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Junyuan Zhao

Thank you!